UNIVERSITY of SALZBURG

EVALUATING HUMAN LIFE USING COURT DECISIONS ON DAMAGES FOR PAIN AND SUFFERING

ANDREA LEITER, MAGDALENA THÖNI AND HANNES WINNER

WORKING PAPER NO. 2010-11

WORKING PAPERS IN ECONOMICS AND FINANCE

Evaluating Human Life Using Court Decisions on Damages for Pain and Suffering*

Andrea Leiter,[a)] Magdalena Thöni[b)] and Hannes Winner[c)]

August 2010

Abstract

This paper provides a framework to evaluate human life based on civil court decisions on damages for pain and suffering. Using judgements from Germany and Austria over the last 25 years, we calculate an average *Value of Damages for Pain and Suffering* (*VDPS*) of about EUR 1.79 millions, with a minimum (maximum) of around EUR 0.67 (4.62) millions. Our approach also allows to calculate the value of body parts and body functions, which might be of interest if information on the benefit of an individual's change in life quality is not (entirely) available.

JEL Code: I10, J17, K13,

Keywords: Pain and suffering; Value of Statistical Life (VSL); Quality Adjusted Life Years (QALY); tort law.

a) Faculty of Economics and Statistics, University of Innsbruck, Universitätsstrasse 15, 6020 Innsbruck.

b) Department for Human and Economic Sciences, University of Health Sciences, Medical Informatics and Technology (UMIT), EWZ 1, 6060 Hall in Tirol.

c) Department of Economics and Social Sciences, University of Salzburg, Kapitelgasse 5-7, 6010 Salzburg.

* We thank the seminar participants at the Universities of Innsbruck and Salzburg and especially Josef Nussbaumer, Michael Pfaffermayr and Engelbert Theurl for valuable discussions and helpful comments. Additional thanks goes to Cornelia Donner and Alexandra Gosch for excellent research assistance and Alexander Dzien and Claudia Walch for medical guidance.

1. Introduction

In everyday live, individuals routinely take choices affecting their health status and mortality risks. Examples include nutrition habits, travelling decisions, leisure activities or working choices. In such situations, people and societies implicitly value their life in the sense that they trade off risks against wealth or income. There are several approaches to evaluate these trade offs and, therefore, human life monetarily. Perhaps the most accepted ones are the Value of Statistical Life (VSL) and the Quality Adjusted Life Years (QALYs) (see, e.g., Jones-Lee 1974, Viscusi 1993, 2008, Johansson 1995, Johannesson, Johansson and O'Connor 1996, Hammitt 2002, Viscusi and Aldy 2003, Sunstein 2004). The VSL relies on the willingness to pay (or the willingness to accept) for changes in mortality risks and is usually based on questionnaires or market observations to calculate these values. QALYs refer to a change in life quality and are defined as the value of living one year in a certain health condition (see, e.g., Drummond et al. 2005, Weinstein 2005). They represent use values that can be monetised either via willingness to pay approaches or via information on health expenditures of the respective medical intervention. While the VSL evalutes the human life as a whole without considering any time dimension, QALYs are applied to evaluate a change in life quality due to a medical treatment, for example, and they explicitly take reference to a specific time period (typically a year).

This paper presents an alternative method for evaluating human life based on damages for pain and suffering (DPS). DPS represent monetary payments assigned by courts to compensate an individual for a physical and mental distress that is caused by the wrongdoing of other persons. Therefore, they do not rely on risk perceptions of interviewed persons, but rather on (ideally) consistent decisions of courts and their instances. Using DPS from about 1,100 judgments from Germany and Austria over 25 years, we illustrate how monetary values of single body parts and body functions can be aggregated to a value of a whole human body, which we refer to as the "*Value of Damages for Pain and Suffering*" (*VDPS*). For our sample of German and Austrian verdicts, we calculate a VDPS of about EUR 1.79 millions (with a range between EUR

0.67 and EUR 4.62 millions). These values are generally in accordance with the ones from previous VSL studies in these countries. In contrast to these studies, the VDPS also provides a disaggregated measure that allows to determine the value of (anatomical) body parts and body functions, which might be of interest in situations, where information on the benefits of public programs to improve an individual's life quality is not entirely known, e.g., the authorization of innovative medical treatments and/or surgical procedures. This, in turn, links the VDPS to the QALY approach.

The paper proceeds as follows. Section 2 briefly describes the legal framework of tort law, especially of damages for pain and suffering; we further provide a law and economics interpretation of the VDPS and compare the underlying conceptual framework with the VSL and the QALY approach. Section 3 describes and presents our sample of German and Austrian DPS. Section 4 demonstrates how monetary values for human body parts and body functions can be inferred from these data. Afterwards, we use these values to calculate the value of a fully operating human body, the VDPS. Section 5 discusses the practical relevance of our approach to evaluate human life, and Section 6 concludes.

2. Background

Generally, damages are defined as the amount of money that is awarded to compensate someone who has been harmed by another’s wrongdoing or negligence. Thereby, harm constitutes the first element required for damages action, the others being cause and breach of duty (see Cooter and Ulen 2008, for a discussion). Generally, damages include pain and suffering, healing costs, present and future loss of earning capacity, as well as payments for psychological and social damage. DPS only focus on the compensation of physical and mental distress suffered from an injury, including fractured body parts and internal ruptures as well as the pain, the temporary and permanent limitations on activity, the potential shortening of life and other forms of suffering (see Posner 2007). They do not cover a decrease in the marginal utility of income due to the injury and a loss of income associated with, for example, sickness absences, reductions in working hours or forces to accept lower paid jobs.

DPS are awarded by courts and affected by a country's tort law,[1] and, in addition, by the severity and intensity of the injury, the impairment of life quality and the duration of pain. Therefore, the monetary value for DPS is subjective in two regards. First, it depends on the individual injury and the aggrieved party's change of life quality, and, second, on the court's assessment of the direct harm (change of life quality) that was inflicted upon the victim. In economic terms, the underlying harm (pain and suffering) is directly transformed into a loss of utility that is evaluated ex post by a third party, the courts. Consequently, DPS should mirror a monetary value providing enough utility to bring the plaintiff back to the original utility level. What is compensated for is exclusively the change in utility due to physical and mental distress, but not the indirect influence of health on earning capacity and income. In this sense, DPS can be viewed as a monetary value for body parts and body functions. This interpretation is illustrated in Figure 1, capturing an individual that derives utility from health, *H*, and wealth, *W*, so that the utility function is $U(H,W)$. The corresponding indifference curves in Figure 1 highlight the basic trade off between health and wealth.

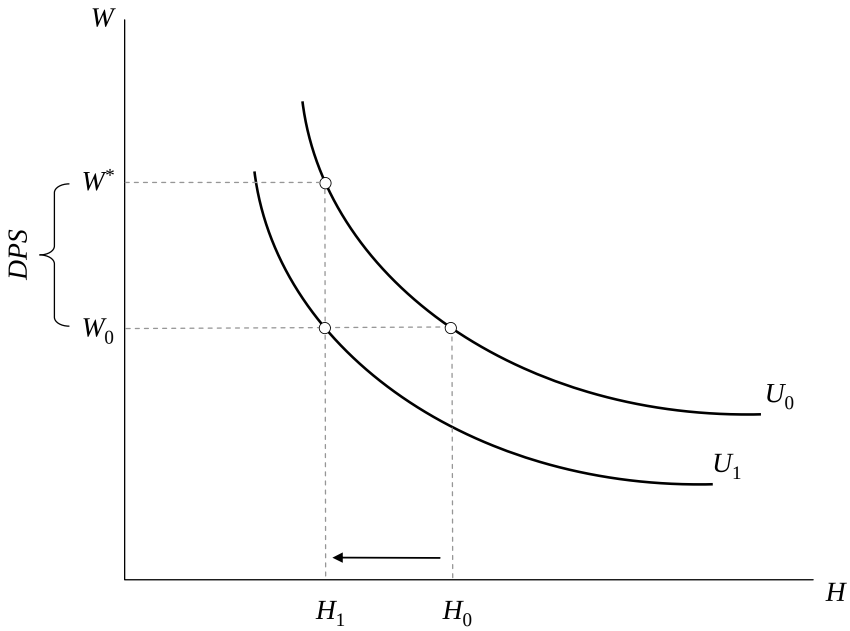

Figure 1: DPS due to changes in the utility after an injury

[1] In Section 3.1., we discuss the details of the German and Austrian tort law.

Consider an individual with health status H_0 and initial wealth W_0. In case of pain and suffering, health quality drops down to H_1 at the indifference curve U_1. If initial wealth is unaffected by the damage, as assumed in Figure 1, the individual is left at W_0. A perfect compensation for this suffering – the monetary value of DPS – enables the victim to return to the initial utility level U_0. In Figure 1, this is equal to the payment of $W^* – W_0$. Thereby, we assume that the damage in health is irreparable, so that the individual is stuck in H_1. Hence, DPS represent the monetary equivalent of an individuals's irreparable decline in health (see Cooter and Ulen 2008). Further, it is obvious from Figure 1 that the monetary compensation on DPS, $W^* – W_0$, depends on

(i) the initial health status (i.e., the lower the health status, the higher is the monetary value of DPS; DPS converge to infinity if health quality is very low),
(ii) the severity and intensity of the damage (i.e., the closer U_0 and U_1 are, the lower is the monetary value of DPS), and
(iii) the shape of the indifference curves, i.e., the more curvilinear the indifference curves are, the higher are the DPS.[2]

Figure 1 depicts a situation where an individual is only faced with a decrease in health, but not with a change in wealth. In reality, injuries might also reduce an individual's wealth due to, for example, pecuniar damages or changes in earning capacity. In this case, the individual would be awarded by an additional payment capturing the reduction in wealth (e.g., losses in income due to sickness absence). But such payments would be a result of a change in wealth and not a change in health quality, and, therefore, they cannot be interpreted as a monetary value of the direct loss of utility due to a reduced health status. Consequently, one has to rely only on DPS when calculating a moentary value of body parts and body functions.

Judges ideally base their assessments on an appraisal of the victim's utility from health and wealth and calculate *ex post* the payment that compensates for the corresponding change in utility. Their decisions are closely tied to a country's legal framework. It is encouraging to compare this approach with the previous ones discussed

[2] Under the extreme case that both goods are perfect substitutes (perfect complements), the DPS remains constant (converges to infinity).

in literature. In this regard, the VSL and the QALY are probably the most accepted and widest used approaches to measure individual changes in health and life quality.

The VSL starts with valuating a marginal change in the individuals' mortality risk, relying on personal judgments, either gained from observed market decisions (e.g., in the labour market) or from questionnaires on valuations of hypothetical risk changes. Then, the amount assigned to the marginal risk change is aggregated to obtain the value of a statistical life. In particular, the VSL is calculated as the ratio between the willingness to pay (WTP) for or the willingsness to accept (WTA) a marginal change in mortality risks and the underlying risk variation. In this regard, the VSL represents a trade off between wealth or income and a certain risk variation (see, e.g., Jones-Lee 1974 or Viscusi 1992).

QALYs are commonly applied to evaluate impairments or improvements in the state of health due to a medical treatment (i.e., a therapy or a surgery). Similar to the VSL, a QALY refers to the direct health effects on the individuals' utility, i.e., a change in utility due to an improvement or decline in health quality. Either potential beneficiaries or experts (physicians) determine the change in health, i.e., the movement from H_1 to H_0 in Figure 1 (or vice versa) due to a specific medical treatment. Specifically, QALYs measure the increase or loss in the number of years in perfect health: the higher the QALY, the higher the improvement in health. In contrast to the VSL or the VDPS, QALYs do not deliver monetary figures but rather use values.[3] A monetarization of QALYs is usually applied in a subsequent step by (i) using the individual WTP (WTA) for a certain health improvement, or (ii) by observing health expenditures related to the respective health treatment (see Drummond *et al.* 2005 and Karapanou and Visscher 2009, for further details).

Both, VSL and many QALY studies rely on the WTA or WTP to monetize life (quality). The WTA answers the question on how much an individual has to be paid *ex ante* to accept a lower health status (say, H_1 in Figure 1), but maintaining the initial utility

[3] Specifically, to calculate QALYs, one has to establish different health conditions, ranging from perfect health to death. Each health status is assigned to a QALY-weight (use value), lying between zero (death) and one (perfect health). QALYs represent the sum of these QALY-weights during the time this health status is observed. For example, consider two medical treatments inducing that person lives 5 (3) years in a health status of QALY-weight 0.1 (0.2) under treatment A (B), we obtain a result of 0.5 (0.6) QALYs for the whole time period. Obviously, medical treatment B has to be preferred over treatment A. See Karapanou and Visscher (2009) for additional examples.

level (U_0 in Figure 1). In Figure 1, this loss in health quality, $H_0 - H_1$, is compensated by the amount of $W^* - W_0$. The WTP, in contrast, reflects the amount an individual is willing to pay *ex ante* to increase her health status (e.g., a movement from H_1 to H_0 in Figure 1). Assuming an initial consumption of W^* and the corresponding life quality H_1 (i.e., utility level U_0), an individual is willing to pay $W^* - W_0$ to end up at an improved health status of H_0 and, thus, to keep the utility at U_0. In any case, both the WTA and the WTP capture the financial payment that compensates an individual for a change in health quality. From this, we firmly can conclude that DPS and the subjective judgments on WTA or WTP turn out to be very similar from a conceptual perspective. The differences between these concepts are

(i) the marginal unit to be evaluated (DPS are based on the evaluation of single body parts and body functions, the VSL is based on a marginal change in mortality risks, the QALY measures the change in the number of years in perfect health),

(ii) the point in time when the valuation is undertaken (the monetary value of DPS is evaluated ex post, after the damage has occurred; the VSL and QALY are based on an ex ante valuation, before a potential damage arises), and

(iii) the subject that valuates the change in utility (DPS are based on a valuation of judges and experts, the VSL and QALY mainly rely on personal judgments of individuals when calculating the WTA or WTP).

In the next section, we present a dataset from Germany and Austria that allows to derive DPS, which can be aggregated to a monetary value of body parts and body functions and, subsequently, to a monetary value for a whole human body.

3. Application: A dataset of German and Austrian verdicts on damages for pain and suffering

3.1. Legal charcteristics of the German and Austrian DPS verdicts

In Germany and Austria, DPS are awarded for physical and mental distress suffered from an injury and aim at compensating the experienced and future pain and the overall resulting loss of life quality. Thereby, the German and Austrian Civil Code only provide a vague framework, which passes the effective evaluation task on to the jurisdiction.[4] Hence, it rests on the civil courts (i.e., the judges) to decide on the magnitude of the compensation.[5] The legal system as well as the legal practice support this judiciary decision making by different means. First, judges are guided by the basic functions of German and Austrian tort law, namely the compensation and the satisfaction function. While the former refers to the idea that the aggrieved party should be appropriately compensated for the damage, the latter intends to pander the experienced harm (see, e.g., Schäfer and Ott 2000). Second, courts are supported by the qualitative evaluation of the (changed) health status of expert opinions (mainly physicians) that comprise the severity of the injury, the impairment of life quality, the intensity of suffering due to the damage (including psychological burden) and the duration of pain. Third, judges typically refer to precedents and specific pain and suffering guidelines extracted from German and Austrian jurisdictions. For example, judges' evaluation of DPS should not distinguish between males and females since courts should follow a gender neutral line in reasoning. Further, age as such should not determine the compensations as young and old people alike suffer from pain. One exception might be permanent damages since young people are confronted with a longer period of poorer health than older persons. Finally, courts should consider contributory negligency when awarding the payment.

3.2. Data description

We extract information on DPS for Germany and Austria from the verdict collections Hacks, Ring and Böhm (2006, 2007) and Danzl, Gutierr-Lobos and Müller (2007). According to the specific interpretation of DPS provided in our theoretical section reflecting the German and Austrian tort law, this data set exclusively covers DPS and not other related compensations (e.g., changes in earning capacity). Originally, our sample

---

[4] See Art. 253 German Civil Code (BGB) and Art. 1325 Austrian Civil Code (ABGB). For general standards on tort law in Germany and Austria see Art. 823 et seq. BGB and Art. 1293 et seq. ABGB.

[5] The German and Austrian judicial power in civil matters is based on four different court types: (i) the District Courts, (ii) the Regional Courts, (iii) the Province Courts and (iv) the Supreme Court. The deciding judges (judge sitting single or senate, with respect to the instance) are independent, free of instructions and irremovable. According to the magnitude of the claim of relief, the legal process starts either at the District court or at the Regional court. Hence, on the one hand the appeal (three instances) may go up to the second instance (Regional Court) and in the third instance to the Province Court. On the other hand, the second instance might be the Province Court, and the third one might be the Supreme Court.

includes around 5,000 verdicts on DPS between 1980 and 2004 (2,871 for Germany and 2,022 for Austria). It contains individual information on the victim’s gender and age, on the type and number of injuries and the amount of compensation. In addition, it includes information on the court type (see footnote 5) and the instance where the decision took place (i.e., first, second or third instance), on comparative negligence and details of the injury (e.g., bruises, fractions, amputations). In cases where persons suffer from more than one injury, we are not able to assign the corresponding judgement to one single injury. To avoid potentially biases in aggregating the corresponding DPS, we exclude these observations from the sample. This reduces our dataset to 1,608 observations, i.e., 1,262 (79 percent) from Germany and 346 (21 percent) from Austria.

Each entry in the database represents a value for main anatomical parts and functions of the body. We use this information to define subcategories (i.e., components of body parts and body functions) and sum up these values to obtain a value for a fully operative human body. As mentioned above, we refer to this value as the VDPS.

3.3. Descriptive statistics and data features

Table 1 provides a descriptive overview on our data. Accordingly, the average DPS amounts to about EUR 11,886. The corresponding minimum (maximum) values are around EUR 50 (299,507). Approximately 47 percent of the victims in the dataset are females (in 137 cases we do not have information on the plaintiff's gender). The average age of the victims is around 33 years. For most of the judgments in the sample, however, age is only classified into "child" (victims between zero and 14 years; coded with entry "1" in the subsequent analysis), "young" (between 15 and 18 years; coded with "2"), "adult" (between 19 and 65 years; coded with "3") and "retired" (older than 65; coded with "4"). Therefore, we only have 565 observations (judgments) where we know exactly the age of the victim. 29 percent of the plaintiffs are at least partly contributory negligent, and 27 percent suffered a permanent damage (in 11 cases, we do not have information on this variable). Regarding instances, 49 (43) percent can be assigned to the first (second) instance, while a considerably lower share (around 8 percent) was decided in the third instance.

Table 1: Descriptive Statistics

Variable	Obs.	Mean	Std.Dev.	Min.	Max.
Compensation in EUR	1,608	11,885.8	27,056.4	50	299,506.9
Female[a)]	1,471	0. 467	0.499	0	1
Age in years	565	32.771	21.134	0	87
Age cohort	952	2.596	0. 876	1	4
Contributory negligence[a)]	1,608	0.286	0. 452	0	1
Permanent damage[a)]	1,597	0. 273	0. 446	0	1
First instance[a)]	1,608	0. 488	0.500	0	1
Second instance[a)]	1,608	0. 431	0. 495	0	1
Third instance[a)]	1,608	0. 081	0.274	0	1
Judgment in Austria[a)]	1,608	0. 215	0. 411	0	1

Notes: [a)] Dummy variable.

Next, we apply a simple regression analysis to examine whether our data is in accordance with the above mentioned German and Austrian legal framework. Such an analysis is further useful to obtain some insights on whether and by how much DPS are systematically affected by the victims' personal characteristics, by the circumstances of the damage and by other aspects of the proceeding itself. Specifically, we regress DPS on a set of explanatory variables including the victim's gender, information on contributory negligence and on permanent damages, on the instance where the decision was made and a set of dummy variables for the injuries (i.e., the aforementioned subcategories). In our case, compensations on DPS are log-normally distributed, so that we take the logarithm of DPS as the dependent variable.

Since the age variable is not fully available in our sample, we estimate two versions of the regression. One where we completely leave out the age information, obtaining a sample of 1,459 observations. In a second specification, we further include indicator variables of the above mentioned age cohorts (the cohort of children is the reference category left out in the regressions), leaving with a much lower sample size of 885 observations. To capture the fact that age should only play a role in the context of permanent damages, we also incorporate interaction terms between the age cohorts and permanent injuries. Finally, to control for a potential difference in DPS between Germany and Austria we include a country dummy (taking entry 1 for Austria), and a time trend to allow for a yearwise change in compensations.

Table 2 reports the estimation results for two model-variants. Model 1 provides simple OLS estimates, while Model 2 corrects for outliers using a quantile (median) regression based on maximum likelihood estimation (see Cameron and Trivedi 2005 for details). Our dependent variable is the logarithm of DPS and most of our covariates are dummy variables (see Table 1). To inform about the relevance of each independent variable separately, we report the marginal effects of the corresponding parameter estimates in Model B, calculated as $(e^{\text{coef}} - 1)\times 100$. The results of the left (right) hand side refer to the lower (larger) sample size with (without) age information.

Table 2 reveals that a substantial part of the variation of the DPS is explained by the explanatory variables (i.e., both the R^2 in the linear regression in Model 1 and the Pseudo R^2 in the non-linear Model 2 are relatively high). Further, and not surprisingly, we find that the dummy variables for the subcategories (i.e., components of body parts and body functions) are jointly significant, indicating that the injuries themselves contribute significantly to the explanation of DPS. Our regression results in both specifications indicate that DPS increased by about 2 or 3 percent per year, on average. We also observe much higher monetary compensations in Austria than in Germany. On average, this difference is about three to four times that of a German DPS.

With regard to the victims' personal characteristics we do not find a significant difference in compensations between males and females and between younger and elder age cohorts. This is not really surprising as courts should follow a gender-neutral reasoning in their decisions. Similarly, age should not determine the compensations as young and old people alike suffer from pain. Further, we would expect to find higher payments for permanent damages in younger than in older age cohorts since younger people are confronted with longer time periods in poorer health than older ones. Regarding this, we firstly find a significantly positive and considerably large effect of permanent damages in the youngest age cohort (which is the reference group in the left panel of Table 2), implying up to three times the DPS than for that of a non-permanent damage in that age group. Second, we find insignifcant coefficients for the interaction terms of permanent damages and the other age cohorts, implying that there is no difference in compensations for permanent damages between younger and older age cohorts. However, one reason for this result might be that the interaction terms and the permanent damage variable are closely correlated (for instance, the correlation coefficient between permanent damages and the interaction term of permanent damages with the middle age cohort is around 0.74, implying potentially ineffecient parameter estimates).

For victims with contributory negligence, we would predict reduced monetary compensation, which is confirmed by the parameter estimates of Table 2 (the difference is around 40 percent). Finally, we observe a systematic difference between the first and the second (third) instance of around 60 percent (44 or 100 percent, depending on which sample we are focusing on).

Overall, our findings of the regression analysis suggest that our dataset of German and Austrian verdicts on pain and suffering are generally well in accordance with the expectations that we would derive from the design of the legal systems in these countries. Further, a comparison of Model 1 and Model 2 reveals that our estimation results are not seriously driven by outlying observations (judgments). This, together with the fact that the point estimates in both samples with and without age information are very similar, suggests that we can rely on the full sample of all 1,608 observations when calculating the VDPS.

4. Calculating the value for damages on pain and suffering

To calculate the VDPS we firstly follow the International Classification of Functioning, Disability and Health (ICF) of the World Health Organization (WHO) and assign each of our 1,608 judgments into one out of 25 main and 123 subcategories.[6] The main categories comprise body structures as anatomical parts of the body such as face, arms, legs and internal organs. The subcategories provide information on body functions and impairments, i.e., fractures, bruises and amputations. Disease patterns, such as headache or blood pressure, are excluded from the sample.

---

[6] The ICF distinguishes between body functions, body structures and impairments. Accordingly, body functions are defined as "*… physiological functions of body systems (including psychological functions).*", body structures are described as "*… anatomical parts of the body such as organs, limbs, and their components.*", and impairments are "*… problems in body function or structure such as a significant deviation or loss.*" (WHO 2002, p. 10).

Table 2: Determinants of DPS (linear regression)

Variable	Sample with age information			Sample without age information		
	Model 1	Model 2	Marginal effect in % (Model 2)	Model 1	Model 2	Marginal effect in % (Model 2)
Female	0.049	0.081	8.4	0.051	0.070	7.3
	(0.069)	(0.077)		(0.053)	(0.062)	
Permanent injury	0.716 ***	0.572 *	77.2	1.047 ***	0.939 ***	155.7
	(0.247)	(0.312)		(0.075)	(0.085)	
Contributory negligence	-0.425 ***	-0.564 ***	-43.1	-0.428 ***	-0.428 ***	-34.8
	(0.162)	(0.183)		(0.105)	(0.132)	
Second instance	0.578 ***	0.419 ***	52.0	0.607 ***	0.515 ***	67.4
	(0.103)	(0.138)		(0.072)	(0.103)	
Third instance	0.504 ***	0.362	43.6	0.694 ***	0.710 ***	103.4
	(0.187)	(0.246)		(0.151)	(0.191)	
Court in Austria	0. 949 ***	1.129 ***	209.3	0.930 ***	0.971 ***	164.1
	(0.176)	(0.215)		(0.123)	(0.146)	
Year	0.020 ***	0.016 *	1.6	0.027 ***	0.025 ***	2.5
	(0.008)	(0.009)		(0.006)	(0.007)	
Age cohort 2: 15 – 18	-0.008	-0.032	-3.1	–		
	(0.193)	(0.216)				
Age cohort 3: 19 – 65	-0.048	0.031	3.1	–		
	(0.118)	(0.128)				
Age cohort 4: > 65	0.112	0.074	7.7	–		
	(0.147)	(0.187)				
Interaction permanent injury and age cohort 2	-0.066	0.113	12.0	–		
	(0.363)	(0.492)				
Interaction permanent injury and age cohort 3	0.409	0.359	43.2	–		
	(0.258)	(0.335)				
Interaction permanent injury and age cohort 4	-0.121	-0.012	-1.2	–		
	(0.303)	(0.395)				
Observations	885	885		1,459	1,459	
(Pseudo) R^2	0.5909	0.3989		0.5784	0.4133	
Joint significance of injuries (*F*-test)	120.8 ***	42.1 ***		103.29 ***	80.2 ***	

Notes: (Robust) Standard errors for Model 2 (Model 1) in parentheses. Marginal effects are calculated as $(e^{coef.} – 1)×100$.
*, **, *** ... significant at 10%, 5% and 1%.

In the next step, we derive a monetary value for each of the main category and subcategory in the sample, which, in a final step, can be aggregated to a fully operating human body. Out of the 123 above mentioned subcategories we rely on 83 ones to compute the VDPS. This choice was taken according to the opinion of medical experts that guided our study.[7] A full list of all 83 subcategories used in the subsequent calculations is provided in Table A1 of the Appendix.

Let us refer to the example of human legs to illustrate how we calcualte a monetary value of main body parts (see Table 3). To determine the monetary value of legs we sum up the DPS with regard to all body components and dysfunctions of the thighs, the knees, the lower legs and the feet. As can be seen from Table 3, overall we use 20 subcategories and calculate an (unweighted) average value of about EUR 549,000 for two human legs. The corresponding minimum is about EUR 310,000, and the maximum lies around EUR 1,056,000, and the interquartile range is between EUR 390,000 and EUR 654,000.

Table 3: Deriving the monetary value of human legs

Subcategory	**# of Sub-categories**	**Mean**	**Minimum**	**Maximum**	**1st Quartile**	**3rd Quartile**
Thighs	4	143,446	80,190	290,406	106,234	156,517
Knees	4	105,863	72,800	194,092	79,500	123,569
Lower legs	5	118,327	48,400	273,000	78,500	146,619
Feet	7	181,042	108,200	298,166	125,500	227,615
Sum	*20*	*548,679*	*309,590*	*1,055,664*	*389,734*	*654,320*

Notes: All monetary values in 2005 Euros. All entries in the table represent unweighted figures.

In a similar vein, we derive values for each of the main (anatomical) body parts including the necessary body functions (e.g., senses or the nervous system) and the psyche. Our results are summarized in Table 4, where the number of subcategories is reported in column 2 and the number of judgments (observations) is indicated in column 3. For instance, we compute an aggregate average value of arms of about EUR 185,300, which is based on seven subcategories with 137 judgments on DPS.

[7] For instance, it is impossible to assign each damage (e.g., higher degree burns) unambiguously to one main category or one subcategory.

Table 4 reveals that the sum of all main body parts is around EUR 1.79 millions. The minimum (maximum) value is about EUR 669,000 (4.62 millions), the 1st and 3rd quartile lie at 993,000 EUR and 2,261,000 EUR. These values can be interpreted as the value of a fully operative human body, the VDPS, which is based on DPS verdicts from Germany and Austria.

Table 4: Deriving the VDPS from monetary values of anatomical parts of the body

Body Part	**# of Subcat.**	**# of DPS**	**Mean**	**Min.**	**Max.**	**1st Quartile**	**3rd Quartile**
Legs	20	301	548,679	309,590	1,055,664	389,734	654,320
Hip	2	7	24,945	12,174	35,174	17,674	35,174
Pelvis	2	10	23,484	2,913	55,000	6,250	42,500
Genitalia	3	53	82,122	51,150	140,000	55,000	100,000
Breast/Thorax	3	24	18,451	1,713	47,500	7,500	22,634
Internal organs	7	80	107,334	16,050	452,500	41,387	135,000
Arms	7	137	185,319	49,200	457,914	92,200	257,778
Back	8	140	229,303	105,950	463,481	117,306	284,499
Head	6	35	114,679	7,904	346,623	32,092	205,632
Face	5	123	18,695	3,125	81,197	7,340	19,723
Sense Organs	10	78	200,081	66,400	679,766	114,215	261,790
Nervous System	4	16	145,436	40,250	340,750	101,582	190,750
Psyche	6	130	89,693	2,450	466,500	11,000	51,250
VDPS	*83*	*1,134*	*1,788,221*	*668,869*	*4,622,069*	*993,279*	*2,261,050*

Notes: All monetary values in 2005 Euros. All entries in the table represent unweighted figures.

5. Discussion

In Section 2, we have shown that both concepts, the VSL and the VDPS, rely on the same conceptual background. From this, one might ask whether our value for the VDPS is consistent with the ones derived in VSL studies. For instance, Spengler and Schaffner (2007), using German labor market data, estimate a VSL lying within a range of EUR 1.91 millions and EUR 6.20 millions (in 2005 Euros). For Austria, the values of VSL studies are broadly within this range. Weiss, Maier and Gerking (1986), focusing on labor market data, find a VSL between EUR 4.41 millions and EUR 7.35 millions (in 2005 Euros). Similarly, according to Maier, Gerking and Weiss (1989) and to Leiter and Pruckner (2007), both applying a contingent valuation approach (i.e., a questionnaire) to derive a VSL for Austria, the VSL is between EUR 2 millions and EUR 5 millions (in 2005 Euros). Although our results for the VDPS are at the lower bound of these figures, they are generally consistent with these studies. This, in turn, suggests that the VDPS is a serious alternative for valuating human life. However, one particular advantage of the VDPS is that it provides additional information on the value of single human body parts, which might be of interest in the context of QALYs.

Similar to the QALY, the VDPS provides disaggregated information about life quality. Further, as is obvious from our discussion in Section 2, both concepts are identical from a conceptual perspective. However, while the VDPS explicitly provides a monetary measure, the QALY represents a use value that has to be transformed into monetary values, ideally, by considering the individuals' WTP (or WTA) for the respective change in health status. Consequently, monetised QALYs as well as the VDPS consist of the same two components: (i) the change in utility due to a change in health quality, and (ii) the required monetary compensation (change in wealth) to keep the individual at the original utility level. Therefore, VDPS and QALYs should deliver similar values if QALYs are monetised via the WTP. A study by Roels *et al.* (2003), who calculate the monetary value of a QALY for a kidney from a European sample, provides a pretty nice example: They estimate a monetary value of a QALY referring to a kidney transplantation of about EUR 26,000.[8] In our case, we observe an average compensation of EUR 29,250 for the same organ (see Table A1 in the Appendix). Hence, the VDPS developed in this paper provides monetary values of single body parts and body functions without making it necessary to transform personal beliefs or observed market behavior into monetary values.

Admittedly, the calculation of the VDPS is based on somewhat critical assumptions. First, we assume that the judges perfectly account for the decrease in the victims' utility. The VDPS might be biased if the courts do not consider or are not aware of all personal circumstances driving the individual's trade off between health and wealth. Second, to calculate the VDPS we rely on an aggregation rule that is based on unweighted figures. This induces a further source of potential biases, depending on whether the value of the

8 As far as we are aware of, there is no further information on QALYs for body parts and body functions available for Germany and Austria that allows a comparison to our DPS values.

whole body is assumed to be higher or lower than the sum over all single body parts and body functions. Third, our data set of German and Austrian verdicts exhibits a relatively thin representation in some subcategories (e.g., for the hip we only have seven victims; see Table 4). Clearly, the VDPS and the corresponding DPS of body parts and body functions become more reliable with increased sample size.

On the other hand, the VDPS is easy to obtain if verdicts on pain and suffering are collected in a systematic and comprehensive way. In addition, it does not need any risk perceptions of individuals or information on their market behavior to calculate monetary values of changes in health quality. After all, we would argue that the VDPS is an interesting and potentially useful alternative to VSL and (monetised) QALY studies, at least to provide some sensitivity checks in evaluating health improvements due to innovative medical treatments and techniques.

6. Conclusions

This paper proposes a new approach to evaluate human life based on court decisions on damages for pain and suffering. Similar to previous approaches of evaluating human life, the Value of Statistical Life (VSL) or Quality Adjusted Life Years (QALYs), the value of damages for pain and suffering (VDPS) basically refers to a change in utility due to a change in health quality. While most VSL and QALY studies rely on risk perceptions of individuals to compute such compensations, the VDPS uses decisions of judges to derive these values.

Using data from about 1,100 German and Austrian court decisions on damages for pain and suffering over the years 1980 to 2004 we calculate an average VDPS of around EUR 1.79 millions (the minimum is EUR 0.67 millions, and the maximum is EUR 4.62 millions), which is within the range of the estimates reported in comparable VSL studies from Germany and Austria. However, the major difference between the VDPS and previous VSL studies to evaluate human life is that it does not only provide information on the value of a whole human life or life quality, but also on the (monetary) value of body parts and body functions, which, in turn, might be important if information on the benefits of changes in life quality due to marginal improvements in health and medical technology is scarce or not entirely known.

Finally, we demonstrate that the VDPS might be also interesting in the context of QALYs, which need personal judgments or market observations to provide monetary values of improvements in health quality. The VDPS is based on the same conceptual background, but directly provides monetary values of changes in health status. This, in turn, allows to monetize QALYs ex post without having ex ante information on how improvements in health quality are perceived by the individuals.

References

Cameron, A.C. and P.K. Trivedi (2005). *Microeconometrics. Methods and Applications*, Cambridge University Press.

Cooter, R. and T. Ulen (2008). *Law and Economics*, 5th ed., Pearson.

Danzl, K.H., K. Gutiérrez-Lobos and O.F. Müller (2007), *Das Schmerzengeld in medizinischer und juristischer Sicht*, 9th ed., Manz, 62 -341.

Drummond, M.F., M.J. Sculpher, G.W. Torrance, B.J. O'Brien and G.L. Stoddart (2005). *Methods for the Economic Evaluation of Health Care Programmes*, Oxford University Press.

Hacks, S., A. Ring and P. Böhm (2006). *Schmerzensgeld Beträge 2006*, 24th ed., Deutscher Anwaltsverlag.

Hacks, S., A. Ring and P. Böhm (2007). *Schmerzensgeld Beträge 2007*, 25th ed., Deutscher Anwaltsverlag.

Hammitt, J.K. (2002). QALYs versus WTP, *Risk Analysis* 22, 985–1001.

Johannesson, M., P.-O. Johansson and R.M. O'Conor (1996). The value of private safety versus the value of public safety, *Journal of Risk and Uncertainty* 13, 263–275.

Johansson, P.-O. (1995). *Evaluating health risks – An economic approach*, Cambridge University Press.

Jones-Lee, M. (1974). The value of changes in the probability of death or injury. *Journal of Political Economy* 82, 835–849.

Karapanou, V. and L. Visscher (2009). The magnitude of pain and suffering damages from a law and economics and health economics point of view, *RILE Working Paper* No. 2009/02.

Leiter, A.M. and G.J. Pruckner (2007). Ökonomie und der Wert des Lebens, in: A. Exenberger, J. Nussbaumer (Hrsg.), *Von Menschenhandel und Menschenpreisen – Wert und Bewertung von Menschen im Spiegel der Zeit*, Innsbruck University Press, 109–130.

Maier, G., S. Gerking and P. Weiss (1989). The economics of traffic accidents on Austrian roads: Risk lovers or policy deficit?, *Empirica* 16, 177–192.

Posner, R. (2007). *Economic Analysis of Law*, 7th eds., Aspen Publishers.

Roels, L., Z. Kalo, D. Boesebeck, J. Whiting and C. Wight (2003). Cost-benefit approach in evaluating investment into donor action: the German case, *Transplant International* 16, 321–326.

Slovic, P., B. Fischhoff and S. Lichtenstein (1982). Facts versus fears: Understanding perceived risk, in: D. Kahneman, P. Slovic, A. Tversky (Hrsg.), *Judgment under uncertainty: Heuristics and biases*, Cambridge University Press, 463–489.

Slovic, P., B. Fischhoff and S. Lichtenstein (2000). Facts and Fears: Understanding Perceived Risk, in: Slovic, P. (Hrsg.), The Perception of Risk, Earthscan Publications Ltd.: London, 137–153.

Spengler, H. and S. Schaffner (2007). Using job changes to evaluate the bias of the value of a statistical life, *Ruhr Economic Paper* Nr. 14.

Sunstein, C.R. (2004). Lives, life-years, and willingness to pay, *Columbia Law Review* 104, 205-252

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

Viscusi, W.K. (1993). The value of risk to life and health, *Journal of Economic Literature* 31, 1912–1946.

Viscusi, W. (2008). The value of life. *New Palgrave Dictionary of Economics and the Law*, 2nd ed.; Vanderbilt Law and Economics Research Paper No. 08-04.

Viscusi, W.K. and J.E. Aldy (2003). The value of a statistical life: A critical review of market estimates throughout the world, *Journal of Risk and Uncertainty* 27, 5–76.

Weinstein, M. (2005). Spending health care dollars wisely: Can cost effectiveness analysis help?, *Sixteen Annual Herbert Lourie Lecture on Health Policy* No. 30/2005.

Weiss, P., G. Maier and S. Gerking (1986). The economic evaluation of job safety – A methodological survey and some estimates for Austria, *Empirica* 13, 53–67.

World Health Organization (WHO) 2002. Towards a Common Language for Functioning, Disability and Health: ICF, Geneva; downloadable at (http://www.who.int/classifications/icf/training/icfbeginnersguide.pdf)

Table A1: Main categories and subcategories of a human body and the corresponding DPS

Main category	Subcategory	Mean	Minimum	Maximum	1st Quartile	3rd Quartile
Legs	Leg bruise	6,975	900	20,000	950	13000
	Knee	60,000	60,000	60,000	60,000	60,000
	Knee: Fracture	20,856	10,000	47,964	12,500	27,500
	Knee: Other injuries	11,145	800	51,128	3,000	15721
	Knee: Injuries to ligaments	13,863	2,000	35,000	4,000	20,348
	Thigh: Amputation of the thigh	104,167	75,000	175,000	90,000	100,000
	Thigh: Fracture	23,312	4,000	65,406	14,534	29,070
	Thigh: Other injuries	8,992	290	30,000	750	14447
	Lower leg	8,750	7,500	10,000	7,500	10,000
	Lower Leg: Amputation of the lower leg	67,136	30,000	120,000	50,000	80,000
	Lower leg: Fracture	17,239	2,500	45,000	10,000	23,619
	Lower leg: Other injuries	17,201	400	90,000	3,000	25000
	Lower leg: Injuries to ligaments	8,000	8,000	8,000	8,000	8,000
	Feet: Amputation of the foot	70,000	70,000	70,000	70,000	70,000
	Feet: Amputation of the toe	46,667	25,000	65,000	25,000	65,000
	Feet: Fracture	16,475	1,500	65,000	6,000	20,000
	Feet: Other injuries	15,415	200	35,000	10,000	25000
	Feet: Injuries to ligaments	9,291	5,000	14,534	5,500	13,081
	Feet: Arthrosis	13,000	6,000	20,000	6,000	20,000
	Feet: Toe	10,196	500	28,632	3,000	14534
	Sum	*548,679*	*309,590*	*1,055,664*	*389,734*	*654,320*
Hips	Fracture of the hip	10,174	10,174	10,174	10,174	10,174
	Other injuries of the hip	14,771	2,000	25,000	7,500	25,000
	Sum	*24,945*	*12,174*	*35,174*	*17,674*	*35,174*
Pelvis	Fracture of the pelvis	13,096	1,750	37,500	5,087	25,000
	Other injuries of the pelvis	10,388	1,163	17,500	1,163	17,500
	Sum	*23,484*	*2,913*	*55,000*	*6,250*	*42,500*
Genitalia	Male genitals	17,071	900	50,000	2,500	25000
	Female genitals	10,051	250	30,000	2,500	15000
	Amputation of the breast	55,000	50,000	60,000	50,000	60,000
	Sum	*82,122*	*51,150*	*140,000*	*55,000*	*100,000*

Table A1 continued

Main category	**Subcategory**	**Mean**	**Minimum**	**Maximum**	**1st Quartile**	**3rd Quartile**
Breast/Thorax	Fracture of thorax	7,561	500	15,000	3,750	13000
	Thorax bruise	7,663	363	25,000	1,750	6000
	Fracture of the rib(s)	3,227	850	7,500	2,000	3634
	Sum	*18,451*	*1,713*	*47,500*	*7,500*	*22,634*
Internal organs	Abdomen and stomach	8,469	200	40,000	2,500	10000
	Intestine	10,458	1,500	20,000	3,750	17,500
	Cardiovascular system	15,656	250	37,500	6,250	22500
	Liver, bile	12,205	3,500	35,000	5,887	15,000
	Lung, windpipe/trachea, midriff	22,296	1,350	160,000	2,500	15,000
	Spleen	9,000	8,000	10,000	8,000	10,000
	Kidney, bladder, urethra	29,250	1,250	150,000	12,500	45,000
	Sum	*107,334*	*16,050*	*452,500*	*41,387*	*135,000*
Arms	Arm/Hand: Amputation of the arm/hand	55,000	30,000	80,000	30,000	80,000
	Arm: Fracture	12,907	900	50,870	4,750	18400
	Arm: Other injuries	7,826	300	50,000	2,350	7750
	Hand: Fracture	7,368	1,600	24,708	2,500	9,000
	Hand: Other injuries	6,628	400	36,336	600	6000
	Hand: Injuries to ligaments	6,233	1,000	16,000	2,000	11,628
	Finger: Amputation of the finger	89,359	15,000	200,000	50,000	125,000
	Sum	*185,319*	*49,200*	*457,914*	*92,200*	*257,778*
Back	General injuries	7,250	7,250	7,250	7,250	7,250
	Shoulder	20,000	20,000	20,000	20,000	20,000
	Shoulder: Fracture	9,470	1,500	30,000	3,500	15,000
	Shoulder: Other injuries	13,338	2,000	26,162	3,000	22,528
	Shoulder: Injuries to ligaments	1,000	1,000	1,000	1,000	1,000
	Spine and lumbar spine	10,326	800	29,069	7,267	10000
	Spine	7,963	727	100,000	2,616	8721
	Paraplegia	159,956	72,673	250,000	72,673	200,000
	Sum	*229,303*	*105,950*	*463,481*	*117,306*	*284,499*
Head	Concussion	1,551	654	2,500	654	2500
	Injury to the brain	72,500	1,000	250,000	25,000	109,009
	Craniocerebral injury	5,454	375	9,447	375	9447
	Injury to the head/head wound	5,000	2,500	7,500	2,500	7,500
	Cranial fracture	29,392	3,000	76,176	3,000	76,176
	Head bruise	781	375	1,000	562.5	1000
	Sum	*114,679*	*7,904*	*346,623*	*32,092*	*205,632*

Table A1 continued

Main category	Subcategory	Mean	Minimum	Maximum	1st Quartile	3rd Quartile
Face	Fracture	2,942	1,000	9,447	1,090	3,634
	General injuries	2,031	300	16,000	500	2500
	Cicatrice	4,104	650	18,000	1,500	3089
	Injuries to the jaw	7,004	1,000	22,750	3,500	7,500
	Dental harm	2,615	175	15,000	750	3000
	Sum	*18,695*	*3,125*	*81,197*	*7,340*	*19,723*
Sense Organs	Eye	10,000	10,000	10,000	10,000	10,000
	Eye injuries	13,279	1,000	43,604	3,000	23,256
	Eye: Absence or impairment	61,081	250	433,326	20,000	75000
	Eye: Absence	42,470	26,162	60,000	29,070	50,000
	Absence or impairment of olfaction and ageusic	14,305	3,500	30,000	6,111	22,500
	Ear	1,500	1,500	1,500	1,500	1,500
	Deafness	14,534	14,534	14,534	14,534	14,534
	Ear: Hardness of hearing (amblyacousia)	8,659	3,000	20,000	7,000	10,000
	Ear: Other injuries	7,586	1,454	21,802	3,000	10,000
	Vocal cords	26,667	5,000	45,000	20,000	45,000
	Sum	*200,081*	*66,400*	*679,766*	*114,215*	*261,790*
Nervous System	Epilepsy	25,000	25,000	25,000	25,000	25,000
	Palsy	93,481	11,250	250,000	72,582	100,000
	Disruption	22,167	500	60,000	500	60000
	Sensibility deficiency/loss	4,788	3,500	5,750	3,500	5,750
	Sum	*145,436*	*40,250*	*340,750*	*101,582*	*190,750*
Psyche	Trauma	5,723	400	17,500	3,000	7500
	Trauma due to dead of others	7,347	1,000	30,000	3,000	10,000
	Trauma due to own harm	9,857	100	40,000	2,000	20000
	Trauma due to false diagnosis	59,000	500	285,000	2,000	5000
	Trauma due to other impacts	1,519	400	4,000	500	2500
	Invasion of personal privacy	6,248	50	90,000	500	6250
	Sum	*89,693*	*2,450*	*466,500*	*11,000*	*51,250*
	Sum total	***1,788,221***	***668,869***	***4,622,069***	***993,279***	***2,261,050***