Willingness to accept for an increase in work-related risk of fatal injury: the evidence from the Czech Republic

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Abstract

The paper presents results of a CVM survey conducted recently that focused on valuation of work-related fatal and non-fatal injuries. Willingness to accept an increase in monthly wage in riskier job has been used to derive VSL in context of labor market. To this end, the authors employed relatively new approach to representing change in fatal risk in the CVM scenario for work-related fatalities. Further, the VSL amounting to median value of 239 million CZK (8.43 million €) is compared with values of VSL obtained in different CVM and HPM studies in context of work-related fatal risk and outside the area of work-related risk.

Keywords: CVM; VSL; WTA; labor market; fatal risk, fatal injury

ERE categories: Environmental valuation

JEL codes: J17, J28, Q26

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I. Introduction

Labor has many direct and indirect impacts on wellbeing of workers, health impacts being the most important among them. Any policy-making decision that has an influence on these impacts (e.g. implementation of work-safety measures) should take into account magnitude of these welfare-related effects. Crucial step in assessment of health impacts of working activity on well-being of workers is monetary valuation of different aspects of work-related health impacts.

One of the important effects of working process is premature death due to work-related fatal injuries. Despite a very specific character of the product, i.e. a premature death, an attempt to put monetary value on mortality has a long tradition in public policy analysis. For instance, Landefeld et Seskin (1982) trace this idea more than 300 years ago in an impact assessment of public programs combating airborne pollution in Great Britain. More recently, the value of statistical life (hereinafter VSL) are used in current policy practice in the US and the EU. US EPA uses as a base VSL of $6.3 million (1999 dollars) in its policy recommendations on groundwater regulations (US EPA, 2000), Department of Transportaion and other US governmental agencies use similar estimates in evaluating regulatory effects (Adler and Posner, 2000; cit. in Jennings and Kinderman, 2003). The European Commission in its CBA guidelines, e.g. for CAFE Programme (EC, 2006) or for the external costs quantification by the ExternE method (EC, 2005), recommends to use a unique value of a statistical life as high as 1 million euro, with 50% premium for cancer.

The value of mortality can be derived by applying three possible methods:
i) human capital approach,
ii) cost derived from medical expenditures (such as QALY),
iii) methods based on measurement of welfare change.

Only the methods based on measurement of welfare change due to mortality risk can asses the impacts of work-related activity on well-being of individual workers consistently with welfare economics.

One of the methods consistent with welfare economics is derivation of value of statistical life (VSL) from stated preferences through contingent valuation or contingent choice experiments. Based on original CV questionnaire developed by Krupnick et al. (2002), the VSL was obtained from willingness-to-pay for risk reduction of dying in wide group of countries. In this way the VSL was estimated for the US and Canada (Krupnick et al., 2002), for Italy, France and UK (in NewExt project; see Alberini et al., 2005), and Krupnick et al. (2006) compare these results with VSL derived for Japan. Further, Alberini et al. (2005) and Alberini et al. (2006) obtained the VSL from WTP for avoiding risk of dying from respiratory and cardiovascular diseases for Italy and for the Czech Republic, while Giergiczny (2006) tested this approach in Poland. Using stated preference approach in choice experiments, the VSL was derived for example by Tsuge et al. (2005) who experimented with various characteristics such as risk type (cancer, heart attack, accident) and latency. Choice experiment approach was used also by Itaoke et al (2006) who treated labeling effect for mortality risk reduction for electric power sector.

Alternatively, the Value of Life Year Lost was obtained from WTP for prolongation of life expectancy by DEFRA study (Chilton et al. 2004), and more recently the values for 8 European countries were provided by NEEDS project (Desaigues et al. 2006).

There have been a number of economic studies aiming specifically at valuation of work-related injuries. This type of research has been important both within the context of fuel production externalities (especially ExterE series) and in the context of work-safety regulations.

However, majority of these studies were carried out using hedonic price model (for recent overview of HPM studies see Viscusi and Aldy (2003))[2]. In effect, we were able to identify only 4 studies using CVM to value mortality risks specifically due to working process. Out of these 4 studies, 3 studies - Gegax et al. (1985, 1991), and Gerking et al. (1988) were based on the same data from a 1984 survey. The survey used for the purpose of these three studies contained information on both subjective perception of work-related risk as well as socio-demographic information about respondents. Subjectively perceived job-related risk was assessed by respondents on a 10-points scale which highlighted levels of objective fatal injury risks for some well known occupations such as lumberjack, miner, electrician etc. The respondents then indicated the level of fatal injury risk that was, according to their perception, similar to their own risk. Consequently, respondents were asked how much they would accept and pay for change in their job-related fatal risk if it had decreased or increased by one level on the previously mentioned scale. Combining this information with socio-demographic information provided by respondents, stated and revealed preferences were analyzed.

Similar approach using 10-step ladder of work-related risk exposure was applied by Lanoie et al. (1995) on the sample of employees in selected firms in Montreal. Following question on perceived level of risk, respondents were asked to state their willingness to pay or willingness to accept in case their job would be rated one step bellow and one step above its current position on the risk ladder. Also in this study were stated preferences compared to revealed preferences suggesting that the two types of methods provide very different results in terms of VLS.

Up to date, there has been no CV study of work-related mortality in the Czech Republic or even in Central European countries. The approach used in this paper derived VSL through CVM by asking respondents whether they were willing to accept certain job with higher risk of fatal injury and higher monthly wage. In contrast to CVM studies of work-related fatal injuries described above, our approach is novel in that respondents are informed about objective statistical risk of fatal injury they are exposed to in their current job as well as about the precise increase in probability of fatal injury in the new job offered to them. This approach is similar to the one used originally by Krupnick et al. (2002).

The aim of this paper is twofold: (1) to obtain the VSL from willingness to accept a compensation for higher occupational risks derived within original CV survey conducted in the Czech Republic; (2) to compare this VSL with VSL obtained in other contexts and VSL obtained from a hedonic wage study undertaken in the Czech Republic recently.

[2] Viscusi (1992) examined 37 hedonic wage (HW), hedonic price (HP) and contingent valuation (CV) studies of the value of a statistical life. Viscusi argued that the two CV studies he analysed, whose sample sizes was 30 and 36 respectively, were less reliable and should not be used (cited in Kochi et al. 2006).

Work-related fatal injuries in the Czech Republic

Working conditions have been improving significantly in the Czech Republic since 1990. While official statistics of SUIP (State Labour Inspection) recorded almost 300 cases of fatal injury and about 100,000 cases of non-fatal occupational injury annually in mid-90's (per total number of 4.7 million employees). Last year (2006), there were only 137 fatal injuries and less than 80,000 cases of non-fatal injury reported.

To put it in relative terms, while there were 0.6 cases of fatal and almost 230 non-fatal work-related injuries per 10,000 employees in mid-90's, the relative risks have declined to 0.3 fatal and 180 non-fatal injuries per 10,000 employees in 2005 (SUIP).

The three figures bellow illustrate this incessant decline in number of both fatal and non-fatal work-related injuries over the last decade.

Figure 1: Annual absolute number of work-related occupational injuries in the Czech Republic (1993-2005)

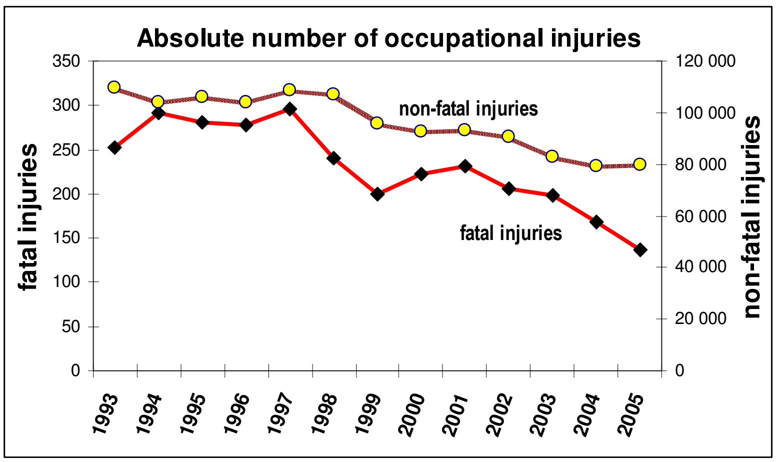


Figure 2: Fatal and non-fatal work-related injuries per 10,000 employees in the Czech Republic (1993-2005)

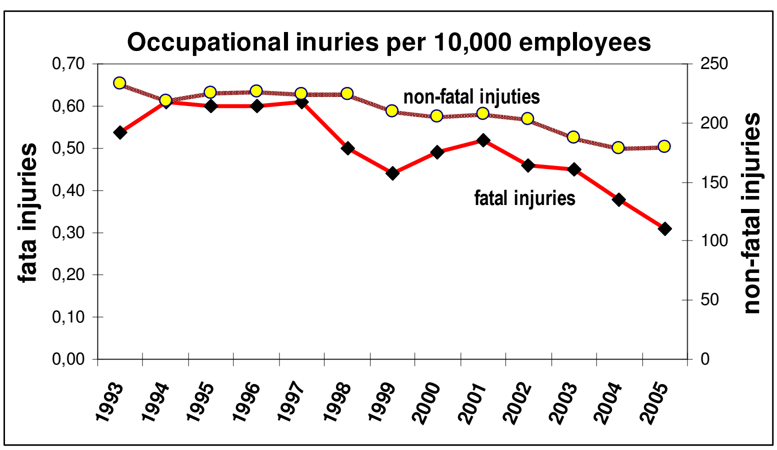
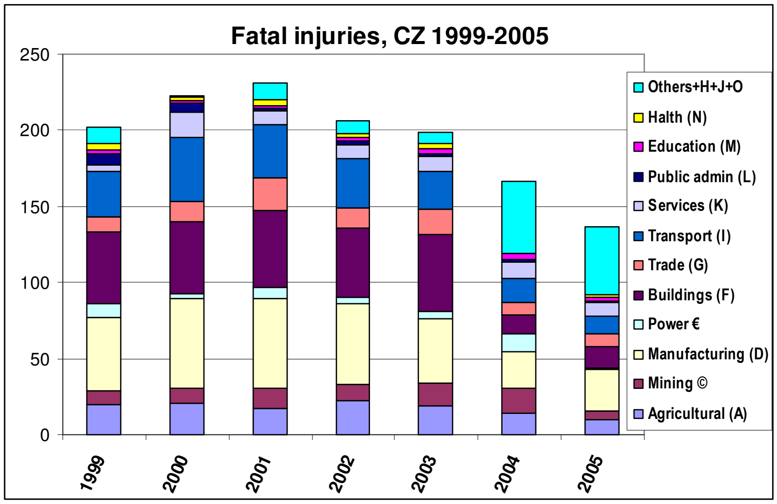


Figure 3: Fatal work-related injuries in the Czech Republic according to category of economic activity (1993-2005).



Presumably, there were several factors responsible for this trend. Firstly, a regulatory system of occupational safety has been enforced with more stringency in the period. Secondly, the Czech economy has been strongly restructured, resulting in higher share of services, and firms being orientated on products with higher added value. Thirdly, growing unemployment drove out less skilled workers from the labor market. These employees were obviously relatively more exposed to risk. Each of these factors might have lowered absolute and relative numbers of work-related injuries.

II. CVM study of work-related morbidity risk

Measure of change in work-related fatal risk

In order to construct CVM scenario for the purpose of valuation of welfare changes due to a change in work-related fatal risk, one has to be able to represent the change of fatal risk in the hypothetical CV scenario.

Often, CVM studies aiming at valuation of mortality risks do represent in the scenarios the risks that are similar in magnitude to those that are statistically relevant for the particular case (see Krupnick 2002, Alberini et al. 2006 , Leiter 2006).

In order to make hypothetical CVM situation as realistic as possible for respondents, we have used real statistical risk of fatal work-related injury in the CVM scenario as a baseline risk. The product offered to respondents in the hypothetical situation was then a 50% increase in this baseline risk.

The baseline statistical risk has been computed for 9 occupation groups (set as groups by 1-digit Classification of Occupations) combined with 17 industry groups (set as groups by 1-digit Industrial Classification of Economic Activities - see appendix for reference). As a result, we got 153 cells combining different occupations and industries. For each cell we have computed risk of fatal injury using individual data on all work-related fatal and non-fatal injuries reported in 2005 and macro-data on number of employees in each of these cells.

Further, we have computed resulting risk of fatal injury after 50% increase of baseline risk for each cell. Probabilities of injury were computed separately for men and women and for fatal and non-fatal injuries. For roughly 10% of cells we did not have reliable information on number of employees working in jobs combining such occupation and industry. In such cases we took average risk for the particular occupation and use it as an estimate for the risk in that particular combination of occupation and sector. Also, in cases where the risk was bellow 1 to 10 000 level, we have rounded up the probabilities resulting in 1 to 10 000 probabilities. In other cases we have rounded the probabilities at 1 to 10 000 levels so that for example risk 3.4 to 10 000 would be rounded to 3 to 10 000.

Resulting tables representing statistical risk of work-related fatal injury at 1 to 10 000 levels were used by interviewers in the course of interviewing in order to determine respondent's "objective" risk of fatal injury (for an example of such table for male and female fatal work-related risk see the appendix). Interviewers could then inform respondents about the “objective” risk they were exposed to currently and about the magnitude of the risk increase that they could await in the new hypothetical job.

Pre-survey

Prior to survey itself, an extensive pre-survey had been launched in order to create hypothetical scenario for CVM that would be realistic and trustworthy to respondents and that would lead to low protesting. The pre-survey consisted of 4 focus groups with manual workers and clerks and some 20 semi-structured interviews with factory workers and their foremen.

Following CVM scenarios using both WTP and WTA were tested:

i) Alleviation of work safety regulations by the EU (WTA)
In this scenario the EU would alleviate safety regulations that are way too strict nowadays. This would lead to small increase in fatal risk and also to decrease in production costs. As a consequence, the average wage would increase.

ii) Abstract (WTP)
This scenario presented a situation when fatal work-related risk would be decreased and the wage would decrease as well. The scenario did not specify how this change would be achieved though.

iii) Voluntary program "Safe work" (WTP)
In this scenario respondents faced situation when their employer could adopt a voluntary program "Safe work". This program would lead to decrease in fatal risk and decrease in wages due to increased production costs.

iv) Foreign investor (WTA)
This scenario specified to respondents that a new owner, possibly foreign investor, would take over the company they were currently working at. This owner would seek to cut down production costs by implementing different measures. As a consequence, fatal work-related risk would increase and wage would increase also.

v) New job (WTA)
In this scenario the respondents faced a situation where they could get a better paid job with slightly higher work-related fatal risk. In all other aspects the new job would be the same as the one they were doing currently.

vi) New job (WTP)
This scenario was similar to the previous one (v) except for the new job that was safer in terms of mortality risk, and worse paid than the current one.

These scenarios differed not only in specified impacts on the respondent but also in the scope of other impacts (such as impacts on co-worker, company etc.).

Our initial intention was to use one of the WTP's scenarios since the WTP usually gives more conservative estimates of welfare changes than WTA. However, in the course of pre-survey we found out that any scenario that operated with wage decrease was seen as unrealistic and protested. This was due to the fact that workers were used to steady growth in their nominal wages and could not imagine different situation. Also, it turned out that workers were generally skeptical about any change of work-related fatal risk taking place in their current workplace. According to prevailing opinion, fatal risk situations in the workplace were only due to personal negligence of workers and could not be removed by any organizational or technical means.

Finally, we decided to apply scenario "New job" with WTA (v) in the survey. In this scenario, respondents were asked whether they would accept new job which would be similar to the one they were doing then except for the work-related fatal injury risk that would be higher by 50%, and wage that would also increase. Consequently, respondents were asked series of bidding game questions that elicited their minimal WTA (for verbatim of the questions see the appendix).

Other major problem that we have encountered in the pre-survey was that there were some workers who claimed that there was no chance of fatal injury in their workplace. These people obviously protested as soon as we started talking about increase in fatal risk because they believed that unless they started doing a different job, they were in no risk of work-related fatal injury. This was the case especially among female workers, but also some experienced older male workers expressed such claim.

In fact, even if we took certain workplace located within particular industry and consisting of workers with same occupational attributes, we found that the odds of fatal injury were not distributed evenly among the workers because of individual factors (craftsmanship, experience, attitudes, and current physical and mental shape) and the very specificity of the task they were performing. For these reasons it was in fact misleading to take statistical risk of work-related fatal injury for some group as an objective measure of fatal injury risk for an individual employee. Apparently, workers were intuitively aware of this fact.

To tackle this problem of discrepancy between objective and subjective measure of fatal risk, we introduced several questions that could help us to filter out those people who were not possibly exposed to some risk of fatal injury. The most prevalent sources of work-related fatal injury in the Czech Republic was machinery, transportation means and people that caused injury to other workers. For this reason we have included questions in the questionnaire indicating whether the respondent used any transportation device or car at work, machinery or tool that could cause serious or fatal injury, or whether he/she got into contact with people that could attack him or her at work (for verbatim of the questions see the appendix).

Another problem with the current scenario was the fact that respondents took into account different types of transaction costs related to change of job such as loss of good relationships with co-worker in the current workplace. We have tried to partially control for this problem by including indicator of these types of reasons for not accepting the new job (for verbatim of the question see the appendix.

Questionnaire

Above described CVM scenario has been used as one of the parts of larger survey *Quality of professional life 2006* prepared and conducted by CVVM opinion poll agency and coordinated by Occupational Safety Research Institute (VÚBP).

As such, the survey questionnaire contained several dozens of questions focusing on attitudes toward different aspects of work and labor market, characteristics of current job and perception of different risks in the current workplace. The CVM part of the questionnaire consisting of some 30 questions formed less than one third of the questionnaire and was placed at the end of the survey so that information about statistical risk did not interfere with other questions in the questionnaire.

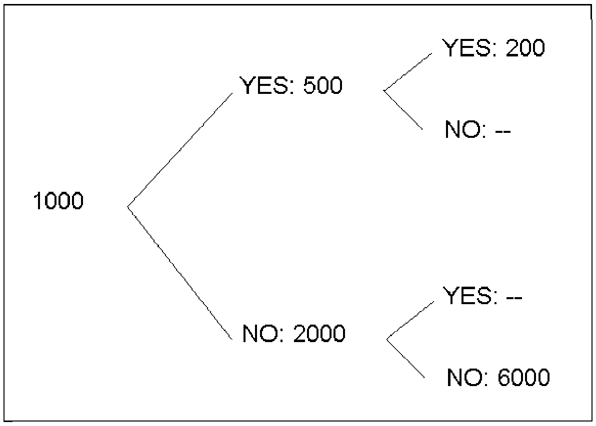
The CVM section of the questionnaire started by questions on the economic sector and profession in which respondent's current job felled. We used standard Industrial Classification of Economic Activities (OKEČ) to classify sectors and Classification of Occupations to classify occupations (KZAM). Both these classifications are used by the Czech Statistical Office.

Consequently, those respondents who were threatened by risk of fatal injury from transportation means, machinery, or other people continued with WTA question for increase in work-related fatal risk, while those respondents who did not report to get in contact with these sources of fatal risk skip the part on fatal risk and went directly to similar questions on WTA for non-fatal risks.

Respondents who got through the "fatal filter" were introduced into hypothetical situation (see above). Interviewers used information on respondents' economic sector, occupation and gender to determine statistical probability of work-related fatal injury. To this end, every interviewer used a table that showed statistical risk of work-related fatal injury for each combination of sector and occupation (at 1-digit levels). Interviewers could then inform respondents about "objective" work-related risk associated with their current job and about the 50% increase of this risk that they would face had they decide to accept the offered job (see the appendix for reference).

After being introduced into hypothetical situation, respondents were asked several bidding-game questions to elicit their minimal WTA.

Figure 4: Bidding game schema used in WTA question for fatal and non-fatal risk (bidding offers in CZK)



In the next step the respondents were asked for reasons for refusing the highest bid (6000 CZK) in case they had refused all bids (see note above and refer to appendix for verbatim of the question).

All respondents then continued to similar section that elicited, in very similar way, WTA for increase in risk of non-fatal injuries. Nonetheless, we do not report results obtained in this section in this paper.

III. Results

The data collection took place in mid-September 2006. Sampling and data collection were conducted by CVVM opinion poll agency. Quota sampling was used to get a representative sample of the Czech population. Quotas for gender, age, highest level of education achieved, and region were set according to results of 2001 Census. Altogether, 2043 valid standardized interviews were carried out.

Out of these 2043 respondents 1373 respondents indicated that they used some form of transport at work, they got into contact with people that may be potentially dangerous to them, or they used some machinery at work that could cause them serious injury. In all these cases it might be presumed that these workers were in more or less potential risk of serious or even fatal injury. We therefore expected that these people might be less susceptible to protesting when offered hypothetical product consisting in increase in their work-related mortality risk and monthly wage.[3]

[3] Using χ^2-test and Spearman correlation coefficient, we found that there is highly significant and moderately strong relationship between gender and exposure to risk (not surprisingly men being potentially more exposed to risk) but also wealthier people reporting that they were potentially more exposed to risk. Further, using binary logistic model that allowed for controlling of other socio-economic variable, we found out that people who had subordinates at work and who had higher wages were potentially more exposed to fatal risk. This was mainly because they reported that they traveled at work more often or because other people could threaten them more often at work. However, we do not report these results in-depth in this paper.

Table 1: Characteristics of respondents who indicated to be exposed to fatal risk at work - car, machinery, people (absolute frequency)

	Exposed to potentially fatal risk?		Total
	NO	YES	
GENDER***			
men	236	909	1145
women	434	464	898
AGE			
15-19	13	21	34
20-29	131	265	396
30-44	259	539	798
45-59	249	501	750
60+	14	44	58
EDUCATION			
elementary	45	75	120
technical training	277	607	884
high school	253	484	737
college	95	207	302
NET MONTHLY WAGE***			
1-20 000 (++ 705.7€)	470	844	1314
20 000 - 26 000 (705,7 - 917.4€)	45	152	197
26 000 - 32 000 (917.4 - 1129,1€)	12	48	60
32 000++ (1129.1€ ++)	4	41	45

Note: Exchange rate used was 28.34 CZK/€ (2006).

Out of the 1373 respondents who got through the "fatal" filter, 100 (less than 5%) failed to answer WTA question or were presented with nonsensical change in their objective risk (such that it was no change at all or it was even decrease)[4]. Resulting 1273 respondents answered WTA question for correct change in objective fatal risk.

After answering the WTA bidding-game questions related to fatal risk, those respondents who responded no-no-no to bidding-game question (and therefore got into WTA interval of 6000 CZK ++, or 211.7 € plus) were asked what were their reasons for refusing to accept any of the bids proposed. Only those who stated that increase in the wage was too low or that risk was too high were treated as non-protesters. On the other hand, those respondents who indicated that they did not accept any proposed bid because they could not imagine any such situation, or liked their workgroup, or have other reasons, were treated as protesters and their answers were excluded from valid WTA's. We found 286 protesters meaning that 987 respondents stated positive and valid WTA for an increase in work-related risk fatal risk.

Table 2 bellow summarizes what changes in fatal risk were respondents offered and how they answered to bidding game questions. We can see that there was rather low variability in the

[4] This was mainly due to equivocation on the part of interviewers who got "lost" in the risk table for different job and industry groups.

magnitude of the risk change offered. This was due to the fact that in many cases the statistical risk of fatal injury is even less that 1 to 10 000. In order to get the cognitive task somehow easier for the respondents, we rounded up those fatal risks bellow 1 to get exactly 1. Since large part of white collar and some of the blue collar jobs would fall into this category, the change in fatal risk by 1 to 10 000 was the one most frequently offered. Note also that only 37 respondents fell into 6000++ CZK category after excluding all protesters that we found in this upper interval.

Table 2: Valid minimal WTA stated for different changes in fatal work-related risk, weighted averages of WTA and VSL using mid-points.

Change in fatal risk (per 1000 workers per 10 years)	WTA (CZK)							Weighted mean WTA (CZK)	Weighted mean VSL (CZK)	Weighted mean VSL (€)
	0 - 199	200 - 499	500 - 999	1000 - 1999	2000 - 5999	6000 ++	Total count			
1	55	52	142	175	423	37	**884**	2 687	322 466 063	11 378 478
2	2	1	8	9	41	1	**62**	3 096	185 758 065	6 554 625
3	2	0	5	6	15	0	**28**	2 605	104 214 286	3 677 286
4	0	0	0	1	1	1	**3**	4 500	135 000 000	4 763 585
5	1	0	1	0	2	0	**4**	2 213	53 100 000	1 873 677
6	0	0	0	0	1	0	**1**	4 000	80 000 000	2 822 865
11	0	0	0	0	1	0	**1**	4 000	43 636 364	1 539 745
14	0	1	0	0	0	0	**1**	250	2 142 857	75 612
21	0	0	0	0	1	0	**1**	4 000	22 857 143	806 533
46	0	0	0	1	0	0	**1**	1 500	3 913 043	138 075
60	0	0	0	0	1	0	**1**	4 000	8 000 000	282 287
Total count	**60**	**54**	**156**	**192**	**486**	**39**	**987**	2716	304 227 912	10 734 930

Since only 37 respondents fell in the open upper interval, we decided arbitrarily to set the upper boundary of this interval to 10 000 CZK so that this interval would have the same range as the previous one. However, due to low frequency of such WTA's, this decision have relatively minimal impact on estimation of regression function of WTA's and on measures of central tendency of WTA's. As you may notice in table of statistical risk of fatal injury (see appendix), no increase of 6 to 10 000 or higher should have been offered to respondents. Changes of fatal risk of magnitude 6 to 10 000 and larger appeared among offered risk changes only by mistake on the part of interviewers who mistakenly took the risk of non-fatal injury as the magnitude of the fatal risk. However, we decided not to exclude these observations from the sample because these respondents did not protest when offered these products.

Note also that the mean VSL value reported in the two last columns is decreasing with scope of the risk increase offered. This may be primarily due to two facts. First, responses to WTA question might have not been sensitive to scope of the product offered (risk increase). Second, respondents who were offered highest absolute change of fatal work-related risks were those who worked in risky jobs and had highest baseline risk. It might be therefore presumed that, according to law of decreasing marginal utility, their marginal dis-utility from increased risk was smallest and therefore they expressed lowest WTA for change of one unit of fatal risk (the interpretation that we endorse for models of VSL further bellow).

Computation of VSL

To compute the value of statistical life (VSL) and its covariates, we apply similar approach as Alberini (2006). Since we have only interval values of stated WTA, we have to compute interval estimates for VSL first. This si showed in formula (1) for lower boundary and in formula (2) for upper boundary of VSL. Notice that we have multiplied the fraction by 12. This is because in WTA question we have asked respondents whether they would accept increase in their monthly wage and therefore we got only their monthly WTA's. The risk was expressed as X cases of fatal injury among 1000 workers in 10 years resulting in average annual exposure of X/10,000 for every worker.

$$VSL_{Li} = \frac{WTA_{Li}}{\Delta R_i} \cdot 12 \qquad (1)$$

$$VSL_{Hi} = \frac{WTA_{Hi}}{\Delta R_i} \cdot 12 \qquad (2)$$

Now, if we assume that VSL varies between these given upper and lower intervals randomly with cdf F (y,λ) where λ stands for vector of parameters of the cdf, the respondent's contribution to the likelihood is:

$$F(VSL_{Hi};\lambda) - F(VSL_{Li};\lambda) \qquad (3)$$

Then the log likelihood for every individual respondent *i* takes the form:

$$LL(VSL) = \sum_{i=1}^{n} \log\left[F\left(VSL_{Hi};\lambda\right) - F\left(VSL_{Li};\lambda\right)\right] \qquad (4)$$

We have used normal, lognormal, exponential, and weibull distribution for VSL finding that weibull distribution best fits the data. However, the lognormal distribution did not perform substantially worse than weibull distribution (see bellow).

Log likelihood of the sample is showed in formula (5) for selected weibull distribution with shape θ and scale σ.

$$LL = \sum_{i=1}^{n} \log\left[\exp\left(-(VSL_{Li}/\sigma)^{\theta}) - \exp(-(VSL_{Hi}/\sigma)^{\theta}\right)\right] \qquad (5)$$

Mean and median values of VSL are computed according to formulas (6) and (7), where σ_{ML} θ_{ML} are maximum likelihood estimates of scale and shape.

$$VSL_{Mean} = \sigma_{ML} \cdot \Gamma\left(\frac{1}{\theta_{ML}} + 1\right) \qquad (6)$$

$$VSL_{Median} = \sigma_{ML}\left[-\ln(0.5)\right]^{1/\theta_{ML}} \qquad (7)$$

Regression models for VSL

Now we will report results of testing of 3 models explaining VSL. These models used accelerated-life model based on weibull hazard. The specification of regression function used in these models is given by formula (5) where θ is same for all respondents, while σ takes specific form for each individual respondent given by equation (8) where x denotes individual characteristics of respondents and z other experimental treatment variables, while β and γ are vectors of coefficients.

$$\sigma_i = \exp(x_i\beta + z_i\gamma) \qquad (8)$$

Further in this section we report results obtained from these 3 regression models. For the explanation of variables used in these models see the appendix.

Model 1 - basic model

In model 1 we have examine the influence of socioeconomic characteristics of worker (gender, age, education, work experience, net personal monthly wage, "breawinning" in the household[5]), characteristics of the sector (work in industry, or agriculture), attributes of occupation (having subordinates, working in white collar job), and different attributes of risk (change in fatal risk offered, baseline statistical work-related fatal risk, subjectively perceived baseline risk). The results of regression analysis using Weibull distribution for VSL are reported in the Table 3 bellow.

Table 3: Basic model: regression model for VSL (using Weibull distribution)

Parameter	Coefficient estimates	Pr > ChiSq
Intercept	10,3971	<,0001
RISKCHANGE	-0,0969	<,0001
OBJRISK	-0,2052	<,0001
SUBJRISK	0,0508	0,4294
MAN	-0,0032	0,9658
AGE	-0,0004	0,8929
COLLEGE	-0,1795	0,0941
EXPERIENCE	-0,0005	0,8984
PWAGE	0,0228	<,0001
BREADWINNER	-0,1189	0,4075
BOSS	0,0592	0,4462
OFFICE	0,0726	0,3631
INDUSTRY	-0,0287	0,6803
AGRICULTURE	-0,0557	0,7191
Scale	0,6571	
Weibull Shape	1,5218	
N = 682		
Log Likelihood = -895,674		

[5] This variable indicated whether the respondent's wage was an important or even main source of income in the household. (This indicator is computed as ratio of net personal monthly wage and net household monthly income: breadwin = PWAGE/HINCOME.

As we can see here only 3 variables in this model have significant effect on VSL. Magniture of risk change offered to respondents is, ceteris paribus, associated with lower VSL. This result can be interpreted as decreasing marginal dis-utility of risk increase. Similarly, also those respondents with higher baseline risk exhibit lower VSL. This is theoretically correct as well because the baseline risk should mirror actual work-related risk these people are exposed to in real life and lower VSL is probably one of the reasons why they accepted the kind of job they are doing currently. Also the influence of respondent's net personal wage that is highly significant and positive seems to be correct suggesting that people are weighting the proposed wage increase by their current wage.

Model 2 - model with validity indicators

In the second model we have employed the same variables that turned out to be statistically significant predictors of VSL in the previous model (change in fatal risk offered, baseline fatal risk and net personal wage).

Further we have added some indicators of validity of answers in this model. The reason for this was that we were suspicious that for many respondents the task of valuing very low risks of fatal injury was cognitively and mentally too demanding and they were not able to give any valid answers. These indicators included dummies for respondents who:

- reported that the questionnaire was difficult for them (DIFFICULT), or were flagged by interviewer as those who:
- were willing to answer questions (OPEN),
- were interested in the interview (INTEREST),
- understood the questions well (UNDERSTANDING).

We have also included variables indicating interactions between these validity indicators and magnitude of risk change proposed (RISKUND, RISKINT, RISKDIFF). Indeed, we have included indicator of those respondents who felt currently threatened by loss of their job (JOBLOSS). The results of regression analysis using Weibull distribution for VSL are reported in the Table 4 bellow.

Table 4: Model with validity indicators: regression model for VSL (using Weibull distribution)

Parameter	Coefficient estimates	Pr > ChiSq
Intercept	10,6268	<,0001
RISKCHANGE	-0,2195	0,1824
OBJRISK	-0,221	<,0001
PWAGE	0,0209	<,0001
DIFFICULT	-0,0225	0,3017
OPEN	0,0454	0,7454
INTEREST	-0,1011	0,7641
UNDERSTANDING	0,0023	0,9946
JOBLOSS	-0,1155	0,0743
RISKUND	-0,0164	0,9545
RISKINT	0,1284	0,6476
RISKDIFF	0,0509	0,3256
Scale	0,6542	
Weibull Shape	1,5286	
N = 739		
Log Likelihood = -967,784		

As we can se in this table, only 2 variables are significant predictors of VSL at 95% significance level, namely baseline objective risk (OBJRISK) and net personal wage (PWAGE). These results are similar to the ones from the previous model 1 and their interpretation is also similar. Other coefficient estimates of other variables are not significantly different from zero at 95% level of statistical significance. Interestingly, change of risk offered is not a significant predictor as was the case in the previous model. But more importantly, none of the validity indicators seem to have systematic impact on VSL. This suggests that values of VSL are not influenced systematically by how well did respondents understood the task and how difficult it was for them.

Model 3 - the best model

The third model that we present here is the model with the highest explanatory power. Apart from variables that turned out to be significant predictors in the first and partially also in the second model (RISKCHANGE, OBJRISK, PWAGE) we included indicator for those who used transportation means at work (TRANSPORTATION). We included in the model variable that indicates whether respondent was thinking about quitting the current job because of low wage (WAGEQUIT) or because of high risk (RISKQUIT). We also included a dummy variable for interaction of change of risk offered (RISKCHANGE) and gender (MALE).

The results of regression analysis are reported in the Table 5 bellow.

Table 5: The best model: regression model for VSL (using Weibull distribution)

Parameter	Coefficient estimates	Pr > ChiSq
Intercept	10,1876	<,0001
RISKCHANGE	-0,0859	<,0001
OBJRISK	-0,2072	<,0001
PWAGE	0,026	<,0001
TRANSPORT	0,1321	0,0268
WAGEQUIT	0,2692	0,0024
RISKQUIT	0,3565	0,0217
RISKMALE	-0,0625	0,0204
Scale	0,6359	
Weibull Shape	1,5725	
N = 742		
Log Likelihood = -956,467		

We can see that all variables added to this model are statistically significant predictors of VSL. The impact of variables RISKCHANGE, OBJRISK, and PWAGE on the VSL is the same as in the model 1 and partially in the model 2. Further, we see here that people who use transportation means at work exhibit higher VSL. Similarly, people who are contemplating leaving their current work either because of low wage or high risk have higher VSL. Interestingly, RISKMALE variable has negative coefficient estimate suggesting that for males their marginal dis-utility associated with higher risks decrease faster than for women.

Using this model, we have experimented with different types of VSL distributions: apart from Weibull also exponential, lognormal and normal. Comparing log likelihood of Weibull model (-956.467), exponential (-1040.142), lognormal (-964.247) and normal (-1315.202) we can conclude that model with Weibull distribution best fits the data, but lognormal model seems to be equally good.

Using the best model with Weibull distribution of VSL we have computed mean (302 million CZK) and median (239 million CZK) for VSL. The mean value of VSL computed using Weibull distribution is only slightly lower than mean value of VSL computed previously using mid-points - 304 millions CZK (see above).

IV. Concluding remarks

We have concentrated mainly on VSL derived from CVM survey data on willingness to accept higher net wage in exchange for higher work-related mortality risks. We conclude that a mean VSL derived by Weibull model is 304 million CZK, or 10.7 million €, while median is 239 million CZK, or 8.4 million €.

In a similar way, Ščasný and Urban (2006) confirmed statistical significant effect of objective fatal risk rate on employee's wage. Based on their estimation of hedonic wage function they derive the wage differentials and consequently the VSL from the Czech labour market. This VSL was estimated to about 6 million € and the VSL was higher, at about 9 million €, for those employees that are exposed to higher occupational risks, particularly for male workers. The VSL obtained from statistical averages for economic sectors ranges from 3.2 to 3.6 million €, if gross wages and salaries were used, the VSL would be about 4 million €. Confirmed statistical relationship between risk rates and wages gives us empirical basis for using the willingness-to-pay concept as a reliable method for valuing a life from individual data microdata.

Ščasný and Urban conclude that more attention must be paid to analysis of the hedonic wage function. In particular, attention must be paid to the role of subjective perception of occupational risks and perception of objective (statistical) risk rates. Measures indicating subjective perception of occupational risks, or the variables describing fatal risk rate did not explain wage differences in data coming from the 2000 survey.

We can also conclude that the VSL's derived in the context of the Czech labor market are higher than the VSL's obtained outside of the labor market. While the VSL derived from labor market is one order of magnitude higher, i.e. about 3 to 9 million €, other estimates yield the VSL about 0.2 to 1.0 million €.

For instance, the value of preventing fatality calculated for the Czech Republic by human capital method (Ščasný, 2005) and considering average macroeconomic labour productivity in 2004 to be as high as 0.4 to 0.5 million € for 40-years-old man (d.r.=4%, or d.r.=3% respectively). Máca (2005) reviewed the costs per QALY for CEEC countries and came up with the range of 370 € to 16,000 €. If we considered 2,900 € per QALY for acute myocardial infarction as found by Máca for the Czech Republic, we get VSL as high as 0.2 million € for average life expectancy; the VSL obtained by such a way for QALY for Statins following pericutaneous coronary intervention (Fluvastatin) in Hungary gets 1.2 million €.

The VSL derived by CV method from WTP for mortality risk reduction from cardiovascular and respiratory diseases in the Czech Republic is 1.3 million € (mean), or 0.58 million € (median) (Alberini et al., 2006). The VSL can be obtained also for Poland from WTP for mortality risk reduction by 1 in 10,000 (Giergiczny, 2006); the VSL is 0.77 million € (mean), or 0.44 million € (median), however, Giergiczny's study did not pass an external scope test and no VSL value was originally reported in the paper.

Median VOLY derived from WTP from life expectancy prolongation by 3 months estimated by the team led by Desaigues (2006) amounts to about 8,000 € for NMS pooled data, or almost 10,000 for the Czech Republic, 8,000 € for Poland and 3,000 € for Hungary (country samples are, however, too small – about 150 each - yielding hardly statistical significant estimates). Very rough estimate can be then derived for average life expectancy of 75 years by neglecting factor of time; this value would be about 0.75 million € for the Czech republic, or about 0.22 million € for Poland.

Higher estimates from CV survey are somehow contradictory to the empirical findings given by economic literature that shows significantly larger estimates generated by the hedonic method than by the CV approach (Kochi et al., 2006). The fact that two valuation methods do not necessarily provide the same outcome is supported on theoretical ground: while the hedonic wage approach is estimating a local trade-off, the CV approach approximates a movement along a constant expected utility locus (Viscusi and Evans 1990). In the other words, marginal utility of changing risks from its optimal level (analysed by hedonic model) can be expected to be the highest because marginal utility declines with marginal risk 'located' more far from the optimal risk, i.e. probably described in the contingent (hypothetical) scenario.

One caveat should be point out: values based on willingness to accept approach used to yield higher values than those derived from willingness to pay. Hanemann (1991) for instance argues that the differences between the compensating surplus, i.e. minimum WTA to consent higher occupational risks in our case and the equivalent surplus, i.e. maximum WTP to prevent increase of the risks, need not be insignificant as counter-argued by Randall and Stoll (1980). Empirical evidence suggests that the minimum WTA can exceed the maximum WTP several times over. Carson (1991) argues that when individuals are asked to state their minimum WTA, they tend to state their expectation of the maximum they could hope to get as a compensation rather than their true minimum WTA (cited in Markandya et al., 2002; p. 425).

To conclude, while the hedonic wage studies may be subject to bias resulting from measurement errors (Black 2001), and omitted variables (Hwang et al. 1992; Gunderson and Hyatt 2001), CV studies may suffer from hypothetical bias. Better understandings of the role of subjective perception of occupational risks in valuation can improve the models tested in this paper. This task needs to be, however, left for future research.

Acknowledgment

This research has been supported by the R&D Project MPSV 1J 039/05-DP1 "The effect of changes in labour market on quality of life" funded by the Czech Ministry of Labour and Social Affairs" within the programme "Modern society and its transformation". The support is gratefully acknowledged. We also grateful for useful comments to Lenka Svobodová from Occupational Safety Research Institute in Prague and Zdenka Mansfeldova and Jiri Vinopal from Sociological Institute of Academy of Sciences – Public Opinion Research Centre with whome we collaborate on the project. Responsibility for any errors remains with the authors.

References

Adler, M.D. and E.A. Posner (2000): "Implementing Cost-Benefit Analysis When Preferences Are Distorted," Journal of Legal Studies 29, 1105-1148.

Alberini, A., A. Chiabai, G. Nocella (2006): Valuing the Mortality Effects of Heat-waves. In: Menne, B., Ebi, K.L. (eds.), Climate Change and Adaptation Strategie for Human Health. Springer, Steinhopff Verlag, Darmstadt. ISBN: 3-7985-1591-3. pp. 345-371.

Alberini, A., Ščasný, M., Braun Kohlová, M. (2005): The Value of Statistical Life in the Czech Republic. Poster presented at the 14th Annual Meeting of the European Association of Environmental and Resource Economics EAERE-2005, Bremen, 23-26 June, 2005.

Chilton, S., J. Covey, M. Jones-Lee, G. Loomes, H. Metcalf (2004): Valuation of Health Benefits associated with Reduction in Air Pollution. Final Report, DEFRA, UK.

Desaigues, B., Ami, D., Hutchison, M., Rabl, A., Chilton, S., Metcalf, H., Hunt, A., Ortiz, R., Navrud, S., Kaderjak, P., Szántó, R., Nielsen, J.S., Jeanrenaud, C., Pellegrini, S., Braun Kohlová, M., Scasny, M., Máca, V., Urban, J., Stoeckel, M.E., Bartczak, A., Markiewicz, O., Riera, P., Farreras, V. (2006): Final Report on the monetary valuation of mortality and morbidity risks from air pollution. Final report. New Energy Externalities Developments for Sustainability, Research Stream 1b, Workpackage 6, New approaches for valuation of mortality and morbidity risks due to pollution. Project funded by the EC within the 6th Framework Programme.

European Commission (2005): Externe - Externalities of Energies: Methodology 2005 Update. Edited by Bickel, P. and Friedrich, R., published by the Directorate-General for Research, Sustainable Energy Systems of European Commission.

European Commission (2006): Thematic Strategy on air pollution, Communication from the Commission to the Council and the European Parliament. COM(2005) 446 final, Brussels.

Gegax, D. Gerking S., Schulze, W. (1991): Perceived Risk and the Marginal Value of Safety. The Review of Economics and Statistics, Vol. 73, No. 4, 589-596.

Gegax, D., Gerking, S., Schulze W. D., Anderson, D. (1985): Experimental Methods for Assesing Environmental Benefits. Vol. IV. Valuing Safety: Two Approaches. USEPA, Washington.

Gerking, Shelby & de Haan, Menno & Schulze, William (1988): "The Marginal Value of Job Safety: A Contingent Valuation Study," Journal of Risk and Uncertainty, Springer, vol. 1(2), pages 185-99, June.

Giergiczny, M. (2006): Value of Statistical Life - Case of Poland. Paper prepared for the the 3rd Annual Congress of Association of Environmental and Resource Economics AERE, Kyoto, 4-7 July, 2006.

Itaoke, Kenshi, Saitoi, Aya, Krupnick, Alan, Adamowicz, Wiktor and Taketoshi Taniguchi (2006): The Effect of Risk Characteristics on the Willingness to Pay for Mortality Risk Reductions from Electric Power Generation. Environmental & Resource Economics (2006) 33: 371-398.

Jennings, P.W., A. Kinderman (2003): The Value of a Life: New Evidence of the Relationship Between Changes in Occupational Fatalities And wages of Hourly Workers, 1992 to 1999. The Journal of Risk and Insurance, 2003, Vol. 70, No. 3, 549-561.

Kochi, I., B. Hubbell and R. Kramer (2006): An Empirical Bayes Approach to Combining and Comparing Estimates of the Value of a Statistical Life for Environmental Policy Analysis. Environmental and Ressource Economics, Volume 34, Number 3, pp. 385-406.

Krupnick, A., Bhattacharya, S., Alberini, A., Veronesi, M. (2006): Mortality Risk Valuation in Six Countries: Testing Benefit-Transfer Approaches. Prepared for The Third World Congress of Environmental and Resource Economics, Kyoto, Japan, July 3-7, 2006.

Krupnick, Alan, Anna Alberini, Maureen Cropper, Nathalie Simon, Bernie O'Brien, Ron Goeree, and Martin Heintzelman (2002): "Age, Health and the Willingness to Pay for Mortality Risk Reductions: A Contingent Valuation Study of Ontario Residents," Journal of Risk Uncertainty, 24, 161-186.

Landenfeld, J., S., Seskin, E., P. (1982): The Economic Value of Life: Linking Theory to Practise. American Journal of Public Health, 72(6): 555-566.

Lanoie, Paul & Pedro, Carmen & Latour, Robert (1995): "The Value of a Statistical Life: A Comparison of Two Approaches," Journal of Risk and Uncertainty, Springer, vol. 10(3), pages 235-57, May.

Leiter, A., Pruckner, G.J. (2006): „Dying in an Avalanche: Current Risks and Valuation." Presented at 3rd Annual Congress of Association of Environmental and Resource Economics AERE, Kyoto, July 4 to 7, 2006. Online: http://www.webmeets.com/files/papers/ERE/WC3/173/Leiter_Pruckner_RiskValuation.pdf

Tsuge, Takahiro, Kishimoto, Atsuo and Kenji Takeuchi (2005): A Choice Experiment Approach to the Valuation of Mortality. The Journal of Risk and Uncertainty, 31:1; 73-95, 2005.

U.S. EPA (U.S. Environmental Protection Agency) 2000: Guidelines for Preparing Economic Analyses. EPA 240-R-00-003. Washington, DC: U.S. EPA.

Viscusi, W.K., Aldy. J.E. (2003): The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World. Journal of Risk and Uncertainty 27(1):5-76.

Viscusi, W.K. (1992): Fatal Tradeoffs: Public and Private Responsibilities for Risk, New York: Oxford University Press, 1992.

Appendix

Mortality risk filter questions

TRANSPORTATION MEANS
Do you use at work any means of transportation (including for official journey or for transportation of material)?

MACHINERY
Do you use any machinery or tool at work that could cause serious or fatal injury?

ATTACK
Do you meet any people at work that could attack you physically?

Verbatim of WTA question for fatal risk increase

"Based on information that you have provided and statistics of work-related fatal injuries it is possible to find out what your objective risk of work-related fatal injury is. According to statistical data, there are X fatal injuries at your current position per 1000 workers over 10 years.

Now imagine that somebody would offer you the same job you are doing now, in the similar workplace and conditions. In the new job you would be given higher wage but you would be exposed to work-related fatal risk injury higher by 50%. It means that the risk of fatal injury in the new workplace would be Y fatal injuries per 1000 worker per 10 years.

Would you accept this offer if your net monthly wage was increased by 1000 CZK?"

(Other bidding game questions followed.)

Verbatim of the question controlling motives for refusing highest bid offered (valid WTA, protest WTA, WTA reflecting transaction costs)

What was your reason for stating that you were not willing to accept the new riskier job if you were offered higher salary?

(Available obtions:)

- The increase in wage is too low.
- The risk is too high..
- I like my current working group.
- I cannot imagine any such situation/ I cannot answer such question/ I did not understand the question.
- Other reasons. (Please, indicate what reasons:__________)

Table of risk of fatal injury in different sectors and occupations for MALES (baseline risk per 1000 workers per 10 years and risk after 50% increase)

	ID.5a (pozice)								
	Management	Scientists, specialists	Technical specialists, medical doctors, teachers	Junior administrative workers	Workers in services, trade and operational workers	Qualified workers in agriculture and forestry	Qualified factory workers and manufacturers	Operators of factory machinery	Unskilled manual workers
Sector	1	2	3	4	5	6	7	8	9
1	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**2** (3)	**3** (5)
2	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**2** (3)	**3** (5)
3	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**1** (2)	**2** (3)
4	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**1** (2)	**1** (2)
5	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**1** (2)	**2** (3)
6	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**1** (2)	**5** (8)
7	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**2** (3)	**2** (3)	**2** (3)
8	**1** (2)	**16** (24)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**9** (14)	**2** (3)
9	**1** (2)	**2** (3)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**2** (3)	**2** (3)
10	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**1** (2)	**2** (3)
11	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**4** (6)	**3** (5)	**5** (8)	**1** (2)	**2** (3)
12	**2** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**1** (2)	**2** (3)
13	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**1** (2)	**2** (3)
14	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**4** (6)	**1** (2)	**2** (3)
15	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**3** (5)	**2** (3)	**1** (2)	**1** (2)
16	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**1** (2)	**2** (3)
17	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**1** (2)	**3** (5)	**1** (2)	**1** (2)	**2** (3)

Table of risk of fatal injury in different sectors and occupations for FEMALES (baseline risk per 1000 workers per 10 years and risk after 50% increase)

	ID.5a (pozice)								
	Management	Scientists, specialists	Technical specialists, medical doctors, teachers	Junior administrative workers	Workers in services, trade and operational workers	Qualified workers in agriculture and forestry	Qualified factory workers and manufacturers	Operators of factory machinery	Unskilled manual workers
Sector	1	2	3	4	5	6	7	8	9
1	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
2	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
3	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
4	1 (2)	1 (2)	1 (2)	1 (2)	2 (3)	1 (2)	1 (2)	1 (2)	1 (2)
5	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
6	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
7	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
8	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
9	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
10	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
11	1 (2)	1 (2)	1 (2)	1 (2)	8 (12)	1 (2)	1 (2)	1 (2)	1 (2)
12	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
13	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
14	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
15	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
16	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)
17	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)	1 (2)

Clasification of sectors (Industrial Classification of Economic Activities)

1. Agriculture, hunting and forestry
2. Fishing
3. Mining and quarrying
4. Manufacturing
5. Electricity, gas and water supply
6. Construction
7. Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods
8. Hotels and restaurants
9. Transport, storage and communications
10. Financial intermediation
11. Real estate, renting and business activities
12. Public administration and defence; compulsory social security
13. Education
14. Health and social work
15. Other community, social and personal service activities
16. Activities of private households as employers and undifferentiated production activities of private households
17. Extraterritorial organizations and bodies

Variables used in the regression models

RISKCHANGE	The change of statistical risk presented to respondents in scenario multiplied by 10 000. RISKCHANGE has been computed for each of combinations of 17 sectors of economic activity and 9 occupational groups.
OBJRISK	The statistical risk of fatal injury in current job multiplied by 10 000 and rounded to get integers. (Rounded up to 1 in case it would be bellow 1). OBJRISK has been computed for each of combinations of 17 sectors of economic activity and 9 occupational groups.
SUBJRISK	Subjective perception of work-related risk at current job. SUBJRISK is a dummy variable equal to 1 if respondent indicated that his job is very much or very risky on 4-point scale.
MAN	Man is dummy variable (1 for males) indicating gender.
AGE	Age of respondents minus 18 (minimal age in the sample).
COLLEGE	Dummy variable indicating respondents with university degree.
PWAGE	Average monthly net personal wage.
BOSS	Dummy variable indicating whether respondent has subordinates at work.
BREADWINNER	Variable indicating to what degree is the respondent the main breadwinner in the household (BREADWINNER = personal wage/ household income)
OFFICE	Dummy variable indicating whether respondent works in white-collar job (first 4 occupational groups)
INDUSTRY	Dummy variable indicating whether respondent works in the industry sector.
ZEMEDEL	Dummy variable indicating whether respondent works in the agriculture.
DIFFICULT	A score from two 5-point scales on which respondent evaluated how difficult the interview was for him.
OPEN	Dummy variable indicating that the interviewer assessed interviewee's willingness to answer the questions as very high to average.
INTEREST	Dummy variable indicating that the interviewer assessed interviewee's interest in the interview as very high to average.
UNDERSTANDING	Dummy variable indicating that the interviewer assessed interviewee's understanding of the question as very high to average.
JOBLOSS	Dummy variable indicating respondents who are afraid of loosing job very much or quite a lot.
RISKUND	Interaction of RISKCHANGE and UNDERSTANDING (product of these two variables).
RISKINT	Interaction of RISKCHANGE and INTEREST (product of these two variables).
RISKDIFF	Interaction of RISKCHANGE and DIFFICULT (product of these two variables).
TRANSPORT	Binary variable indicating people who use transportation means at work.
WAGEQUIT	Binary variable indicating people who are contemplating quitting their current job because of low wage.
RISKQUIT	Binary variable indicating people who are contemplating quitting their current job because of high risk.
RISKMALE	Interaction of variable MAN and RISKCHANGE (product of the two variables).