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## The construction of health state utilities

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## Exploring the reference point in prospect theory

### Gambles for length of life

Exploring the reference point in prospect theory: Gambles for length of life.

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## Abstract

Attitude towards risk is an important factor determining patient preferences. Risk behavior has been shown to be strongly dependent on the perception of the outcome as either a gain or a loss. According to prospect theory, the reference point determines how an outcome is perceived. However, no theory on the location of the reference point exists and for the health domain, there is no direct evidence for the location of the reference point. This chapter combines qualitative with quantitative data, to provide evidence of the reference point in life-year CE gambles and to explore the psychology behind the reference point. We argue that goals (aspirations) in life influence the reference point. While thinking aloud, 45 healthy respondents gave certainty equivalents for life-year CE gambles with long and short durations of survival. Contrary to suggestions from the literature, qualitative data demonstrated that the offered certainty equivalent most frequently served as the reference point. Thus, respondents perceived life-year CE gambles as mixed. Framing of the question and goals set in life proved to be important factors behind the psychology of the reference point. On the basis of our quantitative and qualitative data, we argue that goals alter the perception of outcomes as described by prospect theory by influencing the reference point. This relationship is more apparent for the near future as opposed to the remote future, as goals are mostly set for the near future.

## Introduction

Utility elicitation based on the normative theory of expected utility are not descriptively valid and the major violations are explained by prospect theory (11). An important point in prospect theory is the location of the reference point, i.e. point of view. According to prospect theory, risk behavior varies depending on whether outcomes are perceived as gains or losses, relative to this reference point. Characteristically, a relative gain accompanied by a risk evokes risk-averse behavior, whereas a relative loss accompanied by a risk evokes risk-seeking behavior. The reference point determines this labeling of an outcome (5) and therefore, is an important factor in explaining risk behavior. Little is known about the psychology behind the location of the reference point, for which prospect theory does not include a hypothesis. This chapter attempts to explore the reference point. In prospect theory, outcomes are expressed as gains or losses (positive or negative deviations) relative to a (neutral) reference point (32). With respect to the health domain, it is observed that risk attitude, and thus the reference point, influences treatment choices made by patients (30;33). Furthermore, standard gamble (SG) utilities are often used in health care and two well-documented biases from expected utility (probability weighting and loss aversion) should be corrected for in standard gamble utility calculations (4;34). This correction requires knowledge of the reference point. Therefore, the absence of a theory on the location of the reference point poses a problem for economic evaluation (4;35).

The only available measurement technique in the health domain to assess risk attitude as described in prospect theory is a SG (29). The probability equivalent is a SG in which probabilities are varied and the certain outcome is held constant. The certainty equivalent (CE) is a SG in which probabilities are held constant and the certain

outcome is varied. In the SG, a person behaves in a risk-seeking way if a risky prospect is preferred to a risk-free prospect of equal or greater expected value. A person behaves in a risk-averse way if a risk-free prospect is preferred to a risky prospect of equal or greater expected value. We assume that the CE life-year gamble is subject to deviations from expected utility as described in prospect theory.

In monetary CE gambles, the status quo often serves as the reference point (4). In health settings, e.g. life-year CE gambles, there is only indirect empirical evidence concerning the reference point, with the following argument: for monetary CE gambles, risk-averse behavior is predominantly observed if the outcomes are perceived as gains. Empirical studies report risk-averse behavior for life-year CE gambles (36). Thus, life-year gambles seem to be processed as gains (4), suggesting that the reference point in life-year CE gambles has been zero life years. Death as a reference point seems counter-intuitive, it seems more psychologically plausible that a respondent's life expectancy influences his/her perception of an outcome as a gain or a loss (29), this would contradict the reasoning that life-year CE gambles are processed as only gains. This would fit Kahneman and Tversky's argument that for some situations the aspiration level may determine if outcomes are perceived as a gain or a loss (5). An aspiration level in CE life-year gambles could be the number of years a person strives for, in order to realize a specific goal. Verhoef et al. observed that respondents accepted more risk in order to achieve their aspiration level. Unfortunately, the latter authors did not assess the motivations of respondents systematically (29;37). The impact of goals and immediate needs on decision making and risk behavior has also been emphasized by Lopes, and Schneider & Lopes (38;39).

The purpose of the present article is to provide more insight into the reference point, by combining qualitative and quantitative data. We consider the three outcomes of the

CE life-year gamble (high outcome of the gamble, low outcome of the gamble, and the certain outcome) as potential reference points. For the rest of the paper we will speak of "an outcome that serves as reference point", meaning that an outcome is closest to, or seems to include, the reference point referred to in prospect theory. To provide indirect evidence on the reference point, quantitative data was gathered on the preference curve for life years. Prospect theory theorizes the inflection point of this preference curve, where the curve alters from convex to concave, to be the reference point (11). Additionally, more direct evidence was obtained with the use of qualitative data, thus also providing information about the psychology behind the reference point. We hypothesized that goals drive the reference point. Qualitative data may reveal the effect of goals on the reference point. Consequently, we reasoned that more attention is paid to the life years during which goals are to be realized. Therefore, assessing the focus of attention could provide (additional) insight into the outcome that serves as reference point and the hypothesized relationship between a reference point and goals.

## Methods

### Procedure

Forty-five respondents were recruited using newspaper ads and pamphlets. They were paid € 22.50 for participation in two interviews, one of which is the topic of this paper.

### Quantitative data

Respondents performed seven life-year CE gambles. Probabilities were held constant at  $p = .5$ , and the certain outcome was varied until indifference resulted. We preferred

50-50 gambles for they are cognitively easier, and the probability weighting bias is thought not to have a large effect (4). CE50 is the number of years a person finds equivalent to a 50-50 gamble, between the remaining life expectancy (LE) as a high outcome and death within a week as a low outcome. LE was based on a respondent's remaining life expectancy derived from Dutch life tables (28). To elicit the CE25, the high outcome of the gamble was the previously elicited CE50, and death within a week was the low outcome. Consequently, CE25 is the number of years a respondent finds equivalent to a 50-50 gamble between CE50 and death within a week. Similarly, the CE75 is the number of years a respondent finds equivalent to a 50-50 gamble between the LE as a high outcome and CE50 as a low outcome, etc. The CE50, serving as an outcome for other gambles, had to be performed first, after which the CE25 or the CE75 followed randomly, and thereafter the remaining gambles were performed in a random order. Respondents performed the CE12.5, CE25, CE37.5, CE50, CE62.5, CE75, and CE87.5 (see Figure 3.1).

Elicitations were computerized using the program Ci3 Version 2.5 (26) (Appendix 3A). Certainty equivalents were obtained via a choice-bracketing approach (series of ping-pong questions) that involved forced choices. Each interview took an average of 90 minutes to complete. Respondents started with a verbal and a written explanation, followed by two examples. At any time during an elicitation, it was possible for respondents to take a break, or check earlier answers within that elicitation and change these if they wanted to. Elicitations ended when respondents indicated that they valued two options equally.

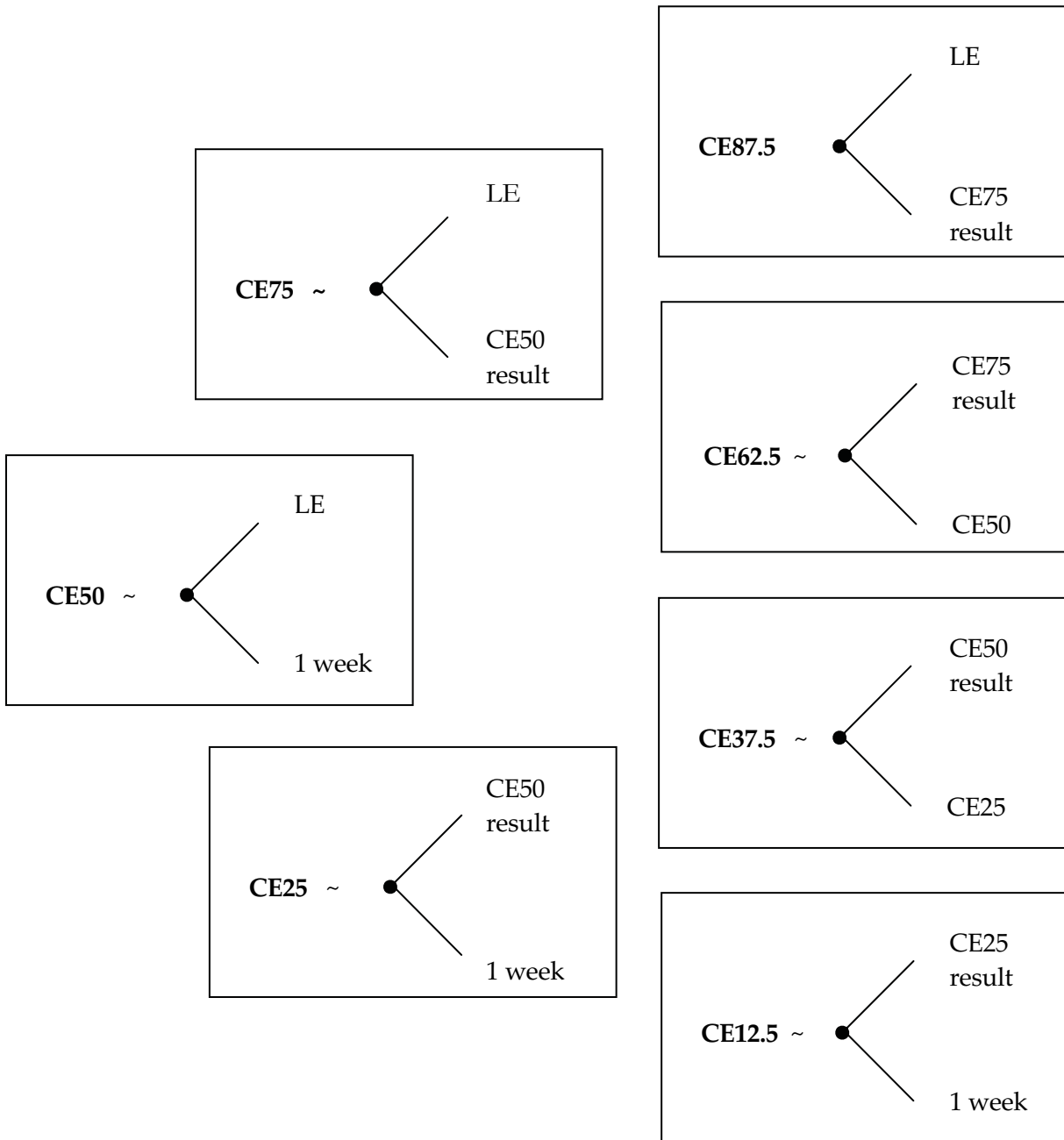


FIGURE 3.1. CE method. The point of indifference in the first gamble, CE50 result, is used to construct the CE25 or CE75 gamble, as high and low outcome of these gambles respectively. In this way, the CE12.5, CE25, CE37.5, CE50, CE62.5, CE75 and CE87.5 were elicited. LE means remaining life expectancy.

### **Qualitative data**

All respondents were instructed to think aloud during the interview. They were specifically instructed not to formulate or make perfect sentences, but merely to think aloud whilst considering the choices. Thinking aloud, i.e. verbalization, has been reported to have an effect only on the time needed to complete the task (40). The main purpose of this study was to assess which outcome in the gamble served as the reference point in CE gambles, while maximizing the degree to which the data could be generalized. Therefore, the number of interventions by the interviewer during computer interviews was minimized, to avoid respondents guessing the construct of interest. The interview was tape-recorded and transcribed. Afterwards, the verbal reports were coded by means of a coding scheme using the computer program QSR NVivo 1.3 (41). Two independent coders each coded all reports, after which, disagreements in coding were discussed to form a consensus coding. If no consensus was reached, a third person was consulted.

### ***Coding***

"Reference point" was coded if a point of view was formulated, i.e. respondents used an outcome of the life-year gamble as a starting point to indicate or calculate the difference with another outcome or both other outcomes and, thus, indicating the perception of the outcomes as loss or gain. A coded "reference point" was the outcome in the life-year gamble that seemed closest to, or included, the reference point. In the qualitative analysis, the three outcomes that could serve as the reference point were the high outcome of the gamble, the low outcome of the gamble, and the offered CE. The latter is the certain outcome that was offered in the search procedure.

We coded a high outcome as "reference point" if one or both other outcomes (low outcome and offered CE) were labeled as losses relative to the high outcome. We

coded a low outcome as "reference point" if one or both other outcomes (high outcome and offered CE) were labeled as gains relative to the low outcome.

We coded an offered CE as "reference point" if the high outcome was labeled as a gain and/or the low outcome was labeled as a loss, relative to the offered CE. Table 3.1 shows three possible verbalized remarks and the appropriate codings. The life-year CE gamble evaluated in this example is a gamble with a 50% chance of living for 40 years and a 50% chance of dying within a week (1 week, 0.5, 40 years, option 1) versus the offered CE of 16 years (option 2).

**Table 3.1.** Example of remarks and codings of the reference points

<b>Example remarks:</b>	<b>Reference point</b>
"I can gain 40 years if the gamble goes well or gain 16 years if I choose option 2."	Low outcome (0 years)
"I can gain 24 years if the gamble goes well or lose 16 if it doesn't."	Offered CE (16 years)
"If I choose option 2, I will lose 24 years. If the gamble turns out badly, I will lose all 40 years."	High outcome (40 years)

A "focus of attention" was coded when a respondent mentioned an outcome but did not explicitly compare it to another outcome. For this coding, less strict coding rules applied than for the reference point coding. A "focus of attention" was coded when an outcome was compared to another outcome independently of a reference point being deducible or not. We assumed that the more frequently an outcome was mentioned or compared, the more attention a respondent paid to that outcome.

A "goal" was coded if a statement was made regarding the realization of a goal with respect to an outcome. In other words, if the respondent referred to a survival period stated in an outcome and assessed that period to be too short, or long enough, to realize the goal.

### Data analysis

The high outcome of the CE50 was each individual's personal remaining life expectancy (LE) and therefore, the raw certainty equivalent alone does not provide information about risk behavior. To allow for comparison of risk behavior between CEs, the proportional match (PM) was calculated as follows (42). Each certainty equivalent was normalized to the range of the gamble, i.e.:

$$PM = (CE - low) / (high - low).$$

Thus, risk-neutral behavior is indicated by a PM value of 0.5, resulting when the raw CE was chosen equal to the expected value of the gamble. If the CE is chosen higher than the expected value, PM is higher than 0.5, thus denoting risk-seeking behavior. Finally, PM is lower than 0.5 if the raw CE is lower than the expected value, i.e. the respondent displays risk-averse behavior.

Additionally, for each respondent separately, a logistic utility curve was fitted to the seven raw CE values<sup>i</sup>. The logistic curve was argued by Kahneman and Tversky (11) and empirically tested by Verhoef et al. (9):

$$U(t) = \alpha / (1 + (\beta / t)^\gamma).$$

Parameter  $\alpha$  was chosen so that  $U(LE) = 1$  and parameters  $\beta$  and  $\gamma$  were numerically set to minimize the squared differences between the CE and  $U^{-1}$  values. Goodness of fit was measured by the explained variance ( $R^2$ ). The logistic utility curve is s-shaped and changes from convex to concave at the inflection point:

$$t^* = \beta ((\gamma - 1) / (\gamma + 1))^{1/\gamma}.$$

According to prospect theory, this inflection point is the reference point. If the logistic curve was convex or concave on the entire interval from 0 to LE, then the reference point was set to LE or 0, respectively. Thus for each respondent the individual reference point was estimated, expressed in life years (absolute reference point) and relative to the remaining life expectancy (relative reference point). We assessed the frequency of the reference point codes, focus of attention codes and goal codes per life-year CE gamble. For those respondents who mentioned a goal with an explicitly stated associated period, the correlation between that period and the (relative) reference point was assessed. The correlation between coded goals (number of years associated with), age and the (absolute or relative) reference point (as dependent variable) was investigated with a linear regression procedure.

## Results

The respondents were twenty-six females aged 18 to 72 years (mean age = 27, s.d. = 12) and nineteen males aged 19 to 61 years (mean age = 34, s.d. = 4). They were educated to at least high school standard. About 50% of the respondents were university students, and 25% of the respondents had children under the age of eighteen years.

### Proportional match

The highest mean PM (0.54) was observed for life-year gambles involving short periods of survival. The lowest mean PM (.29) was observed for life-year gambles involving long periods of survival (see Figure 3.2). In other words, respondents on average behaved in a risk-seeking way with respect to life-year gambles involving short periods of survival, and in a risk-averse way for all other gambles. Risk-averse behavior was strongest for life-year gambles involving long periods of survival. Figure 3.2 shows the mean PM per elicited CE.

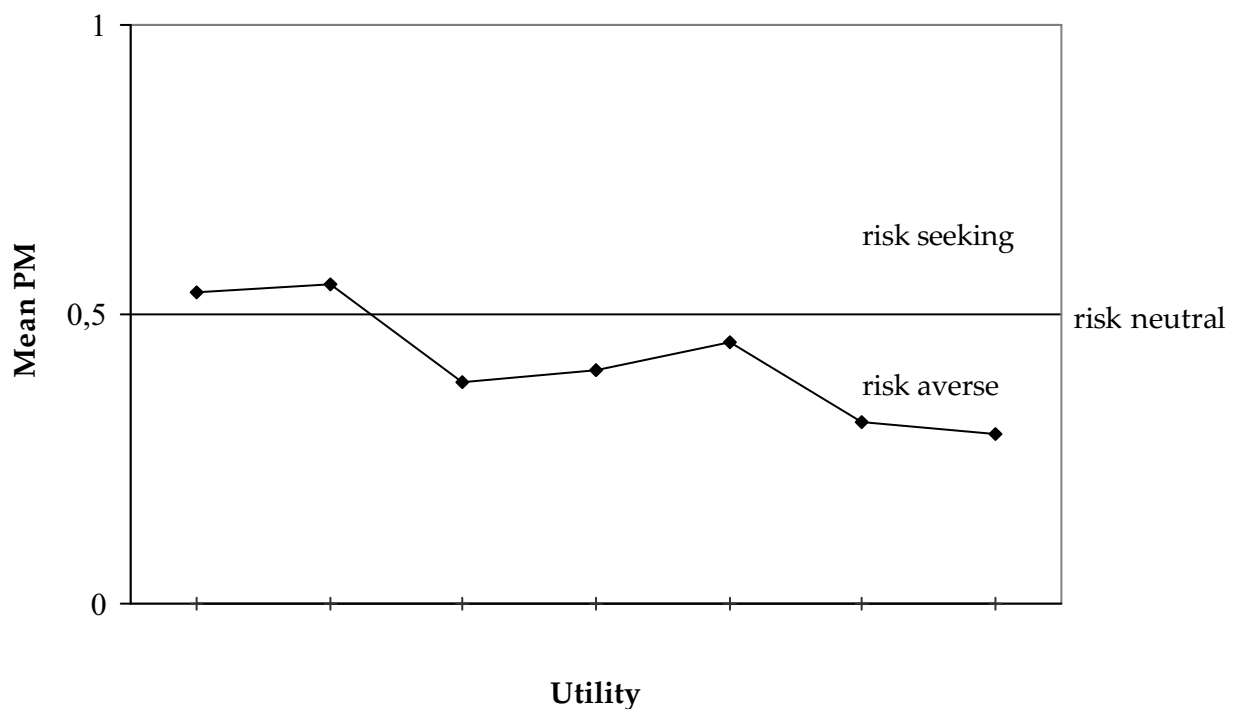


FIGURE 3.2. Mean proportional match (PM) per CE,  $PM > 0.5$  denotes risk-seeking behavior,  $PM < 0.5$  denotes risk-averse behavior,  $PM = 0.5$  signifies risk-neutral behavior.

### **Logistic curve**

The logistic curve provided a good fit for most patients, with an average explained variance of 0.927 (range 0.625 to 0.999). The estimated average absolute reference point was 14.3 years (s.d. = 19) and the average relative reference point was .29 (s.d. = .36).

### **Qualitative data**

The analysis reported here is based on qualitative data from the CE. Gender, age and the CE that was valued, identify the quotes, which we use to illustrate our findings. It was difficult for some respondents to combine verbalization with the task, this was apparent in the reticence of several respondents to verbalize during the task.

For life-year gambles involving short periods of survival, several respondents indicated that they found all three outcomes unattractive. Regarding life-year gambles involving long periods of survival, some respondents viewed the low outcome of the gamble to be a satisfactory survival period. Some respondents even stated that they did not want to live as long as their life expectancy. In advanced age, they anticipated, for example, disease, handicaps, or 'problems of old age' ("The years between 50 and 80 aren't that much fun anyway, as your health will rapidly decline", female, 31, CE87.5). Frequently, choices were based on a feeling ("I find it hard to explain, it is a feeling", female, 39, CE25).

### ***Reference point***

With respect to all CE's, the offered CE was the outcome in the gamble that most frequently served as reference point (61%), followed by the low outcome (22%) and the high outcome (17%) (See Figure 3.3). During the CE50, few codings of "reference point" were deducible.

From Figure 3.3, it appears that a shift occurred in the outcome that indicated the reference point within the gamble (i.e. high and low outcomes). For the life-year gambles involving short periods of survival (e.g. CE12.5 and CE25), the high outcome of the gamble frequently served as the reference point. For the life-year gambles involving long periods of survival (e.g. CE75 and CE87.5), the low outcome of the gamble frequently served as the reference point (see Figure 3.3). Thus, the perceived reference point appeared (partly) dependent on the time horizon. Furthermore, 'death within a week' (the low outcome in the CE12.5, CE25, and CE50) never served as a reference point.

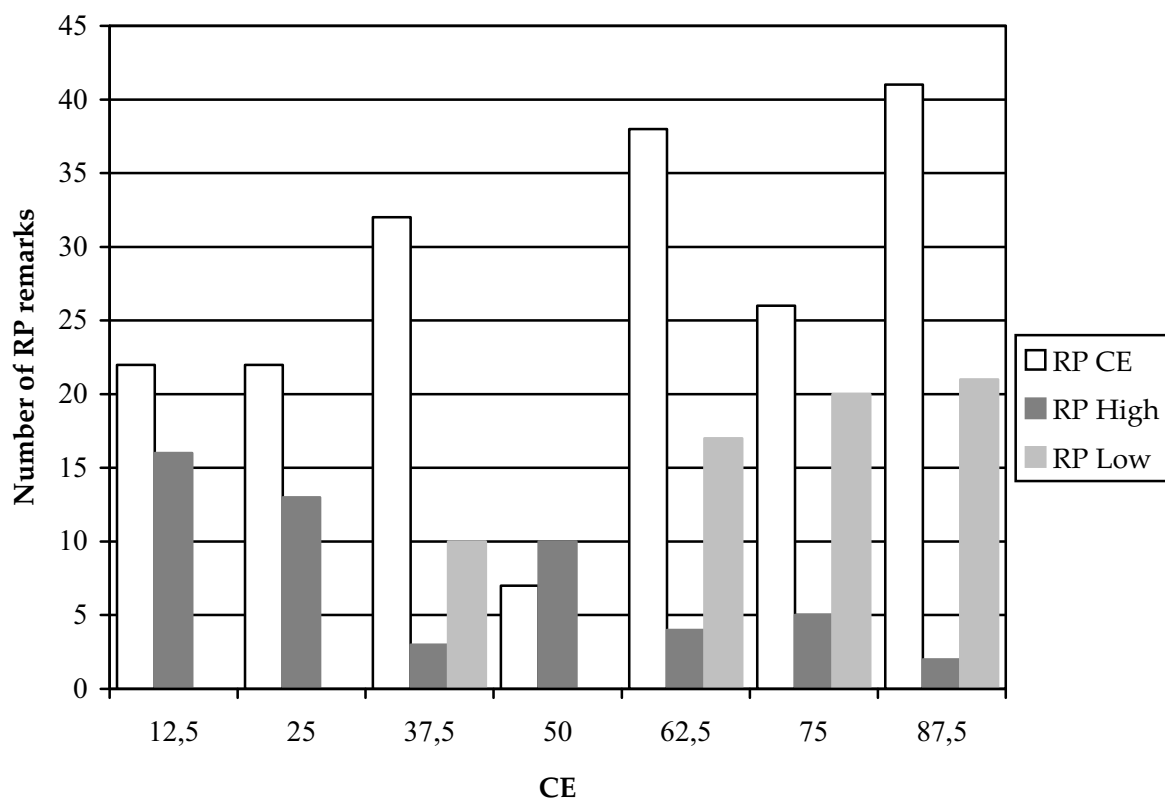


FIGURE 3.3. Frequency of deduced reference points (RP) shown per CE. Within the gamble, a shift was observed between reference points that appeared dependent on the time horizon (i.e. future life years involved in the life-year gamble).

### *Focus of attention*

Respondents mentioned the offered CE most often (82%), followed by the high outcome (10%) and the low outcome (8%). Additionally, the offered CE was compared to most often. In 26% of all comparisons made (two-outcome comparisons and three-outcome comparisons), the offered CE was compared to the high outcome. Additionally, in 26% of all comparisons made, the offered CE was compared to the low outcome. Comparisons between the high and low outcome were made infrequently (8%). Comparing all three outcomes was done most frequently (40%).

A shift occurred in the frequency of comparing the offered CE to the high outcome as opposed to the frequency of comparing the offered CE to the low outcome (see Figure 3.4). As was the case for the reference point, the focus of attention seemed to be (partly) dependent on the time horizon. Regarding life-year gambles involving short periods of survival, the focus *within the gamble* lay mostly on the high outcome. This outcome was compared to the offered CE more frequently. Regarding life-year gambles involving long periods of survival, the focus *within the gamble* lay mostly on the low outcome. This outcome was compared to the offered CE more frequently.

### *Goals*

Most respondents mentioned more than one goal during the interview. Goals were grouped into five categories: 1) Unspecified goals ("I think if I live for that many years, I will still be relatively young, but can accomplish all I want to.", female, 19, CE50), 2) Career-related goals ("If I live for only three more years, I won't even be able to get my PhD.", female, 31, CE50), 3) Retirement-related goals ("I have to work until I am 65 and I want to enjoy more than one year of my retirement.", male, 39, CE50), 4) Child-related goals ("I won't consider my life a success if I cannot start a family; I could not do that if I only live until I am 39.", male, 23, CE25), or 5) Miscellaneous other ("If I choose this one, then I will be

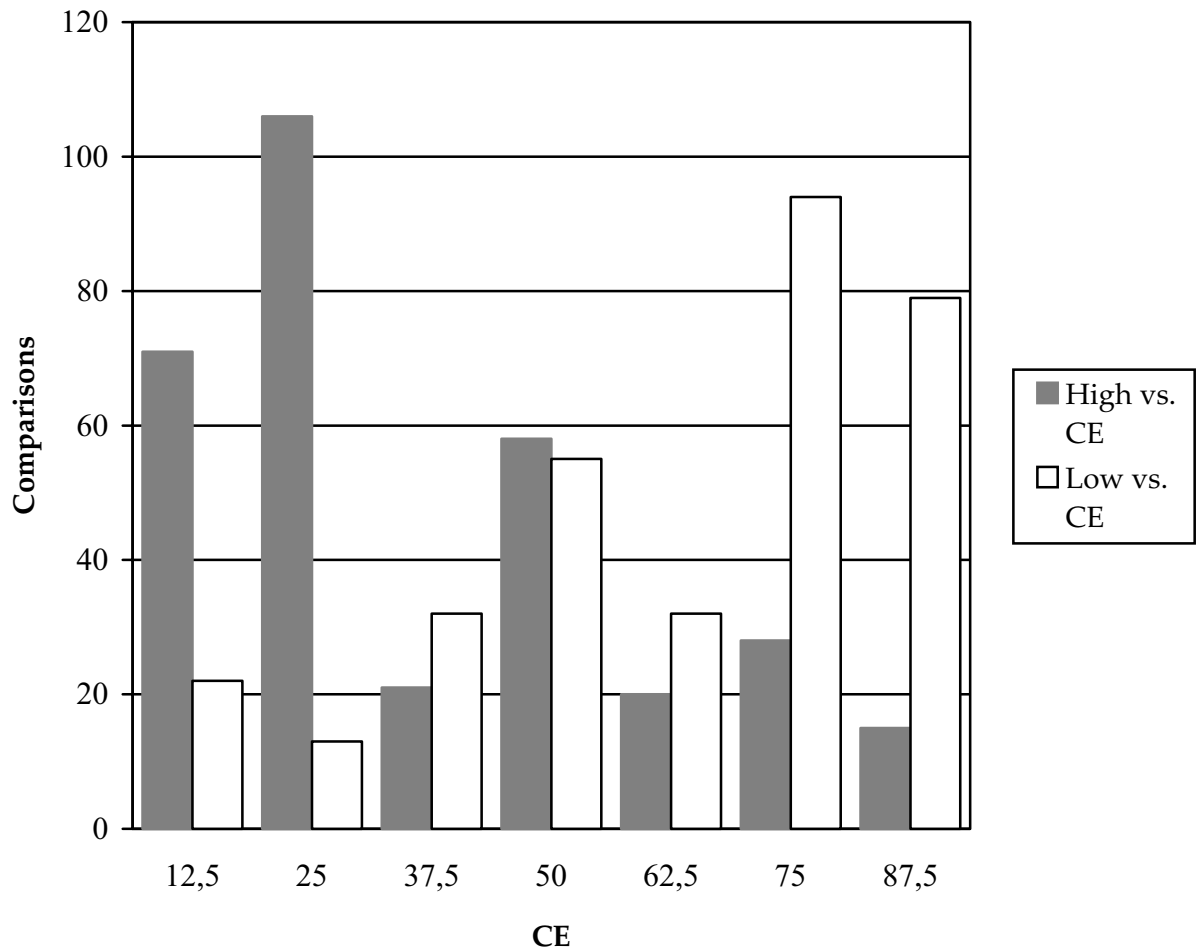


FIGURE 3.4. The frequency of two-outcome comparisons made with the offered CE, representing the focus of attention within the gamble. Again a shift was observed.

*able to take care of my dog until she dies. If my dog dies, I won't care so much about living anymore."* female, 72, CE50).

Respondents mostly used the period of time stated in the offered CE to assess if realization of a goal was possible (81%). The high outcome (12%) and low outcome (7%) were infrequently used to assess the possibility or impossibility of goal realization. However, if these outcomes were used to assess goal realization, again it was in a similar pattern depending on the time horizon. Mostly for the CE50 and CE75, the *possibility* of realizing a goal with respect to the offered CE, and to a lesser

extent with respect to the high outcome, was mentioned, but this was not the case with respect to the low outcome. On the other hand, mostly during the CE25 and CE50, the *impossibility* of realizing a goal was mentioned with respect to the offered CE and low outcome, but not with respect to the high outcome. Thus, again a shift occurred, depending on whether the life-year CE gamble involved trade-offs with long or short durations of survival. Goals were more frequently mentioned for nearby years than for the more remote life years.

Seventeen respondents mentioned a goal with an explicitly stated associated period, like "I need twenty years to raise my children." A linear regression showed that the explicitly stated periods are strongly related to the absolute ( $p < .001$ ) and relative reference point ( $p < .001$ ) that were indirectly obtained from the quantitative analysis, see Figure 3.5. The explained variance of the absolute reference point by the goal-related period was  $R^2 = .66$ . The seven respondents with a relative reference point of 0 (death within a week), had an average goal-related period of only 4 years. Conversely, the five respondents with a relative reference point of 1 had an average goal-related period of 33 years. Age showed a non-significant relation to the absolute reference point ( $p = .19$ ) and relative reference point ( $p = .82$ ).

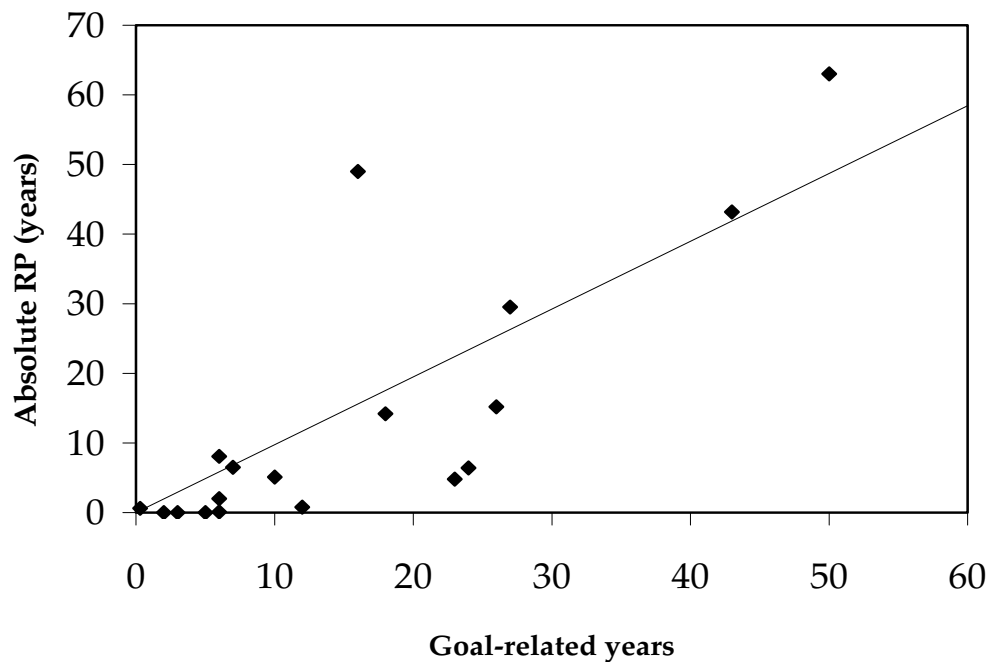


FIGURE 3.5. Scatter plot of the relation between goal-related years and the absolute reference point (RP) indirectly obtained from the quantitative analysis.

## Discussion

The objective of this study was to assess the outcome in the CE gamble that seems closest to, or seems to include, the reference point. Additionally, the psychology behind the reference point was explored. To the best of our knowledge, no other studies have collected, in a systematic way, qualitative data on the process of valuing SG data that enabled study of the reference point. The data presented here provide evidence that the offered CE most frequently served as a reference point, and, thus, the life-year CE is most likely perceived as a mixed gamble in which the low outcome is perceived as a loss and the high outcome is perceived as a gain. Also an interaction was observed between the outcome that served as reference point and the time

horizon. A similar interaction was observed between the outcome that loomed largest and the time horizon. Frequently, some, or all outcomes were explicitly perceived as losses. Our qualitative findings argue that the CE life-year gamble is very likely not perceived as an all gains gamble, as has been suggested by Bleichrodt et al. (4). Quantitative data corroborate this finding, arguing that, contrary to a suggestion made by Bleichrodt et al., respondents behaved in a risk-seeking way for life-year CE gambles involving short periods of survival. They behaved in a risk-averse way for all other gambles, particularly so for gambles involving long durations of survival. Since prospect theory predicts risk-seeking behavior for losses, this provides indirect evidence that the reference point will not be zero life years. Indeed, in our quantitative data, only seven respondents showed a reference point of zero life years. Moreover, in our qualitative data, the outcome 'death within a week' never served as a reference point.

We propose two factors that may explain why the offered CE mostly served as a reference point: framing and goals. For all CEs, our qualitative data show that most attention was paid to the offered CE, which was mentioned and compared to most often. In the choice-bracketing search procedure, its value changes with every answer and, as a result, draws most attention. If the task is to be done properly, this is a logical consequence. That most attention was paid to the offered CE is a probable cause explaining why respondents mostly compared goals to that outcome, and to a lesser extent to the high and low outcomes of the gamble. As the offered CE attracts more attention, it renders itself nicely as a starting point for comparisons. Consequently, it serves well as a reference point due to framing of the question. We did not explicitly request information about the reference point and are, therefore, not capable to determine its exact location. Through the use of the choice-bracketing procedure we may have induced a changing reference point in the way one introduces a change in

the reference point by offering respondents a money amount to start with in money gambles.

However, framing cannot explain the shift in the outcomes that served as reference point, which occurred when the gambles involved trade-offs with relatively long and short durations of survival. We propose that goals caused the shift in outcomes that served as reference point because the outcomes closest to a goal-realizing period most likely served as the reference point. Respondents could experience some control over the offered CE, and, thus, the outcome was frequently closest to the goal-realizing period. Consequently, it was most often closest to the reference point. To live for the period in which goal realization is possible appears to underlie the motivational processes (29;43). This notion is supported by combining the quantitative and qualitative data that showed a strong relationship between the explicitly stated goal related period and the reference point indirectly deduced from the quantitative analysis. In non-health settings, it has been shown that the goal itself may serve as a reference point (44). Other research on goals presents related findings, such as Verhoef et al. They also observed a trend towards a lower absolute reference point with increasing age (29). We found no significant relation between age and the reference point. We argue that goals alter the perception of outcomes, as described by prospect theory, by influencing the reference point. This relationship is more apparent for the near future as opposed to the remote future, as goals are mostly set for the near future. Our findings support this. The preference curve shows that the reference point on average lies at 29% of the personal life expectancy and not the long term. Setting goals in the relatively near future enhances self-efficacy, and therefore, expectations of future success; as opposed to setting goals for life years in the long term, for which task mastery is low (44).

To summarize, if the life-year CE gamble involved short periods of time, life years were involved, for which goals were formulated. Consequently, attention shifted to the outcome involving the longest length of time, enhancing the likelihood of realizing set goals. As a result, risk taking increased for short-term gambles. For some respondents, the high outcome even served as the reference point. If a life-year CE gamble involved long durations of survival, few goals appeared set. Consequently, the prospect of goal realization was not in danger. As a result, the outcome closest to the goal-realizing period loomed largest, in this case the low outcome. For some respondents, the low outcome even served as the reference point. Mostly, people minimize risk taking if it is not required, such as for life-year CE gambles involving long durations of survival. Consequently, respondents take fewer risks. Some subjects did not even want to live as long as their remaining life expectancy, e.g. because they anticipated disease at advanced age. This could serve as a confounder in utility assessment.

Our findings also follow Lopes' SP/A (security-potential/aspiration) theory, a descriptive two-factor theory. The security-potential factor reflects the way that a person usually looks at risk, allowing for a perceptual change with respect to risk. This change depends on the second factor, the aspiration level. The aspiration level is a kind of reference point, but situational. It can be task dependent. Choices involve a balance between one's disposition towards risk (Lopes: degree of preference for Security versus Potential) and the opportunities of the situation, i.e. goals that can be realized during a number of years offered in an outcome (Lopes: Aspiration level) (45;46). The idea that goals strongly influence motivations has also been reported in other studies in other disciplines (39;43;47).

One of the limitations of our study was the order of the elicitations. The CE50 was always performed first. Subsequent CEs rely on the results (and possible errors) from the CE50 assessment, and this may lead to an upward or downward bias. To minimize the undesirable effect of error propagation, respondents were given two examples as well as an extensive verbal and written explanation beforehand. Due to verbalization and the presence of a researcher during the task, errors with respect to the task were noticeable and immediately corrected during the examples. We believe that due to these measures errors were minimized. However, a learning process was still observed. There were few "reference points" coded during the CE50, and much attention was paid to the offered CE. Moreover in the CE50, the high outcome (i.e. life expectancy) most frequently served as the reference point. The life expectancy appeared to influence the reference point when respondents first started the interview. A further limitation to our study was that about half of our sample consisted of university students. This may have implications for the extent to which our findings can be generalized. A further important point is that the findings are applicable only to the choice-bracketing elicitation method. If utilities had been derived using the matching method, these findings may have been different. Additionally, the think-aloud protocol is not without limitations. We were unable to code that which respondents did not verbalize.

## Conclusions

On the basis of direct and indirect evidence, we conclude that the offered CE most often serves as the reference point and, therefore, that a life-year CE gamble is most likely perceived as a mixed gamble. This can have important consequences for economic evaluations, since for mixed gambles the corrected valuations differ from the uncorrected valuations (11;34). Framing and goals influence the outcome that served as reference point. Goals also cause an interaction between the time horizon and the attention paid to an outcome. We argue that motivational constructs should be incorporated into research of the reference point. Additionally, when patient preferences are involved in treatment decisions, it is desirable to address a patient's goals, because these influence preferences.

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<sup>i</sup> Strictly speaking, to circumvent a Catch-22 situation, our analysis is based on inconsistent assumptions. First, assuming expected utility (EU), the utility of the certain outcome in each CE is calculated as the (untransformed) EU of the corresponding 50-50 gamble. Next, the inflection point of the thus estimated S-shaped utility curves is interpreted as the reference point assuming prospect theory. Considering the results of the linear regression analysis, however, we have confidence that this procedure results in a good estimate of the reference point.

**Appendix 3A. Stimulus screen**

Imagine you have a choice between 1, 2, and 3.

*Choice 1*

A gamble between:

-a 50% chance of living in good health for

.. years and .. month(s), and

-a 50% chance of dying within one week.

*Choice 2*

A guarantee (100%) that you will live in good health for

.. years and .. month(s).

*Choice 3*

I have no preference, for me choices 1 and 2 are equal.

Press, according to your choice 1, 2, or 3.



