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Quality Adjusted Life Years as a Way Out of the Impasse between Prevention Theory and Insurance Theory

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Quality Adjusted Life Years as a Way Out of the Impasse between Prevention Theory and Insurance Theory

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Abstract

In a previous paper we have argued that tort law can benefit from the use of Quality Adjusted Life Years (QALYs) in assessing pain and suffering damages for personal injuries. In the current paper we pose that QALYs may be able to solve a problem which exists in the economic analysis of this area of law. The question whether a tortfeasor should compensate non-pecuniary losses is not answered unambiguously in Law and Economics, as shows from the debate between the prevention theory (which argues that the injurer should be liable for immaterial losses) and the insurance theory (which argues that the victim should not receive compensation for such losses).

In our view, QALYs are able to bridge the gap between these two theories. They provide a framework for the assessment of pain and suffering damages for personal injuries, which is based on the impact of the health impairment on the victim. This is important for the (primarily legal) objective to provide adequate compensation to the tort victim, and for the (primarily Law and Economics) goal to provide adequate deterrent incentives.

A QALY expresses the value of living one year in a certain health condition. Health Economics literature enables assessing the impact of different health conditions on the quality of life. By subsequently monetizing QALYs, this impact is expressed in monetary terms, which provides a non-arbitrary basis for pain and suffering damages. This is not only relevant within the domain of Law and Economics, but it also allows a more systematic assessment of pain and suffering damages than the current legal approach, which lacks a framework to assess the correctness of the damages. In addition, in our view QALYs are able to deal with adaptation.

By way of illustration, we compare pain and suffering damages in several European countries with the amounts that would result from a conservative estimation of the monetary value of a QALY for specific types of personal injuries. We show that the amounts that are currently awarded are too low, both from a legal compensation as from an economic incentives point of view.

Keywords: Adaptation, Health Economics, Insurance Theory, Pain and Suffering, Prevention Theory, Quality Adjusted Life Years, Tort Law

JEL Classification: I12, K13

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1. Introduction

The literature regarding the economic analysis of tort law and tort damages does not answer the question whether non-pecuniary losses should be included in tort damages unambiguously. From an economic point of view, damages in tort law aim to fulfill the goals of deterrence and loss spreading (see, among many others, Calabresi, 1977, 26ff; Shavell, 2004, 175; Schäfer & Ott, 2005, 125ff; Cooter & Ulen, 2008, 325ff). Whether these goals can be reached depends heavily on the calculation of damages. If the award of damage compensation correctly reflects all the losses inflicted, the tortfeasor may be induced to perform his activities less often and/or more carefully (see e.g. Posner, 1972; Brown, 1973; Shavell, 1980; Shavell, 2004, 242). Moreover, including the losses in damage compensation is crucial as those losses will be subject to spreading between the parties.

In the Law and Economics literature, two approaches toward compensation of nonpecuniary losses are distinguished. According to the *prevention theory*, such losses have to be compensated, because the optimal incentives for the injurer should encompass all losses he may cause, both pecuniary and non-pecuniary. This approach hence focuses on the primary accident costs. The *insurance theory*, on the other hand, focuses on the secondary accident losses and argues that non-pecuniary losses should not be compensated, because a rational victim would not self-insure against such losses. We treat the debate between both theories in more detail in Section 2. Here, we also spend attention to a possible synthesis between both theories, which is mentioned in the economic literature, but which is not further developed there.

In our view, the concept of *Quality Adjusted Life Years* (QALYs) from the domain of Health Economics is well suited to bridge the gap between the prevention theory and the insurance theory. This measure, which we discuss in Section 3, regards the impact of diverging health impairments on the quality of life. A QALY expresses the value of living one year under a certain health condition and is able to convey both severity and duration of a health impairment.

In Section 4 we argue that QALYs can be utilized as a more systematic measure to assess pain and suffering damages than the current legal practice. Hence, QALYs are not only able to solve an, in our view, problematic area in the economic analysis of tort law and the law of damages, but can also offer guidance in a problematic legal area (see Karapanou and Visscher, 2010). We limit our analysis to damages in tort law as a result of personal physical injuries and use the term 'pain and suffering damages' throughout the paper to indicate all immaterial losses which result from the injuries (for example pain, anxiety, loss of enjoyment of life, et cetera).

The way in which non-pecuniary losses are treated and the magnitude of the amounts awarded for their compensation varies considerably between and even within countries (Bovbjerg, Sloan & Blumstein, 1989, 916-917; Magnus, 2001; Rogers, 2001; Markesinis et al., 2005, 16ff). In most countries, courts rely on previous decisions for similar injuries. In others, courts use injury damage tables and in some jurisdictions courts even decide with full discretion. Diverging practices lead to unpredictable and varying damages, which frequently do not reflect the true magnitude of the loss inflicted. Currently there exists no measure for the correctness of the damages since the reliance on previous rulings does not guarantee that those past decisions were correct to start with. A correct assessment of damages would involve not only incorporating all incurred losses in the compensation award but also calculating the damages in a consistent way, taking into consideration objective criteria for the assessment, such as duration and severity in cases of personal injury. Existing legal frameworks cannot adequately evaluate such aspects.

In Section 5 we spend attention to the topic of adaptation (i.e. victims adapting to their injuries and/or disabilities so that they do not suffer a lasting loss of enjoyment of life) and argue that QALYs are able to incorporate this phenomenon.

In Section 6 we provide several examples which show how QALYs can be used for the assessment of pain and suffering damages. Exactly because QALYs incorporate the severity and duration of health impairments, they can serve as an external framework for pain and suffering damages assessment. This way, such damages can be founded on their very basis, being the impact of the personal injury on the quality of life of the victim.

In Section 7 we conclude.

2. Pain and Suffering Damages in the Law and Economics Literature

2.1 The Uneasy Tension between Deterrence and Insurance Theory

In the economic analysis of law, a distinction is made between pecuniary and non-pecuniary losses. In case of a pecuniary loss, the victim loses money or replaceable goods. The damages received by the victim make up for the loss in money or enable him to replace the lost goods. In case of a non-pecuniary loss, non-replaceable 'goods' such as e.g. family portraits, but also health and emotional well-being are lost or damaged (Shavell 1987, 133; Arlen, 2000, 697ff ; Shavell, 2004, 242). The damages received by the victim do no enable him to replace the lost goods. The money yields utility, but it does not mend the immaterial losses.

Cooter and Ulen spend attention to the problem of how courts should assign a money value to nonpecuniary losses. The idea of perfect compensation, meaning that the amount of compensation brings the victim back to the same utility level he had before the accident, is 'the right goal for courts trying to internalize costs, but implementing the goal is difficult for intangible, but real, harms' (Cooter & Ulen, 2008, 328). This is so because it is not possible to observe and measure this subjective loss, and also because the idea of perfect compensation fails in situations where the money received does not make up for the immaterial loss. Cooter and Ulen describe that these problems have resulted in the same court awarding different amounts for victims with identical injuries, and of course also different courts awarding different amounts for identical injuries. This is an issue to which we return in Section 6.

Within Law and Economics, two approaches exist regarding the question whether immaterial losses should be compensated. According to the first, the 'prevention theory', in order to provide the potential injurer with the correct behavioral incentives, he has to compensate both pecuniary and non-pecuniary losses, because both types constitute losses to the victim. If the injurer does not face both types of losses in the expected damages, he does not fully internalize the negative externalities of his behavior, and tort law then cannot reach its preventive goal (Adams, 1989, 213, 214; Ott & Schäfer, 1990, 566; Arlen, 2000, 702; Shavell, 2004, 242; Cooter & Ulen, 2009, 326ff;). The prevention theory hence focuses on Calabresi's primary accident costs and weighs the additional costs of care measures against the resulting decrease in expected accident losses (both pecuniary and non-pecuniary).

The second approach is labeled the 'insurance theory'. Ott and Schäfer discuss the problem that non-pecuniary losses are difficult to assess. Given that these losses do not have a market value, the authors argue that one should determine in an indirect way how many resources should be spent on precautionary measures. A possible way to do this, is to investigate how

much money people are willing to spend on insurance against non-pecuniary losses (Ott & Schäfer, 1990, 566). Compensation should only be provided for losses against which rational individuals would purchase insurance. If they would not buy insurance against immaterial losses, tort law should not force such coverage upon them (Shavell, 1987, 228ff; Adams, 1989, 216, 217; Schäfer & Ott, 1990, 568; Pryor, 1993, 101ff; Shavell, 2004, 269ff).

People want insurance against pecuniary losses because the marginal utility of money is higher in the post accident state where they have less wealth left than in the pre accident state. Insurance allows people to distribute resources across the different states of the world, in such a way that they improve their situation (Croley & Hanson, 1995, 1822). Therefore people are willing to pay an insurance premium in order to receive money after the accident. With non-pecuniary losses, this line of reasoning does not hold. Cook and Graham explain this by using the concept of a *ransom*, i.e. the maximum amount an individual would be willing to pay to exchange the certainty of losing an irreplaceable commodity for the certainty of not losing it. In situations of replaceable commodities and actuarial fair premiums, the individual will fully insure. However, if the commodity is irreplaceable but 'normal' (in the sense that the individual is willing to pay a higher ransom if he has a higher level of wealth), he will not buy full insurance. After all, in such a case the marginal utility of wealth in the state where the individual loses the irreplaceable commodity is lower than the marginal utility of wealth *net of the ransom* in the state where he does not lose it (because the ransom lowers the remaining wealth of the individual). If this wealth effect is sufficiently large, the individual would only buy insurance against the replaceable loss (Cook & Graham, 1977, 146-149). This leads the authors to the conclusion that 'the goal of full compensation to victims of violent crime or accidents that result in injury or death is not compatible with economic efficiency' and that 'full compensation is an inefficient policy for tort settlements that involve irreplaceable commodities' (Cook & Graham, 1977, 151, 155).

Danzon argues that full compensation is only optimal for purely monetary losses. However, for injuries which affect the utility of wealth, optimal compensation is higher if the accident increases the marginal utility of wealth, and lower if it decreases it (Danzon, 1984, 520, 521). Whether or not disability increases or decreases utility of wealth cannot be determined theoretically. Danzon investigates whether people take out full insurance coverage against non-pecuniary losses and whether such losses are included in compulsory public coverage. The results she finds indicate that full coverage for all losses 'far exceeds the coverage people are prepared to pay for given the choice' (Danzon, 1984, 524. Also see Croley & Hanson, 1995, 1801).

Friedman states that the marginal utility of wealth will decrease due to bodily injuries, because such injuries eliminate ways in which the individual can spend his wealth. After all, if the individual now reallocates his wealth to different activities than before the accident, these activities necessarily have a lower marginal utility (otherwise he would have spent more on it already before the accident). Hence, full compensation is inefficient (Friedman, 1982, 82). Empirical research corroborates the idea that injuries reduce the marginal utility of wealth (Viscusi & Evans, 1990).

Summarizing, because non-pecuniary losses do not involve a loss of wealth, marginal utility of wealth does not increase, and likely decreases, after the accident. A rational individual hence is not willing to buy insurance, because paying the premium costs more utility than the insurance coverage yields after the accident. Since the victim is not willing to self-insure against non-pecuniary losses he should not receive compensation for such losses either.

2.2. A Possible Synthesis between Prevention and Insurance Theory

It follows that according to the prevention theory the injurer should be liable for the immaterial losses he has caused, but according to the insurance theory the victim should not receive compensation for these losses. Hence, there exists a tension between both theories, because they lead to different 'optimal amounts' of damages. In the literature, decoupling liability is sometimes suggested as a solution to this problem (see e.g. Arlen, 2000, 706ff). In our view, several lines of reasoning suggest that the tension may not be as strong as suggested above.

Croley & Hanson (1995, 1815) argue that people *do* want to insure against non-pecuniary losses because such losses lower their 'baseline utility'. The authors distinguish between 'baseline-independent' utility and 'baseline-dependent' utility. According to this distinction, the overall well-being of an individual (i.e. his base-line utility) affects the marginal utility of wealth under certain conditions, while it does not under other conditions. They provide a clear example of baseline-dependent utility: in deciding which of two friends to give an opera ticket, the friend who enjoys opera more in principle will derive more utility from the ticket. However, if the other friend has a difficult period in his life, an evening out (whether it is the opera or something else) might give him much utility, given that his baseline is so low. Therefore, it could be that the second friend derives more utility from the ticket, even though the first friend likes opera better. The authors explain that non-pecuniary losses lower the baseline utility of the victim. Under the assumption that individuals may use insurance not only to substitute money with a low marginal utility for money with a high marginal utility, but also to increase the baseline utility in the post-accident state, people would want to take out insurance against non-pecuniary losses after all (Croley & Hanson, 1995, 1827, 1834). However, imperfect information regarding the extent of the non-pecuniary losses, the probability of their occurrence and the compensation needed, countervailing social norms in the form of societal rejection of pricing pain and sorrow and legal restrictions such as the indemnity principle prevent manifestation of demand for such insurance (Croley & Hanson, 1995, 1845ff). The authors also argue that in practice there *is* such insurance available, albeit under different names. They provide the example of first party accident insurance that compensates the insured when he is legally entitled to recover damages from an uninsured, judgment proof motorist. This insurance also covers non-pecuniary losses (Croley & Hanson, 1995, 1862ff).
On the supply side of the insurance market, adverse selection and moral hazard occur due to limited monitoring possibilities regarding non-pecuniary losses. This may prevent insurers to satisfy consumers demand (Bovbjerg, Sloan & Blumstein, 1989, 934).
Pryor (1993, 110ff) argues that the conclusion from the insurance theory that the marginal utility of wealth remains the same or even decreases after suffering non-pecuniary losses is flawed. First, empirical research in this area (such as Viscusi & Evans, 1993) is based on the viewpoint of nondisabled. Given their informational problems and their inability to assess how a disability may transform ones preferences, values, desires, et cetera, Pryor doubts whether they can provide accurate statements about marginal utility of money after a disability. She assesses that these problems will lead to an underestimation of the marginal utility (Pryor, 1993, 116, 117). Furthermore, she argues that although the insurance theory makes the compensation of losses conditional on whether they are pecuniary or non-pecuniary, it does not provide clear guidelines regarding this distinction and thus does not clarify which part of the losses should be compensated and which part not (Pryor, 1993, 125ff).

The above authors all question whether the conclusion from the insurance theory that rational individuals do not want to self-insure against non-pecuniary losses is correct. However, even if one would accept that this conclusion is correct, there may be a solution for the alleged tension between both theories. Several authors mention the following idea: Even if a rational person would not self-insure against non-pecuniary losses, he is still willing to spend resources to avoid such losses, or at least to reduce the probability of suffering such losses (Friedman, 1982, 83 and 85; Danzon, 1984, 526; Bovbjerg, Sloan & Blumstein, 1989, 913; Ott & Schäfer, 1990, 568; Geistfeld, 1995, 779; Arlen, 2000, 703ff; Schäfer & Ott, 2005, 371). These resources form the basis of *ex ante* determined damages which are correct from the prevention and the insurance point of view. They satisfy both goals, because the injurer correctly internalizes the costs the victim would be willing to spend on accident avoidance, while the victim is not 'over-insured' against his will. In principle, every person who is exposed to the risk should receive from the injurer the amount this person was willing to pay to avoid the risk, whether or not the risk has materialized. That way, victims would be indifferent between not running the risk on the one hand and running the risk but receiving the amount they were willing to spend on accident avoidance on the other hand. Victims are then ex ante compensated for the risk they run, and injurers receive adequate care incentives because they pay for the expected harm caused by their activities. However, given that under tort law the injurer can only be held liable if he indeed has caused losses, only those persons for whom the risk actually has materialized can receive damages. By multiplying the amount the victim was willing to pay to avoid the risk by the reciprocal of the accident probability, the same result can be reached: the injurer pays the amount which the victim was willing to spend on accident avoidance. Therefore, according to this line of reasoning, non-pecuniary losses should be compensated on the basis of the resources that the victim would have spent himself on reducing the expected accident losses.

The extensive literature on the 'value of a statistical life' (VSL) investigates how much resources people are willing to spend on reducing the probability of fatal accidents (Sunstein, 2004; Sunstein & Posner, 2005; for a review article see Viscusi & Aldy, 2003). This literature offers a first step in answering the question regarding the correct magnitude of damages both from the prevention and the insurance point of view. The VSL is derived from decisions which people take and which influence health and safety, such as buying a dangerous product or choosing a risky job. Such choices contain an implicit tradeoff between money and safety indicating people's willingness to pay (WTP) to reduce the probability of fatal accidents. On the basis of these tradeoffs, the VSL is estimated. The resulting amounts differ greatly, but according to Sunstein, the VSL in 2004 was set at about $6.1 million (Sunstein, 2004, 205). From this amount, which encompasses both the pecuniary and the non-pecuniary losses, according to Miller 50-75% consists of immaterial losses (Miller, 1989, 893-894). Schäfer and Ott (2005, 373) explain the idea of the VSL as follows: if a victim is willing to spend 1,000 Euro to lower the probability of suffering the non-pecuniary loss with 0.0005, the correct ex ante damages would be two million Euro (also see Geistfeld, 1995, 820ff). Schäfer and Ott base their analysis on fatal accidents and state that compensation for pain and suffering for less severe injuries should be some fraction of the value attached to the willingness to pay to prevent death. They do, however, not suggest how to determine the appropriate fractions, and neither do the other authors.

We argue that the concept of QALYs enables us to extend the idea to non-fatal accidents, because it offers a systematic way to assess immaterial losses in non-fatal accidents. In our view, such a framework is currently missing in the economic approach of immaterial losses. It enables determining the 'fractions' Schäfer and Ott were mentioning, this way providing a

basis for assessing the 'ex ante damages' which could bridge the gap between the prevention theory and the insurance theory.

3. Quality Adjusted Life Years

A QALY is a measure regarding the value of living one year in a certain health condition. This health condition is used as a proxy for the quality of life during that year. QALYs are often used in evaluating different health programs, medical treatments and techniques (Brazier et al., 1999, 3-4; Dolan, 2000; Folland, Goodman & Stano, 2007, 81).

To calculate QALYs, different health conditions have to be established, ranging from perfect health to death and everything in between. Each condition is assigned a QALY-weight, varying from 0.00 (death) to 1.00 (perfect health). Conditions which are regarded as worse than death have a negative value. After QALY-weights for each condition have been established, the QALYs are calculated as the sum of the individual's quality weighted health conditions (q(h)) for the duration (t) these conditions were experienced (Hammitt, 2002, 986-987; Adler, 2006, 2). The lifetime of the individual is divided in time periods during which only one health condition was present. These time periods are indexed by i and the health condition related to that period is denoted as h_i hence:

$$QALYs = \Sigma_i \, q \, (h_i) * t_i.$$

By applying QALYs, one can form an opinion on the relative value of different treatment possibilities. Suppose that for a person with a certain ailment two treatments exist which are equally expensive. Treatment A increases the quality of life with 0.1 for 5 years, treatment B by 0.2 for 3 years. Treatment B is then preferred, because it yields 0.6 QALY (0.2*3) while treatment A 'only' yields 0.5 QALY for the same amount of money.

Different methods exist for trying to establish QALY weights (Nord, 1992, 561ff; Johannesson, Jönsson & Karlsson, 1996, 283-284; Bleichrodt & Johannesson, 1997, 155-157; Brazier at al., 1999, 23ff; Dolan, 2000, 1733ff; U.S. EPA, 2001, 16-17; Hammitt, 2002, 994-996). In some methods, respondents are asked to compare two situations in order to elicit their overall perception of a specific ailment. In the *standard gamble* method, people are asked to choose between living in a certain health condition on the one hand, and undergoing treatment which, with varying possibilities, leads to either perfect health or death on the other hand. The lowest possibility of living in perfect health which the respondents still assess as high enough to undergo the treatment determines the QALY weight of the ailment. Indifference between living with the ailment or undergoing a treatment with a 70% probability of success and a 30% probability of death, results in a QALY weight of the ailment of 0.7.

In the *time trade-off* method, respondents trade off *x* years in perfect health with *y* years with a certain health condition. The ratio *x/y* determines the QALY weight. The more life-years the respondent is willing to forego in order to achieve perfect health, the lower the QALY weight for the health condition involved. If respondents assess 40 years life expectancy with the ailment as equal to 30 years in perfect health, the QALY factor is 0.75.

In the *person trade-off*, respondents are e.g. asked to choose between improving the health or extending life expectancy of *x* people in the first (better) condition and *y* people in the second (worse) condition (U.S. EPA, 2001, 17; Hammitt, 2002, 995). The ratio *x/y* determines the

relative QALY weights of both conditions. If respondents are indifferent between extending life with one year for 20 healthy people and 25 people with a certain health condition, then the QALY-weight of the second health condition is 20/25 = 0.8.

In the *visual analogue scale*, respondents are asked to rank the ailment on a vertical line with concrete endpoints ranging from 0 to 100 where 0 represents death (or the worst imaginable health condition) and 100 represents perfect health (or the best imaginable health condition). The ranking of the ailment yields its QALY weight. For example, an ailment rated with 85 points on the scale has a QALY factor of 0.85.

Other ways used to establish QALY weights are frequently referred to as 'generic' or 'quality of life' measures because they establish a QALY-weight for the quality of life of the health condition involved, taking under consideration both affected and unaffected health aspects. The *EuroQoL EQ-5D* questionnaire (Cheung et al., 2009) differentiates health states using five dimensions: mobility, self care, usual activities, pain/discomfort and anxiety/depression. In the first part of the questionnaire, respondents are asked to mark their health condition on the basis of these five dimensions by indicating whether they have no problems, moderate problems or extreme problems in each dimension. Each of these levels is assigned a weight previously elicited by the visual analogue scale or the time trade off method. In the second part, respondents are asked to rank their health condition on a visual analogue scale thus communicating their overall perception of the ailment. All possible combinations of dimensions and their levels yield 243 different health states to which death and unconsciousness are added. The QALY weight for the health state is calculated from the overall evaluation of the respondent of all health dimensions by adding up the relevant weights and subtracting them from 1.00, i.e. perfect health.

The *Health Utilities Index Mark 3 (HUI3)* (Horsman et al., 2003) uses eight dimensions to classify health states: vision, hearing, speech, ambulation, dexterity, emotion, cognition and pain. Each dimension comprises five or six different levels (speech, emotion and pain have five levels) indicative of a gradual deterioration in that dimension. These levels are assigned a weight previously elicited by standard gamble and visual analogue scale methods. Combining all dimensions and levels, 972,000 health states can be realized in total. Respondents are asked to indicate how much a certain condition affects the various health dimensions. The QALY weight of the health condition is calculated by a multiplicative function which accounts for the overall evaluation of the respondent of all health dimensions. The HUI3 is the most recently developed Health Utilities Index. Previous versions are the HUI and HUI2.

Other generic measures to elicit QALY weights are the 'Quality of Well Being Scale', the 'SF-36', the '15D' and the 'Rosser disability/distress scale'. However, so far the EQ-5D and the HUI3 are regarded as better measures for the QALY weight elicitation (Brazier et al., 1999).

The different methods lead to different results, among others due to the type of questions being asked and the comparison being made (with death, perfect health or with another ailment). Moreover, the cognitive tasks that the methods require the respondents to undertake may be difficult to understand and perform. Furthermore it is relevant whether the questions are asked to people who actually have the ailment or not, to doctors or other health specialists. If people with the ailment are regarded as more competent for the elicitation of QALY weights, the question then becomes when to ask them. People can adapt to their life circumstances (see Section 5 for a more detailed discussion of this issue) so that an evaluation of the health condition shortly after it is incurred may differ from a later evaluation (Dolan, 2000, 1738-1739; Bagenstos & Schlanger, 2007, 763-765). Hence,

additional research is still needed and refinement of methods is necessary to acquire more uniform QALY weights for the different health conditions.
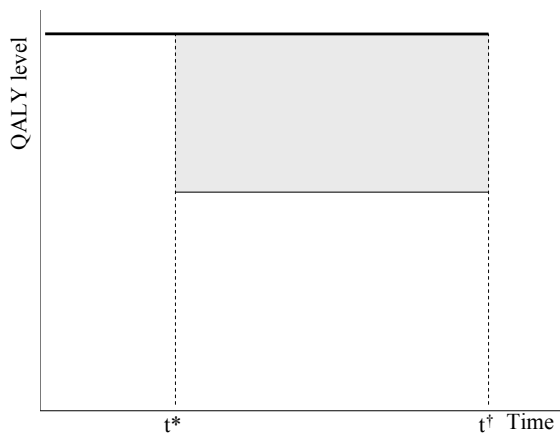

4. Pain and Suffering Damages Based on QALYs

The approach suggested by Schäfer and Ott lacks a coherent framework to assess the correct ex ante compensation for immaterial losses due to non-fatal injuries. In our view, QALYs exactly offer such a framework. Even with the existing abovementioned restrictions, we think it is better to base the damages for deteriorations in health conditions on the results of this specialized research than on the amounts that courts have awarded in the past.

QALY research provides information about the average QALY losses due to certain health impairments. Combining this information with the (expected) duration of impairments resulting from non-fatal accidents enables a relative ranking of non-pecuniary losses. This idea can be illustrated by the use of the following graphs. On the horizontal axis, time is depicted, which is limited by the normal life expectancy ($t^\dagger$) of the victim who has suffered non-pecuniary losses. At time t* the accident takes place. The vertical axis represents the QALY-level of the victim. The bold line indicates the QALY level of the victim without the accident in which he has suffered the non-pecuniary losses, while the fine line indicates the QALY level after the accident has occurred. The vertical distance between both lines represents the seriousness of the injury. The shaded area reflects the total loss of quality in life, which pain and suffering damages seek to prevent and compensate.
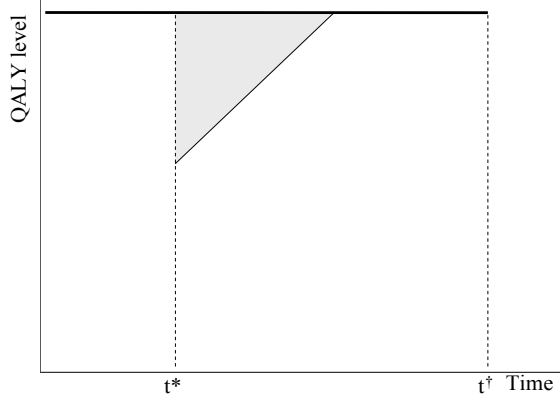
Graph 4.1 reflects a lasting injury, which does not affect the life expectancy of the victim, such as for instance scar tissue and remaining pain:
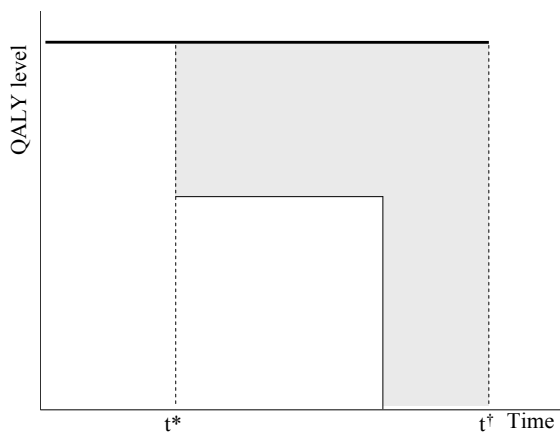
Graph 4.1

Different than depicted in graph 4.1, some injuries do not last but heal in a finite amount of time. Assume that during the healing process, the loss of quality of life gradually decreases, the result would be something like this:

Graph 4.2

QALY level

t*   t† Time

It is also possible that some injuries do not only affect the QALY level of the victim, but also his remaining life expectancy, for example because the victim becomes more susceptible to infections. Graph 4.3 illustrates this situation:

Graph 4.3

QALY level

t*   t† Time

Of course, many more situations exist, such as injuries which partly heal over time, but where the victim does not reach his pre-accident QALY level anymore. Furthermore, it would be possible to incorporate the idea that health decreases with age, by not using horizontal lines as in the above graphs, but by using downward sloping lines. If health decreases quicker as a result of the injury, the slope of the fine line would be steeper than that of the bold line. The best depiction of a given situation depends, of course, on the type of injury, but also on the information that is available in health economics literature regarding the impact of such injuries on the quality of life.

For the purpose of our paper, such refinements are not necessary to carry across the main idea: the concept of QALYs enables to capture the essence of what pain and suffering damages seek to express: the immaterial losses (hence, the reduction in the quality of life) which are caused by personal injuries. In all the above-described situations and corresponding graphs, the shaded areas provide the graphical representation of this loss.

In order to be able to put a money value on this loss, one does not only need to know the decrease in QALYs caused by the injury, but one also needs to monetize the QALY. This enables providing a rational and systematic basis for the assessment of pain and suffering

damages in personal injury cases (Johannesson & Weinstein, 1993, 466; Bleichrodt & Quiggin, 1999, 683ff; Dolan & Edlin, 2002, 828; Klose, 2003).

Two basic approaches have been followed so far to attach a monetary value to a QALY. The first compares the costs of QALY-generating treatments and medical interventions that are implemented within a fixed health care budget (Phelps & Mushlin, 1991, 18; Johannesson & Weinstein, 1993, 466-467; Brazier et al., 2007, 276-277). The cost per QALY gain of the last treatment/intervention to be funded yields a potential money value for a QALY. This cost per QALY is used as a threshold; QALY gains that are produced by more expensive medical interventions are considered not to be worth the costs. A recent overview of literature which attaches a money value to a QALY (Kenkel, 2006, 421) indicates that authors looking for the limits below/above which an additional QALY is worth/not worth its costs arrive at an upper limit of about €174,000.[1] The so-called kidney dialysis value which is based on the consideration that kidney dialysis is a treatment which is (more than) worth its costs, poses a limit of about €80,500 to €103,500 for one QALY. The National Institute for Clinical Excellence in the UK uses a lower limit of £20,000 - £40,000 (about €24,500 - €49,000, which in the literature is generally regarded as too low (Pomp, Brouwer & Rutten, 2007, 37).[2]

The second approach that has been followed to attach a monetary value to a QALY involves estimating people's WTP for a QALY gain (Johannesson & Meltzer, 1998, 4-6). One way to achieve this is by eliciting people's WTP for marginal gains in QALY (Robinson, 2010). If for instance an individual is willing to pay €5,000 for a treatment that improves his health by 0.05 QALYs, then the value of one QALY for the individual is €100,000. This method, among others, has been applied by a European project under the name 'European Value of a Quality Adjusted Life Year' which aims to determine a monetary value of a QALY for ten countries over the period 2007-2010.[3] The alternative way used to derive a value for a QALY is by utilizing the existing WTP values readily found in VSL literature (Johannesson & Meltzer, 1998, 5; Hirth et al., 2000, 335; Kenkel, 2006, 427). In an overview of 2000 where QALY values are based on VSL-research, an amount of about €289,500 is mentioned as a median value of the different estimates while 28 out of the 35 estimates exceed €109,000 for a QALY (Hirth et al., 2000, 338-340).

For our purpose of providing a basis for assessing the correct ex ante compensation for immaterial losses, only the QALY values derived with the second monetization approach are relevant. By using the amounts people are willing to spend for a QALY, we can arrive to the value of 'ex ante damages' which could bridge the gap between the prevention theory and the insurance theory.

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[1] The amounts in this section have been calculated by first expressing the amounts from the original American publications in dollars from 2010 (see http://www.bls.gov/data/inflation_calculator.htm). Subsequently we have expressed them in Euros (and rounded them off) on the basis of the 2009 Purchasing Power Parity (PPP) of the Euro area as published by the OECD: 0.803 (see http://www.oecd.org/dataoecd/61/54/18598754.pdf). We are aware that there are differences between the PPP of the countries within the Euro area. We leave the question whether pain and suffering damages should be harmonized within the European Union or if the amounts should differ per country untreated in our paper, in order to be able to focus on the relevance of insights from Health Economics. Applying the PPP for the Euro area avoids having to list separate amounts for all Member States. The results of our calculations differ from those in Karapanou & Visscher 2010, because those results are based on earlier years.

[2] NICE has been using the same range of £20,000 - £30,000 as the acceptable cost per QALY for many years. (http://www.nice.org.uk/newsroom/features/measuringeffectivenessandcosteffectivenesstheqaly.jsp). This low threshold however is not implemented strictly and recent literature (Devlin & Parkin, 2004, 437,449) shows that in practice the upper threshold limit is higher, at approximately £40,000. We therefore use the range of £20,000-£40,000.

[3] http://research.ncl.ac.uk/eurovaq.

We use the QALY-weights provided by Health Economics literature and apply a conservative estimate of €50,000 for a QALY to assess the pain and suffering damages for specific health conditions. We chose to apply this conservative estimate of €50,000 per QALY and a relatively high discount factor of 4% when calculating the present value (Chan & Chan, 2003, 17; Weir et al., 2008) to avoid overestimating non-pecuniary losses and to account for people's ability to adapt to new circumstances as well as the possible decreasing effect of age on QALY losses (for the latter effect, see e.g. Van Praag and Ferrer-i-Carbonell, 2001). In Section 6, we compare these amounts to actual amounts awarded in several European countries for these health conditions resulting from personal injuries as a brief illustration of how QALYs could be utilized (also see Karapanou & Visscher, 2010).

5. QALYs and Adaptation

A question which has attracted a lot of attention in recent (mainly American) literature is whether pain and suffering damages should incorporate the fact that people are able to adapt to new situations, also if that new situation implies having to live with permanent injuries and/or disabilities. For example, Sunstein has argued that especially 'hedonic damages' (damages which seek to compensate for the loss of enjoyment of life) currently are often too high, because they do not incorporate adaptation by the victims. He explains that compensation for hedonic losses 'is meant to capture the utility or (subjective) welfare losses produced by some adverse event' (Sunstein, 2008, 160. Also see Bagenstos and Schlanger, 2007, 748). Sunstein refers to publications which suggest that e.g. paraplegics are almost as happy as other people. The same holds for young people who have lost a limb due to cancer, moderately disabled people, kidney dialysis patients, and colostomy patients (Sunstein, 2008, 165, 166. Also see Ubel and Loewenstein, 2008, 198 ff). If healthy people are asked to assess the impact of certain adverse conditions on their level of happiness, they generally do not consider this adaptation and therefore assess this impact on happiness much larger than actual patients or victims report it to be (also Bagenstos and Schlanger, 2007, 769 ff). Given that hedonic damages are awarded by judges or juries, this 'adaptation neglect' results in higher damages than would be required to reflect the actual impact of the injury on enjoyment of life. Of course, in situations where people do not adapt (e.g. because they have chronic pain), the problem of excessive hedonic damages does not exist.

To be sure, Sunstein does not argue that in situations where adaptation occurs, the victim should receive (almost) no damages at all. After all, even if there is no or only little hedonic loss, the victim who for instance became paralyzed, has lost a 'capability' for which he should receive damages: 'when people have lost a capability, they have lost something significant from the normative point of view, even if they have suffered no hedonic loss' (Sunstein, 2008, 178. Also see Ubel and Loewenstein, 2008, 206 ff).

The question whether or not to include adaptation is relevant in the area of health economics as well, because it affects the outcome of cost-effectiveness analyses regarding the value of medical interventions. Menzel et al analyze moral arguments in favor of and against including adaptation into the analysis and they distinguish eight elements of adaptation (Menzel et al, 2002, 2151, 2152): People may adapt because of cognitive denial of their functional health state, over time they may not realize anymore what full health was like, they may lower their expectations in life, they might find that to be happy they do not have to come as close to reaching their goals as they previously thought, they may enhance their skills in the capacities that are left, they may adjust their activities to their possibilities, they may change their goals and they may change their conception of what 'healthy' actually

means. The first three elements have a negative connotation and the fourth can be regarded as positive or negative. The authors doubt if the negative arguments should play a role in cost-effectiveness analyses. The same doubt may hold for including this type of adaptation in the assessment of pain and suffering damages: if the victim e.g. lowers his expectation in life and over time forgets how it was to be fully healthy, should the injurer benefit from this adaptation through lower damages?

It is not our intention to go into detail into the discussion regarding whether or not to include adaptation in pain and suffering damages, because that warrants a separate paper and goes beyond the scope of the current paper (see e.g. Bagenstos and Schlanger, 2007, 750 and the literature mentioned there). We do think that many of the possible arguments against including adaptation lose much of their relevance if 'loss of capabilities' is regarded as a form of compensable losses. After all, even if a victim would adapt instantaneously to his new situation, he would then still receive damages for the loss of capabilities. For the current paper we will therefore accept the line of reasoning that *if* a patient adapts to his post-accident life so that he does not suffer a lasting loss of enjoyment of life, he should not receive damages to express such a (non-existing) lasting loss of enjoyment of life. After all, pain and suffering damages should reflect the loss in quality of life due to the injuries. If the level of enjoyment of life of victims after a while increases due to adaptation, this affects his quality of life. However, irrespective of the enjoyment of life, the impact of the injuries on the capabilities of the victim likewise affects his quality of life. Hence, both adaptation and loss of capabilities are relevant.

In our view, QALYs are able to encompass both issues. First, as already explained in Section 3 above, QALY weights can be assessed by asking 'the general public' about their view on how certain injuries and/or disabilities would influence their quality of life, but one could also ask 'real patients'. By using the responses of patients and by asking their opinion not too soon (e.g. at least a year) after the injury, adaptation can be taken into account. After all, if a victim has adapted to the new situation, this will be reflected in his own assessment of his current situation. At the same time, if the loss of capabilities would affect the quality of life of the victim, this would also show from his answers.

The above is especially clear if 'generic' or 'quality of life' measures are used to elicit QALY values (Brazier et al, 2007, 114). For example the HUI3 includes questions regarding 'emotion' (possible responses: happy and interested in life; somewhat happy; somewhat unhappy; very unhappy; so unhappy that life is not worthwhile), but also regarding vision, hearing, speech, ambulation, dexterity and cognition. An adapted paralyzed victim therefore may indicate that he is 'happy' or 'somewhat happy' while at the same time for ambulation he may answer that he 'cannot walk at all'. An adapted victim who has lost a leg likewise may be 'happy' or 'somewhat happy', while for ambulation he may be 'able to walk around the neighbourhood with walking equipment, but without the help of another person', or 'able to walk only short distances with walking equipment, and requires a wheelchair to get around the neighbourhood'. The combination of answers to *all* questions in the HUI3 determines the QALY-weight for the specific injury.

The phenomenon that pain may impede adaptation (as also mentioned in Sunstein 2008) will also be reflected in the use of QALYs, again especially when using quality of life measures. Pain will likely affect the level of happiness as reported by the patient. In addition, in some quality of life measures such as the EQ-5D, the HUI2 and the HUI3 'pain' is a separate rubric. The overall quality of life of a victim which reports to be free of pain and discomfort will be higher than that of a victim which reports e.g. 'moderate to severe pain that prevents some activities' or ' severe pain that prevents most activities'.

Sunstein (2008, 170 ff.) also argues that the so-called 'focusing illusion' will lead to too high estimates for hedonic losses. This problem occurs because if e.g. judge or juries focus on a loss, they do not realize that the actual victims do not focus on their loss during everyday life. The use of QALYs may suffer from this same problem, if during the research the attention is indeed focused on the particular injury. However, especially the use of quality of life measures may limit this problem, because a respondent is answering questions on many different issues, some of which will not be related to his injury at all. For example, for a victim with an amputated arm, the questions in the HUI3 on vision, hearing, speech, ambulation and cognition are not relevant at all, while those on dexterity, emotion and pain may be. Still, the respondent answers *all* questions. It is am empirical matter (of which we have no data) whether the focusing illusion can be avoided in this way. We do believe that even if the illusion is not fully avoided, it will be less severe than when courts or juries have to try to assess what an appropriate amount of pain and suffering damages would be. After all, they would then have to focus their attention on the specific injuries of the victim in this case. Because they themselves are not the ones suffering from the injuries, they have no good way of evaluating the impact of the injuries in everyday life. The patients/victims who filled out the HUI3 will be better able to do so.

In conclusion, we believe that QALYs are able to incorporate possible adaptation, if the QALY-values are derived by inquiries of actual patients/victims e.g. at least a year after they have suffered their loss. The responses will be affected by whether or not adaptation has taken place and if yes, to what extent. Also loss of capabilities will be reflected in the results. The quality of life measures explicitly distinguish between factors relating to emotion and to capabilities. Also if a more simple approach such as a standard gamble or a visual analogue scale would be used, the patient/victim in his response would include all factors relevant to him (be they more happiness-related or more capabilities-related). The focusing illusion may also be overcome by the use of QALYs but even if it is not, it probably will be less problematic than if the court or jury have to assess what an appropriate amount of pain and suffering damages would be.

6. Legal and Economic Standards Compared

In this section, we illustrate the approach we propose by three concrete examples and we compare the resulting pain and suffering damages with the amounts which were actually awarded in several European countries.

6.1 Amputation of foot and lower extremities

In the Netherlands, a 31 year old motor driver whose lower leg was amputated received about €56,000 in a settlement, whereas a 54 year old woman whose leg was amputated just above the knee received €45,000 (Jansen, 2006, 43). In Germany a young woman was awarded €40,000 for amputation of her forefoot (Jaeger & Luckey, 2008, 776). In Greece, €150,000 was awarded to a 27 year old man after a car accident which resulted to the amputation of his leg right under the knee.[4] In another case, a minor received €170,000 in pain and suffering

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[4] Drama Court of First Instance 124/2004.

damages for amputation just below the knee.[5] A 32 year old man who was involved in a work related accident and had his lower leg amputated, received €58,700.[6] In Italy, a man received €135,000 in pain and suffering damages for amputation of his foot.[7]

In Health Economics literature regarding foot ulcers, relevant information on the impact of a foot amputation on the quality of life can be found. Increasing preventive efforts in diabetic patients can lower the probability of foot ulcers and amputations, and the research investigates whether these benefits are worth the costs (see e.g. Ragnarson Tellvall and Apelqvist, 2001, 2077). According to a study from 2000, there are differences in QALY values of people with ongoing foot ulcers, after primary healing of a foot ulcer, after healing with minor amputation and after healing with major amputation. In the study, patients suffering from these conditions provide information on their quality of life based on the EQ-5D questionnaire. The difference in QALY value between diabetes patients after primary healing of a foot ulcer and diabetes patients who have healed with major amputation is 0.29 (Ragnarson Tellvall and Apelqvist, 2000, 238). This QALY-weight indicates the net effect of amputation to the quality of life of the patients. The QALY-research was executed by sending a questionnaire to patients who had been treated for foot ulcers in the previous four years. This implies that any adaptation by patients whose treatment took place a while ago is included, but that for the most recent patients, adaptation might not (yet) have taken place. Applying the QALY-weight of 0.29 and a monetary value of €50,000 per QALY, with an average life expectancy of 78 years in the Dutch case involving a 54 year old victim, the total loss in QALYs would result in a present value of pain and suffering damages of about €235,000.[8]

6.2 Vertebral fracture / Spinal injury

In the Netherlands, according to case law, pain and suffering damages for a vertebral fracture amount to approximately €30,000- €40,000. In Germany, €12,500 was awarded to a 30 year old man who suffered a vertebral fracture which resulted in a displacement of his spinal canal, whereas pain and suffering damages of €20,000 were awarded to a 65 year old woman for a vertebral fracture which resulted in a restriction of the spinal canal (Hacks, Ring & Böhm, 2009, 329, 391). In another case, a 19 year old received €30,000 as well as a monthly allowance of €100 for pain and suffering damages due to a multiple vertebral fracture (Hacks, Ring & Böhm, 2009, 598).

Vertebral fractures are common injuries. They usually cause temporary disability while their most serious complication is spinal cord injury, which can result in paralysis. There is extensive literature in Health Economics in which the costs and quality of life reduction for osteoporosis related fractures is estimated. In a study from 2006, the decrease in quality of life due to a vertebral fracture is assessed at 0.20 (Ström et al., 2008, 276). This QALY-weight is elicited from patients using the generic measure EQ-5D 24 months after the fracture occurred. When patients were asked only four months after the injury, the reported decrease was 0.26. This difference in our view may reflect adaptation by the patients. For a person with a remaining life expectancy of 49 years (such as the 30 year old from the German case)

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[5] Thessaloniki Court of Appeal 2601/2006, *Armenopoulos* 2007, p. 1921.
[6] Areios Pagos (Supreme Court) 961/2007.
[7] Corte di Cassazione (Highest Court of Appeal) n. 25751.
[8] The net present value of 25 annual payments of €14,500 (0.29 * €50.000), applying a discount factor of 4%, equals €235,580.

who suffers a vertebral fracture with remaining health problems, pain and suffering damages would amount to about €222,000.[9]

6.3 Deafness

The highest amounts awarded in the Netherlands for severe deafness to both ears to a child aged 5 and a baby were about €42,000 and €62,000 respectively (Jansen 2006, 81). In Germany, a 15 year old student received €25,000 as well as a monthly allowance of €50 for severe deafness to both ears (Hacks, Ring & Böhm, 2009, 596).

There is extensive cost-effectiveness research regarding cochlear implants, which are hearing devices implanted in the inner ear, as opposed to the more traditional acoustic hearing devices. In a research from 2002, it is investigated to what extent cochlear implantation improves the quality of life in older adults (Francis et al., 2002). Patients who have experienced deafness for a duration ranging from 1 to 69 years indicate how they perceive their health condition before and after the cochlear implantation using the HUI3 generic measure. The difference in QALY values between these health conditions can be used to express the decrease in quality of life due to deafness. Given that the patients responding to HUI3 have experienced deafness for more than one year, we believe that the QALY-weights incorporate adaptation. According to the research, the decrease in quality of life due to deafness is 0.24 QALYs (Francis et al., 2002, 1484). Applying the estimate of €50,000 for a QALY for a person with a remaining life expectancy of about 64 years (such as the 15 year old student in the German case), pain and suffering damages for deafness would amount to about €286,000.[10]

7. Conclusion

In our view, the Law and Economics argument that non-pecuniary losses should not be compensated because a rational victim is not willing to self-insure against such losses neglects the fact that people are willing to spend resources on reducing the probability of suffering such losses. Ex ante damages are an expression of this willingness to pay. In the Law and Economics literature, the Value of a Statistical Life is used as an example of such damages, but this literature does not offer a way with which ex ante damages for non-fatal accidents can be assessed. We think that QALYs offer this systematic framework for assessing pain and suffering damages. They thereby provide a synthesis between the deterrence theory and the insurance theory and enable calculation of ex ante pain and suffering damages for non-fatal accidents.

There are still unresolved issues such as discussion over the monetary value of QALYs and the methods to assess the relative weights of different health impairments. Furthermore, QALYs are not developed to determine the magnitude of damages, even though in our view they can be used for this task. Because of these unresolved issues we use a very conservative monetary value of QALY, to avoid overstressing the impact of Health Economics insights and subsequently overestimating damages.

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[9] The net present value of 49 annual payments of €10,000 (0.2 * €50,000), applying a discount factor of 4% equals €221,951.
[10] The net present value of 64 annual payments of €12,000 (0.24 * €50,000), applying a discount factor of 4% equals €286,647.

Even with such a low estimate, these insights suggest that pain and suffering damages should be substantially increased. We believe that information about the quality of life derived by specialized research forms a better basis to determine pain and suffering damages than the amounts previously granted by courts. QALYs are therefore able to improve the legal approach to pain and suffering damages for personal injuries, as well as the way in which Law and Economics handles such non-pecuniary losses.

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