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# Priorities and Prospect Theory

## by Michael Happich

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**Hintergrund.** Man ist sich weitgehend einig, dass eine Priorisierung im Gesundheitswesen notwendig ist, will man eine Finanzierungskrise verhindern. Die Kriterien dafür festzulegen, ist bedeutend schwieriger. Diskussionen kreisen immer wieder um die grundlegenden Annahmen, wie Entscheidungen getroffen werden. Da man gezwungen ist, Verhaltensaxiome festzulegen, sind darauf aufbauende, präferenz-basierte Methoden zur Evaluation von Gesundheitszuständen nicht so weit verbreitet, wie es denkbar wäre. Tatsächlich lässt sich zeigen, dass derart erzielte Ergebnisse verzerrt sind durch Phänomene, die von Kahneman und Tversky 1979 in der sogenannten „Prospect Theory" zusammengefasst wurden. Diese Verzerrungen werden deutlich im Vergleich von Evaluationen betroffener und nicht-betroffener Personen. Auf der anderen Seite bietet diese Theorie die Möglichkeit, Ergebnisse entsprechend zu korrigieren.

**Methoden.** 210 Tinnitus Patienten wurden gebeten, ihren Gesundheitszustand entsprechend der Standard Gamble und der Time Tradeoff Methode zu beurteilen. Darüber hinaus sollten sie angeben, ob sie sich einer Operation oder Behandlung unterziehen würden, die ihre Situation deutlich verbessern, aber auch deutlich verschlechtern könnte, beides mit gleicher Wahrscheinlichkeit. Ihre Angaben sind verglichen worden mit Einschätzungen 210, von ständigen Ohrgeräuschen Nicht-Betroffener. Beide Gruppen waren ähnlich in der Zusammensetzung nach Geschlecht, Alter, Familienstand, beruflichem Status und Ausbildungsstand, um Verzerrungen durch demografische Einflüsse vorzubeugen. Die Gruppenmittelwerte wurden auf Gleichheit getestet. Es wurde der nicht-parametrische Mann-Withney-U-Test für zwei unabhängige Gruppen verwendet. Das gleiche ist mit den Mittelwerten der beiden Gruppen in denselben Risikoklassen geschehen. Korrelationen zwischen Risikoeinstellung und Evaluationen sind mit dem nicht-parametrischen Spearman's Rho getestet worden.

**Ergebnisse.** Der Vergleich zeigt signifikante Differenzen zwischen beiden Gruppen. Evaluationen der Tinnitus Patienten fallen deutlich höher aus, als die der Nicht-Betroffenen. Gleichzeitig sind die Patienten weniger risikofreudig als die nicht-betroffene Gruppe. Es gibt eine starke Korrelation zwischen Einschätzungen und Risikoeinstellung. Das stimmt mit Vorhersagen der Prospect Theory überein. Auf der anderen Seite schätzen diejenigen beider Gruppen, die dieselbe Einstellung zu Risiken haben, Tinnitus nicht signifikant verschieden ein.

**Schlussfolgerung.** Wenn gerade das letzte Resultat auf andere Krankheiten übertragbar ist, scheint die Frage gelöst, wer bei der Evaluation von Gesundheitszuständen befragt werden soll. Es ist möglich, Nicht-Betroffene die Einschätzung vornehmen zu lassen. Diese Bewertungen werden anschließend mit der Risikoeinstellung von Betroffenen gewichtet. Die damit ermittelte durchschnittliche Bewertung entsprechend ziemlich gut dem Durchschnitt Betroffener.

**Background.** Most would agree that priority setting is necessary to avoid a financial collapse in the health sector. It is much harder to find criteria how to do it. Discussions lead straight to the principles of decision making. But since all theories depend on assumptions given to make them work, debates on the assumption side are open for any kind of critic. This might be a reason why prefernce-based methods for evaluations of different health states are not as common and popular as they could be. Indeed, it can be shown that results derived by such methods are severly biased by phenomenons which are summarized in a so-called „Prospect Theory“. These biases are quite obvious if one compares data of affected and unaffected people. But this theory offers, as well, a way to get results more accurate.

**Methods.** 210 Tinnitus patient were asked to evaluate their own health state according to the Standard Gamble and the Time Tradeoff method and to state whether they would let an operation or treatment be done that could either improve or deteriorate their condition considerbly - both with an equal chance. These scores have been compared to evaluations of 210 people not affected by permanent ear noises. Both groups were similar in age, sex, marital status, employment status and education to avoid biases by demographic factors. The sample means have been tested for differences by a two-tailed non-parametric test (Mann-Withney-U-Test) for independent groups. The same has been applied for sample means in either groups with the same risk posture. Correlations between risk attitudes and evaluations have been tested with the non-parametric Spearman’s Rho.

**Results.** Comparison demonstrates a significant difference between both groups. Scores of Tinnitus patients are considerbly higher than scores of their unaffected counterparts. At the same time Tinnitus patients are less risk seeking than those without the condition. There is a strong correlation between evaluation of health states and risk posture. These results are in accordance with Prospect Theory. On the other hand, sample means of either group with the same risk posture showed no or insignificant differences.

**Conclusion.** If these results are valid not only for Tinnitus but for most other illnesses, the question who to ask for health evaluations, seems to be resolved. It is possible to let unaffected people rate certain health conditions and weight them according to risk attitudes of affected ones. The overall sample mean of unaffected will be pretty close to patients‘ who have experienced that condition.

# Introduction.

Our society is less and less able to afford every health-related intervention presently available at the marketplace. However, just the notion of efficacy was often left to anecdote.[1] But with rising financial pressure on health systems, concentration on necessary or efficient health provision is worth discussing. Since you cannot have the best of all worlds, proposals in the health domain focus on optimizing one or two parts under minimum restrictions of the third. Key words are budget constrains or minimum standards. The economic way to do it is cost-utility or **cost-effectiveness** analysis.[2] Quite easily what do we get for the money we pay or better, what are the most efficient methods for creating health? Of course, resource allocation decisions can never entirely rely on the mechanical ranking of cost-effectiveness ratios.[3] These ratios just carry one type of information or „value", health benefit per dollar spent. Nevertheless, a crucial element is the evaluation of **health state utilities** because they determine one side of the cost-effectiveness ratio in a preference-based framework. But current decision rules are probably inadequate to guide choices toward those interventions our population benefits most from.

Much debate exists about who's utilities should count. Who is going to decide what medical intervention is really needed? Gold et al. recommend that „Community preferences for health states are the most appropriate ones for use in a Reference Case analysis."[4] Kaplan supports them: „..., preferences should represent the will of the general public, ..." [5]

Intuitively, one might expect that people affected by a certain health condition are much better prepared to judge how it is to suffer that illness. Therefore, to demand just the opposite, needs some clarification: Gold et al. point to the „veil of ignorance"

[1] McGinnes in Gold et al. (1996), „Foreword".
[2] Schöffski, „Einführung" in Schöffski et al. (1998).
[3] Gold et al. (1996), „Introduction".
[4] Gold et al., „Identifying and Valuing Outcomes" in Gold et al. (1996), p. 122.
[5] Kaplan, „Utility Assessment for Estimating Quality-Adjusted-Life-Years." in Sloan (1995), p.50.

saying that aggregating the utilities of the rational public which is blind to its own self-interest, is most appropriate.[6] This is open to much debate since it assumes utility maximizing behaviour among affected people in answers to health state evaluations.

Another argument is that it doesn't really matter whether to ask affected or unaffected people as soon as you explain any illness properly enough. That is a question about stable utilities.[7] Does personal experience with a particular health state change evaluations or is just the information about it enough to judge? If experience can be substituted by information, every rational decision maker can base her judgement simply on the knowledge about a health condition. If health-related utility functions of affected and unaffected people are similar, as is expected by proponents of this argument, than both groups should come to similar average evaluations of health states.

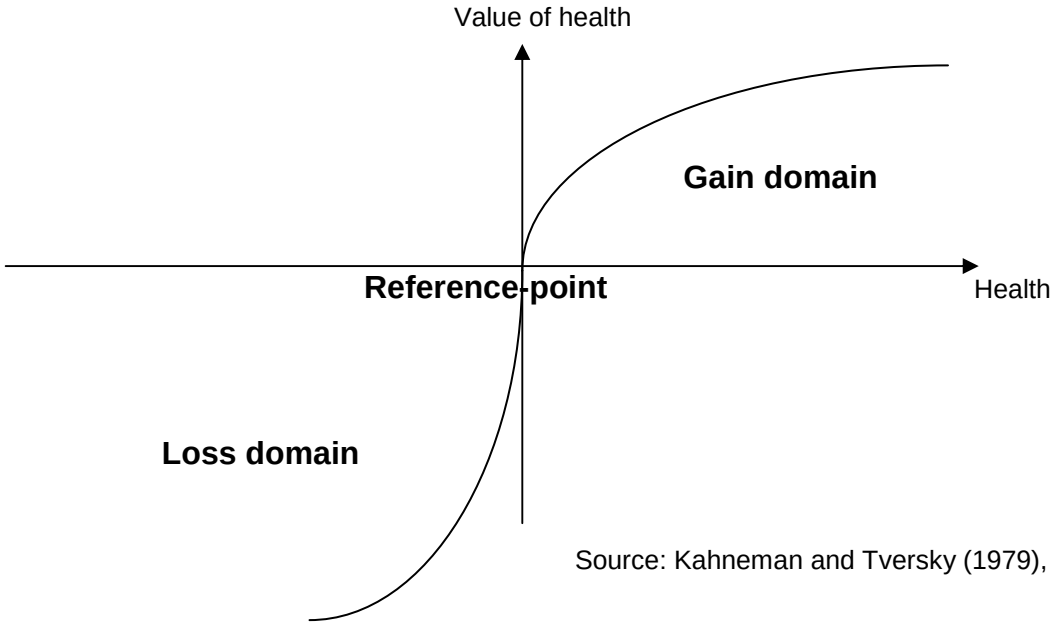
Some papers, indeed, point in this direction.[8] But even if there exist some deviations, they bias mostly in favour of the affected group[9] meaning that unaffected people assume a certain health condition to be more serious than the affected group would do. Illness experience does matter under such circumstances. From a certain illness-focused perspective, this is just fine. Ethically speaking, peolpe in need get enough and more support as long as there is enough money in the health care system.

From a broader point of view, take the whole society for example, such deviations are crucial for **priority setting**. They can influence the ordinal ranking of priorised treatments in league-tables and, hence, decide whether one or the other health condition is more supported by society. These deviations can be contributed to the impact of Prospect Theory.[10]

[6] Gold et al., „Identifying and Valuing Outcomes" in Gold et al. (1996), p. 100.
[7] Llewellyn-Thomas (1993).
[8] Llewellyn-Thomas et al. (1984), Balaban (1986), Llewellyn-Thomas (1993).
[9] Rosser (1978), Sackett and Torrance (1978), Lenert et al. (1999).

## Prospect Theory

In opposition to normative theories of decision, the descriptive Prospect Theory assumes individual reference levels to exist that will severly influence health state evaluations. Take the inividual health state as the status quo representing the **reference level**, then the reason for deviations are threefold: First, depending on the reference level, a decision maker will code improvements in health as gains and deteriorations as losses – that should not surprise. But second, value functions in the gain domain are concave whereas convex in the loss domain. Third, the convex part is steeper than the concave part.[11] (See the figure 1.) Hence, the overall utility function of an unaffected person will be more convex than affected ones who have much more to gain.

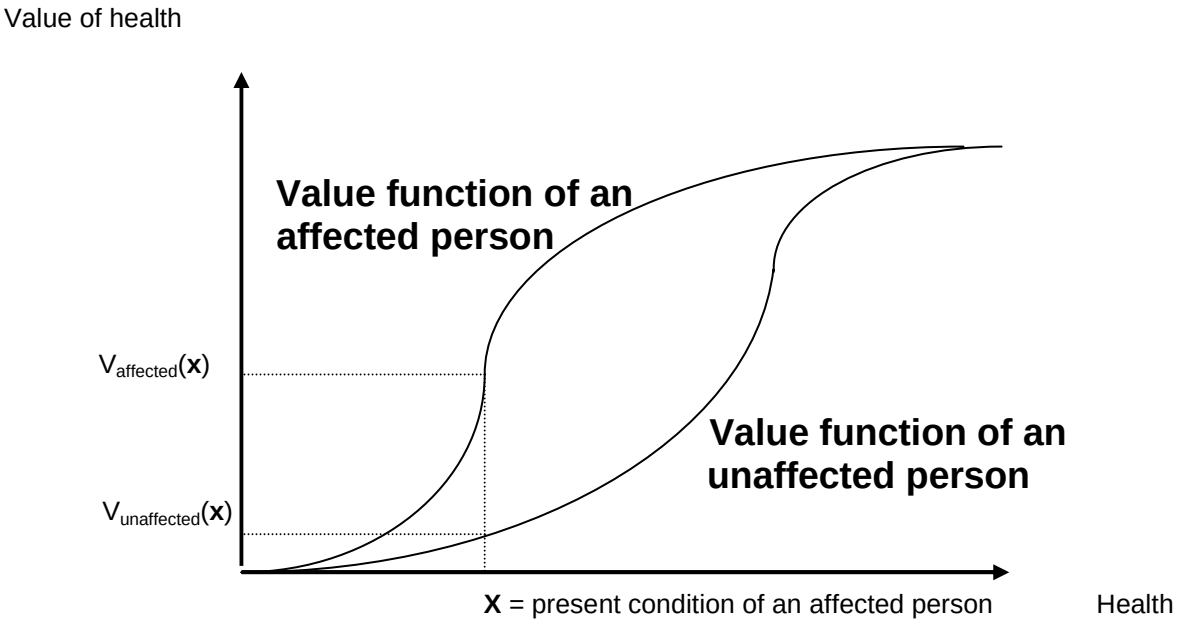



Source: Kahneman and Tversky (1979), p.280.

**Figure 1**: **Value function according to Prospect Theory**. Main characteristics: 1) Health is evaluated in relation to a reference point. 2) This reference point divides the evaluation space in a gain domain and a loss domain. 3) The value function is concave in the gain domain whereas convex in the loss domain. 4) The loss function is steeper than the gain function.

[10] Kahnemann and Tversky (1979).

This might explain different perceptions of the same health condition. Healthy people should judge a condition much more severly as shown in the next figure 2.




Source: Lenert et al. (1999), p. 481.

**Figure 2. Impact of Prospect Theory on Evaluations**: Affected and unaffected people have a different perceptions of the same health state because they have different reference points. The point of reference for an affected person lies lower (and more to the left) than for an unaffected person. The characteristics of Prospect Theory lead to the typical depicted value curves. Hence, the valuation of a health condition X is different.

Lenert et al. have already discussed this solution and tried to gather evidence in favour of the Prospect Theory.[12] The prove went only half way through. They mentioned similar sources of evidence as in the general debate of whose preferences are to use and found the same mixed results. The only point they considered as something of a prove was a decrement in ratings of the general public compared to those of affected persons. What they did not consider is the relative curvature of utility functions.

[11] Kahnemann and Tversky (1979), p. 280.

This study, on the one side, wants to further support those health economists who assume deviations in health evaluations. On the other side, we will analyse the crucial role of **risk attitudes** in determining health values since, economically speaking, relativ curvatures of utility functions are interpreted as risk posture. Convex curves exhibit risk seeking behaviour whereas concave curves stand for risk aversion.[13]

Since unaffected people evaluate a health state on the convex part of their value function, they should be mainly risk seeking considering any improvements or deteriorations of that condition. Affected people have more to lose than to gain if they judge any changes in health in relation to the reference point. The loss function is steeper than the gain function. That indicates a risk averse behaviour.

## Value and utility

Before puzzlement is complete we want to stress that the changing use of the terms „value“ and „utility“ is no expression of lax and indefinable behaviour. The term „value“ describes preferences derived under certainty, but the term „utility“ describes preferences derived under uncertain conditions.[14] The reason we have to discuss this distinction at all, is that Prospect Theory originally refers to value functions whereas the evaluation methods, we used in this study, namely Standard Gamble and Time Tradeoff, refer to utility functions for axiomatic reasons.[15]

[12] Lenert et al. (1999).
[13] Eisenführ, F. and M. Weber (1999), p. 223.
[14] Barron et al.(1984).

The literature has already analysed and tried to combine value and utility.[16] Theoretically, a utility function can be split into a value function and an intrinsic risk part.[17] Hence, anything valid for a value function will influence the overall utility function as well. That cannot be said the other way round. Our analysed problem is the unproblematic direction. Therefore, we won‘t follow that distinction any longer and use the term „utility“ since that is what we have measured.

## Methods.

Tinnitus patients and unaffected persons were asked to answer a questionaire-based interview to evaluate the relationship between life expectancy and willingness to exchange (expected) life years for better health. In order to define individual life expectancy all participants were asked how old they guess to become. The difference between individual life expectancy and actual age can be defined as remaining life expectancy. This procedure allows to avoid reference point biases considering life years. [18]

In addition, there are different ways to measure preference-based, health-related quality of life. A method to evaluate individual health perception asks the maximum number of years participants would be willing to give up in order to free themselves of the symptoms of Tinnitus.[19] A medicament is given as example that would have that effect but has an influence on life expectancy. The number of years to give up are successively risen until the respondent are indifferent between taking the medicine or living with that condition. The ratio between remaining and actual life expectancy

[15] Kaplan, „Utility Assessment for Estimating Quality-Adjusted-Life-Years.“ in Sloan (1995), p. 40-41.
[16] For example: Barron et al. (1984).
[17] Bamberg (1996).
[18] Verhoef et al. (1994).
[19] Torrance (1986).

gives a value between 0 and 1 (or normed between 0 and 100) and defines individual quality of life of that health condition. This procedure is the so-called **Time-tradeoff** method.

A similar utility-based method is the „**Standard Gamble**":[20] Respondents are asked to state their indifference point of survival probability for a hypothetical operation that would remove any signs of Tinnitus. Starting with 100 percent survival probability, figures are successively lowered until participants can not cleary state any more whether they would take part or refuse such operations. The stated probability determines a point on a scale between 0 and 100 that describes the individually experienced or imagined quality of life of that health condition.

Those measures say nothing about risk attitudes. Risk posture is defined as the curvature of utility functions, as has been stated previously. However, Standard Gamble and Time Tradeoff use two attributes to form a utility function since the utility of health-related quality of life is expressed in length of life or survival probability, i.e. expected length of life. Hence, any curvature of the utility function concerns length of life since this attribute is the numeraire health-related quality of life is measured in.

In order to get data about the risk posture concerning health-related quality of life, we exploit a Corollary of Keeney and Raiffa:[21] „A decision maker who prefers the expected consequence of any 50-50 lottery $\langle x_1, x_2 \rangle$ to the lottery itself is risk averse."

The opposite holds for risk seeking behaviour. Respondents are asked whether they are willing to accept an operation that can either improve or deteriorate their health condition, both with an equal chance. The possible answers to measure the intensity of risk aversion or seeking are given on a five-point rating-scala with the categories: 1)in no case, 2)unlikely, 3)maybe, 4)likely, 5)in any case.

[20] Torrance (1986).
[21] Keeney and Raiffa (1976), p.150.

210 patients were interviewed between september and december 2000, 110 women and 100 men between 16 and 85 years old, on average 53,8 years. Almost two third of them were married (146), 24 were singles, 14 lived as widows, and 26 were divorced or seperated. Patients were met at four different places in Berlin: 21 at the Tinnitus-League, a self-help association, 21 at the Heinrich-Heine-Hospital, a hospital with a focus on psychosomatic conditions, 63 at the ear, nose, and throat department of the Charité, the hospital connected to the Humboldt-University, and 105 patients at Dr. Berndt, a leading medicin in Tinnitus treatment.

210 unaffected persons were interviewed between october 2000 and january 2001, 108 women and 102 men between 13 and 81 years old, on average 54,05 years. Almost two third of them were married (142), 24 were singles, 15 lived as widows, and 29 were divorced or seperated. Participants were met at four different places in Berlin: 46 at Kaiser‘s, a supermarket in Kreuzberg, 57 at the main station, 52 at Ring-Center and 55 at Kaufhof, two shopping center in East Berlin. Detailed demographic composition of either group concerning occupation and education, too, is given in the appendix in figures 7 to 10.

Unnaffected participants were described the primary symptoms of **Tinnitus** – an undebilitating sound in the ear subjectively perceived by patients that cannot be removed by operation or treatment in most cases.[22] To simulate possible sounds and loudnesses, participants could listen to a tape that replayed sounds by a syntethizer which had been simulated according to descriptions of affected persons. In addition, the participants were told possible secondary symptoms as sleeplessness, ear trouble, depression, concentration problems and, first of all, (un)ability to cope since the last point is crucial for living with that condition.[23] Participants were asked to imagine such a state and think about their own possible ability to cope. Afterwards, interview questions followed.

[22] Feldmann (1998).
[23] Feldmann (1998).

Affected persons were invited to describe their own condition, i.e. individual sounds and second symptoms. Afterwards, interview questions followed. Returned interview questionaires were coded. The data input was performed in SPSS (Version 8.0 for Windows). Numbers not doubtlessly recognizable were coded as missing values.

## What can we expect ?

- On average affected people rate their own health state less severe than unaffected would do.
- On average affected people are more risk-averse than unaffected.
- There is a correlation between risk posture and evaluation.

## Results

Out of 420 participants, 21 people said that they could not answer the Standard Gamble question or refused to do so, 10 of those were affected, 11 not affected. 29 participants did not answer to the life expectancy and Time Tradeoff question – 16 affected and 13 unaffected. However, only 8 persons did not answer to the question about operation risks, both groups with 4 participants. One of the participants broke off the interview.

All three hypothesis could be **confirmed** as can be seen in the following 4 figures 3 to 6.

The first hypothesis is analysed in figure 3, the second in figure 4:

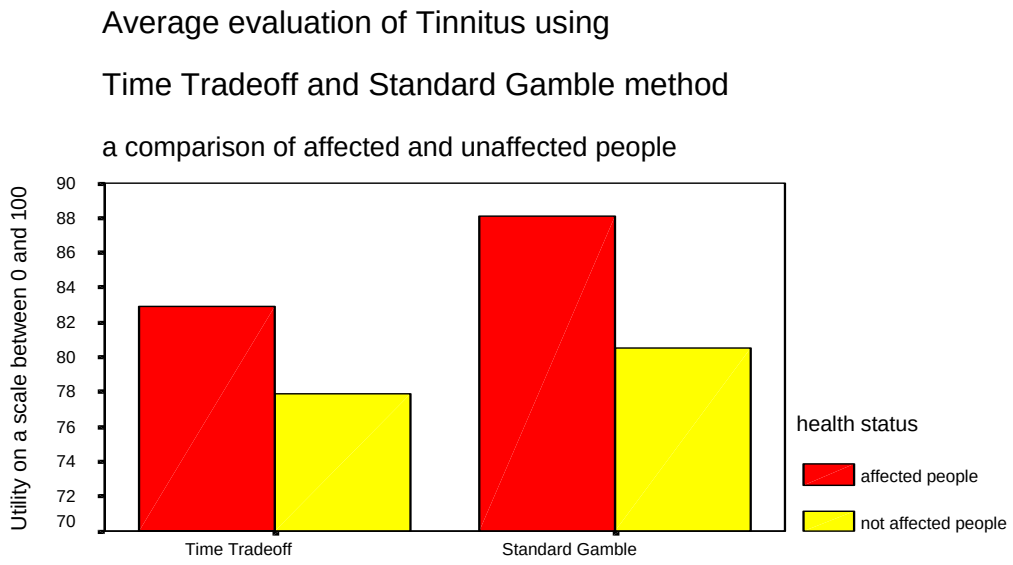



**Figure 3:** A comparison of Tinnitus affected and not affected people demonstrates **different perceptions of the same health state**. Independent of evaluation method, affected people judge on average their own health condition less severe than unaffected do if informed about the same health state.

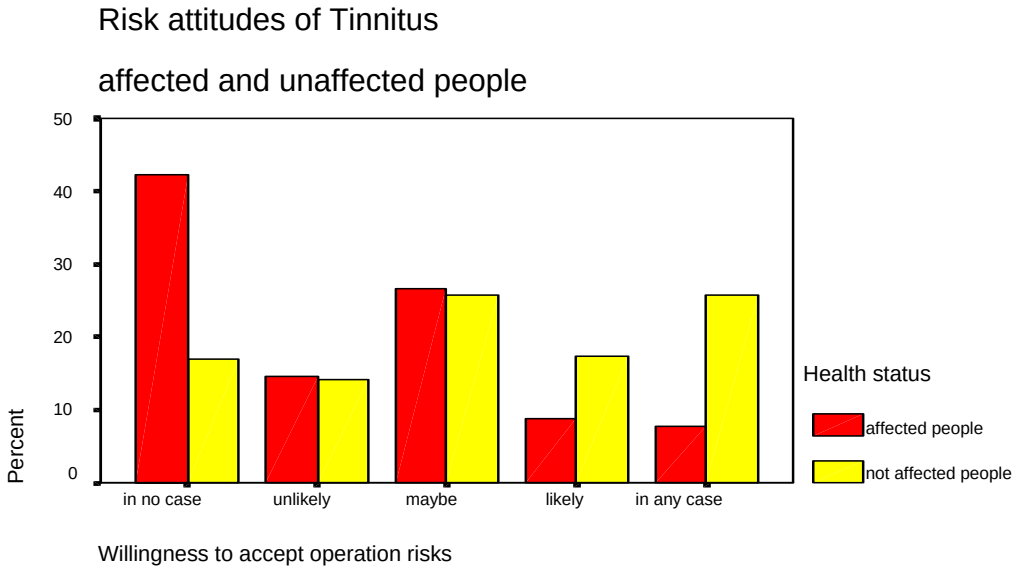



**Figure 4: Affected people have a different risk posture than unaffected have.** The majority of those with Tinnitus would not (ca. 42%) or probably not (ca. 15%) be willing to accept an operation with an equal chance to improve or deteriorate the own health condition. This is in contrast to unaffected people. Only about 30% of those would avoid such an operation in case they had to face Tinnitus.

These results are significant according to the Mann-Whitney-U test, a non-parametric procedure to compare mean values of two groups, as can be seen in Table 1:

| | Operation risk | Standard Gamble | Time Tradeoff |
|---|---|---|---|
| Mann-Whitney-U | 13287,000 | 15610,000 | 16681,500 |
| Wilcoxon-W | 34608,000 | 35510,000 | 36184,500 |
| Z | -6,747 | -3,808 | -2,219 |
| Asymptotic significance (two-tailed) | ,000 | ,000 | ,027 |

**Table 1:** Asymptotic significance is close to zero, i.e. the probability to make a mistake to assume different values for affected and unaffected people is very little. For example, the probability to make such a mistake in case of the Time Tradeoff values is just 2,7%, and for the other questions even lower.

The third hypothesis is analysed in figure 5 and 6:

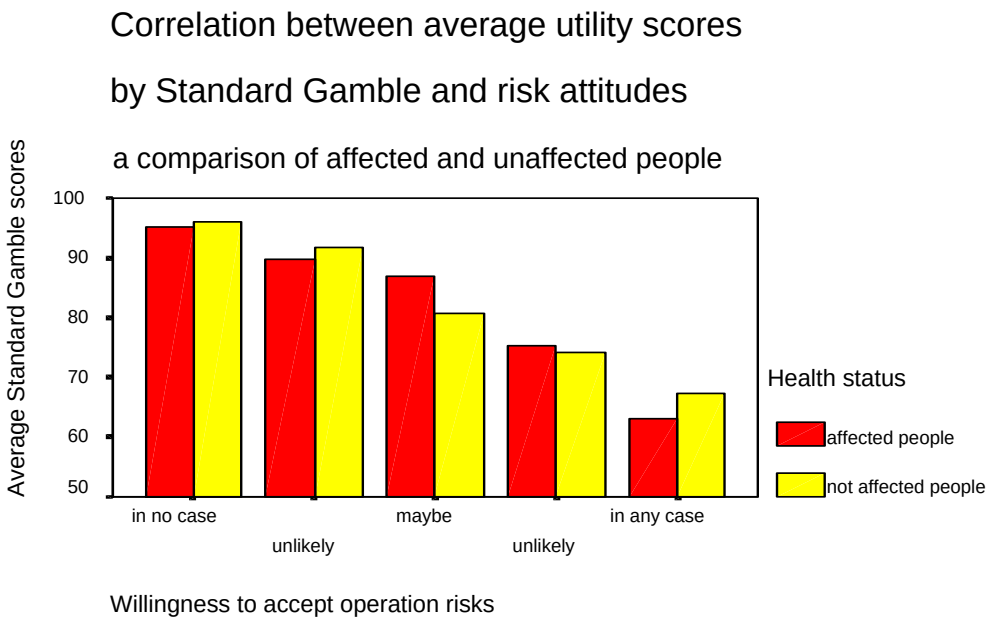



**Figure 5:** There is a **correlation between average evaluation of Tinnitus and willingness to accept operation risks** if measured by the **Standard Gamble** method. The more willing people are to accept those risk the lower is the evaluation of Tinnitus.

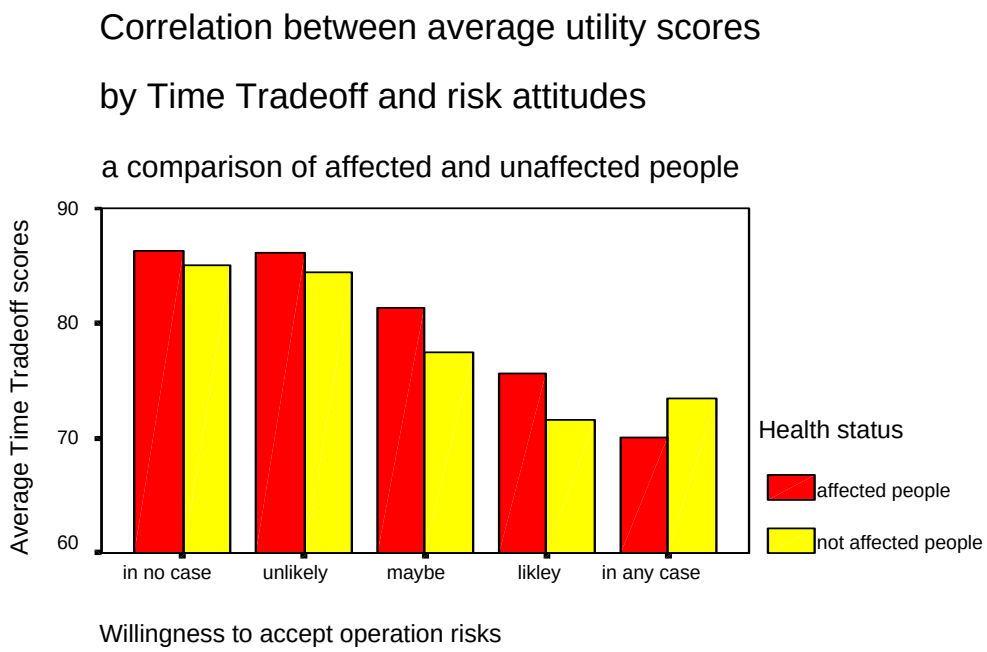



**Figure 6:** There is a **correlation between average evaluation of Tinnitus and willingness to accept operation risks** if measured by the **Time Tradeoff** method. The more willing people are to accept those risk the lower is the evaluation of Tinnitus.

The correlation is significant on a level of 0,01 for Standard Gamble as well as Time Tradeoff scores if one applies Spearman's Rho, a nonparametric test of correlation. Given the confirmation of all three hypothesis, we are left in an uneasy situation. It seems that a recommodation demanding the use of evaluation scores of unaffected people is not justified - at least not for the reason that it does not matter who to ask.

But another point can be made: In the last two Figures 5 and 6, evaluations of affected people are not consistently above those of the unaffected group. In contrast, if one compares average evaluations within the single risk groups, significant differences cannot be confirmed in most cases (See appendix tables 4 to 8). For example, those affected people who said in Figure 5 they would in no case take part in an operation gave on average an almost identical evaluation of Tinnitus than the unaffected group. Similar observations can be made within the other risk groups.

How can these observation be explained? Assume that those with equal risk posture evaluate a certain health state on average similarily, and assume that those with similar evaluations refer to the same reference point, then **risk posture is an indicator for the reference point**. People only have to anticipate the „right“ reference point to correctly evaluate a certain health state. Unaffected people are, obviously, able to judge properly but they are not able to anticipate on average the shift in reference point. Hence, differences in figure 3 can be mainly explained by different reference points. This implicitely means that judgements of affected people reflect „true“ estimates.

But it is possible to generally correct for that if this connection can be confirmed for other illnesses as well. A decision maker who wants to combine evaluations of the general public and the experience of affected people can use scores of the first group and weights them with the risk attitude of the second.

Mathematically speaking:

$$\sum_{i=1}^{5} SG_{iN} \times R_{iB} = \varnothing SG_{iN}$$

as **formula 1** in case of the Standard Gamble method

$$\sum_{i=1}^{5} TTO_{iN} \times R_{iB} = \varnothing TTO_{iN}$$

and as **formula 2** in case of the Time Tradeoff method

where
- i = number of risk class
- SG = Standard Gamble evaluation values
- TTO = Time Tradeoff evaluation values
- N = unaffected
- B = affected
- R = percentage of affected people in risk class i (see figure 4).

How this formulas can be used is demonstrated in the following example: Table 2 shows mean evaluations for the single risk classes:

| | | | Health status | |
|---|---|---|---|---|
| | | | affected | unaffected |
| | | | mean | mean |
| Standard Gamble | operation risk | in no case | 95,27 | 96,06 |
| | | unlikely | 89,80 | 91,72 |
| | | maybe | 86,82 | 80,55 |
| | | likely | 75,33 | 74,12 |
| | | in any case | 63,13 | 67,45 |
| Time Tradeoff | operation risk | in no case | 86,30 | 85,08 |
| | | unlikely | 86,13 | 84,40 |
| | | maybe | 81,35 | 77,43 |
| | | likely | 75,57 | 71,59 |
| | | in any case | 70,05 | 73,50 |

**Table 2: Mean evaluations of single risk groups.**

Applying formula 1 and 2 leads to the following average scores

Standard Gamble:

42,2% * 96,06
+ 14,6% * 91,72
+ 26,7% * 80,55
+ 8,7% * 74,12
+ 7,8% * 67,45 = **87,14**

Time Tradeoff:

42,2% * 85,08
+ 14,6% * 84,40
+ 26,7% * 77,43
+ 8,7% * 71,59
+ 7,8% * 73,50 = **80,86**

which are much closer to the real values of affected people than the unweighted values of the not affected as can be seen in the following Table 3.

| | Health status | |
|---|---|---|
| | affected | unaffected |
| | mean | mean |
| Standard Gamble | 87,93 | 80,67 |
| Time Tradeoff | 82,68 | 78,02 |

**Table 3: Mean evaluations of entire sample.**

## Discussion

Generally, whose preferences count is still an ethical question. Nobody can say for sure that reference points of affected people are the „true“ ones. However, if any decision maker wants to include the experience of people who have suffered a certain health condition, the proposed procedure is an elegant way to combine evaluations of the general public with the knowledge of those who have to face illnesses.

Of course, before this procedure can be applied in a broader framework, the connection between individual reference points, risk attitudes and evaluation of health-state utilities has to be shown for other illnesses first. But if this relationship can be confirmed, present League-tables in the health domain are questionale at best. Those League-tables are meant to rank medical interventions according to costs and effectiveness. However, ordinal rankings are severely biased if effectiveness measures refer to „wrong“ reference points, and, hence, over- or underestimate the true underlying impact of a medical intervention.

On the other hand, our analysis depends on several „if‘s“, and although the results seem to be structural valid since all theoretically derived hypothesis‘ could be confirmed, it is open to much debate whether these results indeed prove what they pretend to do. It seems to be just obvious that two questions which deal with almost identical subjects, namely risky operations, correlate. It seems to be straight forward that people with lower scores for certain health states risk more to improve their condition.

However, correlations could be proven for items where such connections are not expected in advance as in case of the Time Tradeoff measure. In addition, it is astonishing that the relationship between evaluations of health states and risk attitudes towards health-related quality of life has been neglected so far in the past. To prove such a relationship is a step forward in establishing better instruments to cover more aspects of quality of life.

We have dealt quite a lot with reference levels. What we have not done is to show what provokes shifts in reference levels. Kahneman und Tversky just proposed such a theory in case there is a shift. They did later indicate that rapid adaptation might induce such a shift.[24] For future analysis, this might be a crucial point for better understanding evaluations in a cost-effectiveness framework, too.

[24] Kahneman and Tversky (1983).

# Appendix

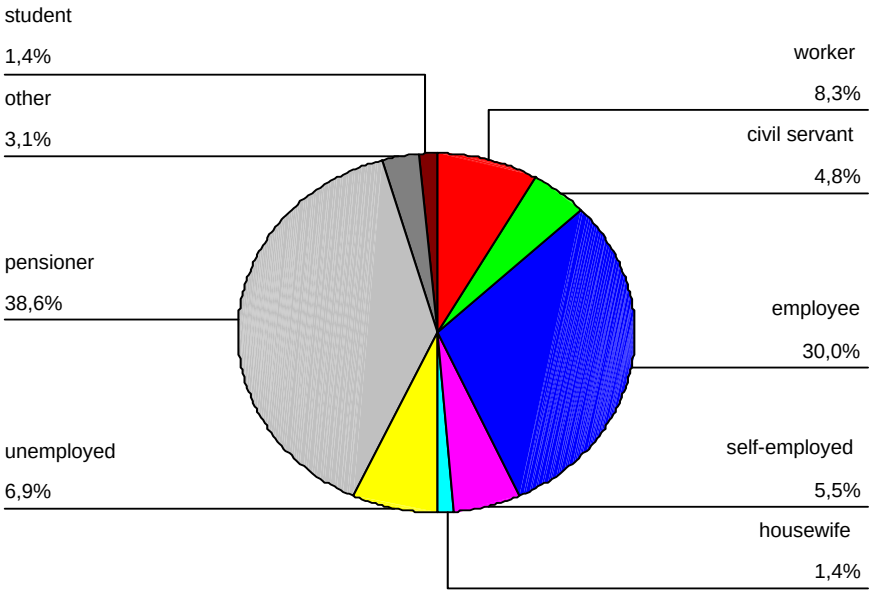



**Figure 7 : Occupation of affected person in the sample.**

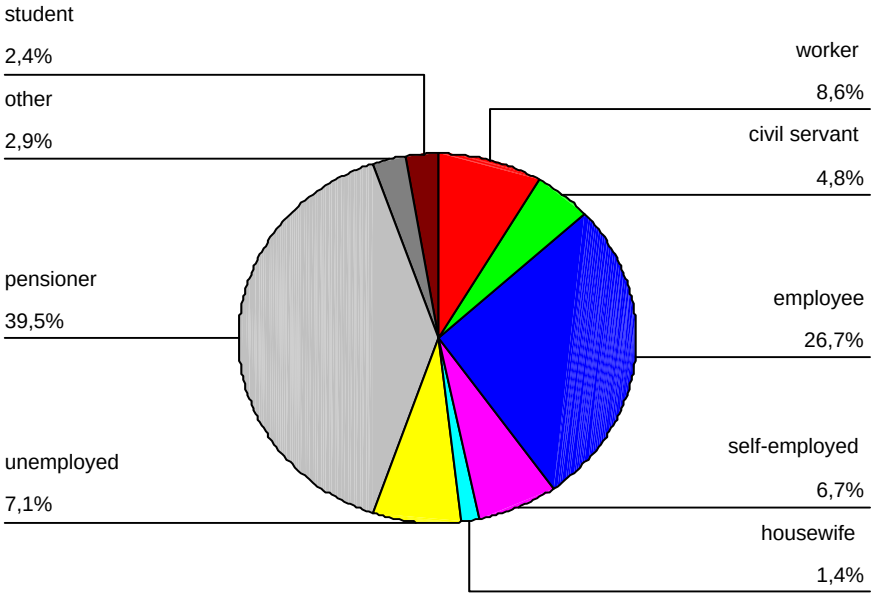



**Figure 8 : Occupation of unaffected person in the sample.**

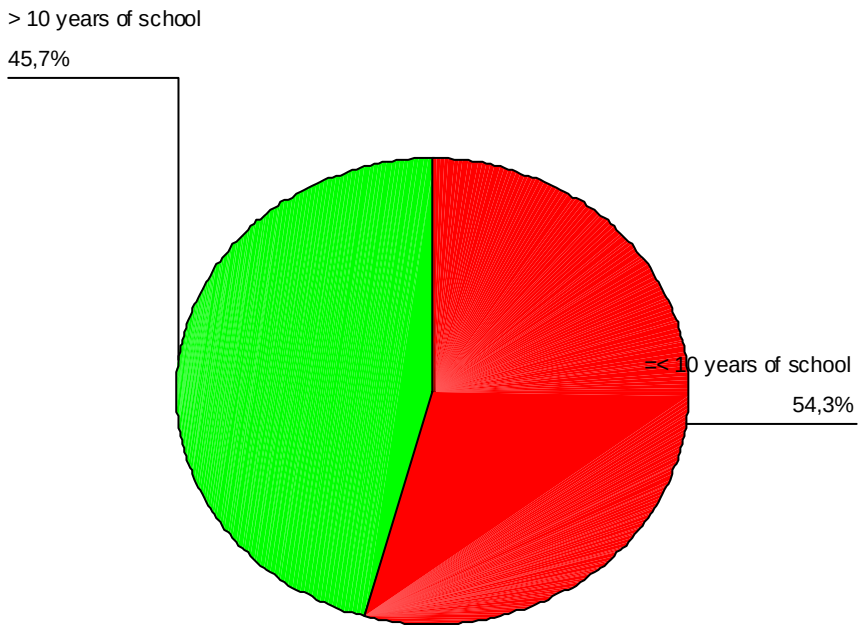



**Figure 9: Years of school attendance of affected people in the sample.**

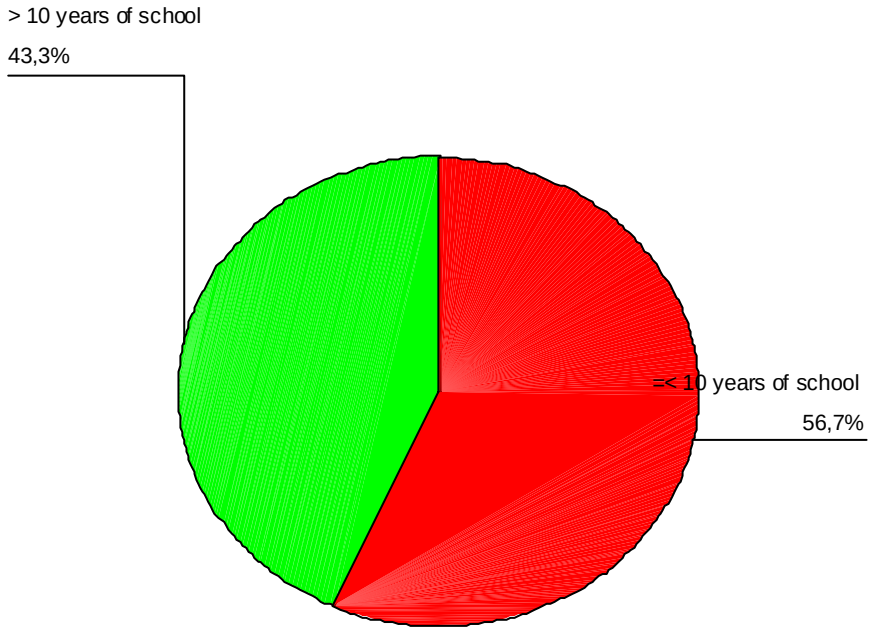



**Figure 10: Years of school attendance of unaffected people in the sample.**

| | Standard Gamble | Time Tradeoff |
|---|---|---|
| Mann-Whitney-U | 1289,000 | 1294,000 |
| Wilcoxon-W | 4692,000 | 1924,000 |
| Z | -,482 | -,797 |
| Asymptotic significance (two-tailed) | ,630 | ,425 |

**Table 4:** Mann-Whitney-U Test for sample means. Affected and unaffected people who said they would **in no case** undertake an operation with an equal chance to improve or deteriorate their condition have been compared. Differences in sample means are not significant even on a significance level of 0,1 for either measure.

| | Standard Gamble | Time Tradeoff |
|---|---|---|
| Mann-Whitney-U | 337,500 | 395,000 |
| Wilcoxon-W | 802,500 | 801,000 |
| Z | -1,500 | -,181 |
| Asymptotic significance (two-tailed) | ,133 | ,856 |

**Table 5**: Mann-Whitney-U Test for sample means. Affected and unaffected people who said they would **unlikely** undertake an operation with an equal chance to improve or deteriorate their condition have been compared. Differences in sample means are not significant even on a significance level of 0,1 for either measure.

| | Standard Gamble | Time Tradeoff |
|---|---|---|
| Mann-Whitney-U | 1044,000 | 1134,500 |
| Wilcoxon-W | 2370,000 | 2359,500 |
| Z | -1,882 | -,808 |
| Asymptotic significance (two-tailed) | ,060 | ,419 |

**Table 6:** Mann-Whitney-U Test for sample means. Affected and unaffected people who said they would **maybe** undertake an operation with an equal chance to improve or deteriorate their condition have been compared. Differences in sample means are not significant even on a significance level of 0,1 for the Time tradeoff measure, differences in sample means are not significant on a level of 0,05 for the Standard Gamble measure.

| | Standard Gamble | Time Tradeoff |
|---|---|---|
| Mann-Whitney-U | 298,500 | 270,000 |
| Wilcoxon-W | 893,500 | 865,000 |
| Z | -,148 | -,380 |
| Asymptotic significance (two-tailed) | ,882 | ,704 |

**Table 7:** Mann-Whitney-U Test for sample means. Affected and unaffected people who said they would **likely** undertake an operation with an equal chance to improve or deteriorate their condition have been compared. Differences in sample means are not significant even on a significance level of 0,1 for either measure.

| | Standard Gamble | Time tradeoff |
|---|---|---|
| Mann-Whitney-U | 363,000 | 307,500 |
| Wilcoxon-W | 499,000 | 412,500 |
| Z | -,446 | -,481 |
| Asymptotic significance (two-tailed) | ,656 | ,630 |

**Table 8:** Mann-Whitney-U Test for sample means. Affected and unaffected people who said they would **in any case** undertake an operation with an equal chance to improve or deteriorate their condition have been compared. Differences in sample means are not significant even on a significance level of 0,1 for either measure.

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