Conventional and Chained Standard Gambles in the Assessment of Coronary Heart Disease Prevention and Treatment

LYNE LALONDE, PhD, ANN E. CLARKE, MD, MSc,
LAWRENCE JOSEPH, PhD, STEVEN A. GROVER, MD, MPA, and
THE CANADIAN COLLABORATIVE CARDIAC ASSESSMENT GROUP*

The authors compared the abilities of descriptive and valuational health-related quality-of-life measures to discriminate healthy participants (n = 39) from those on diets for dyslipidemia (n = 35) and angina patients (n = 30). On the rating scale, the time tradeoff, and the General Health Perception subscale of the SF-36 Health Survey, the participants with dyslipidemia or angina reported lower mean scores than the healthy participants. No differences were detected between these groups on conventional or chained standard gamble (SG) scales. The distribution of the conventional and the chained SG scores was very skewed, with the vast majority of scores being equal or very close to the maximum score. It is concluded that in this study the discriminant ability of the chained SG was comparable to that of the conventional SG and inferior to descriptive and non-risky valuational scaling techniques. This may be explained by the distortion of probabilities, by a misunderstanding of the SG chained assessment, and by a strong certainty effect. *Key words:* dyslipidemia; coronary heart disease prevention; angina; health-related quality of life; health status; SF-36 Health Survey; validity. **(Med Decis Making 1999;19:149–156)**

The pharmacoeconomic evaluation of primary preventive interventions is highly dependent upon the interventions' immediate effects on the participants' health-related quality of life.[1,2] Although the negative impact of such interventions on quality of life may be small, the net impact on quality-adjusted life years (QALYs) during those interventions may be large if the interventions last for very long periods of time, do not substantially increase life expectancy or decrease the incidence of the preventable disease, and affect most participants, including those who will never develop the preventable disease. Furthermore, the discounting of future outcomes amplifies the short-term negative impact of preventive interventions on the quality of life and attenuates the long-term positive impact related to the prevention of diseases. Accordingly, accurate evaluation of any negative impact of preventive interventions on the quality of life of participants may be particularly important.

There is no consensus on the most appropriate valuational scaling technique to estimate the health-related quality of life for cost–effectiveness analysis.[3] The standard gamble (SG) is often considered the standard criterion with which the other valuational scaling techniques are to be compared, because it is based on solid theoretical foundations.[4–6] Measuring the utilities associated with primary prevention programs with a conventional SG consists of asking individuals receiving primary preventive treatment to choose between their *current health* and a risky alternative with specific probabilities of a better outcome (*perfect health*) and a worse outcome (*immediate death*) (figure 1). Unlike other scaling techniques, the SG measures not only the strengths of preferences for health conditions but also the respondents' attitudes toward risk. Because most medical decisions are risky, the inclusion of a

Received February 12, 1998, from the Division of Clinical Epidemiology (LL, AEC, LJ, SAG); the Centre for the Analysis of Cost-Effective Care (SAG); and the Divisions of General Internal Medicine (SAG) and Clinical Immunology and Allergy (AEC) of the Montreal General Hospital, and the Departments of Medicine (SAG, AEC), Epidemiology and Biostatistics (LL, LJ, SAG), and Mathematics and Statistics (LJ) of McGill University, Montreal, Quebec, Canada. Revision accepted for publication December 8, 1998. Presented at the annual meeting of the Society for Medical Decision Making, Houston, Texas, October 1997. Supported by a research grant from The Dairy Farmers of Canada.

Address correspondence and reprint requests to Dr. Grover: The Division of Clinical Epidemiology (L 10.521). The Montreal General Hospital, 1650 av. Cedar, Montreal (Quebec), H3G 1A4, Canada.

*Including: L. E. Cassidy, MD, L. Green, MD, D. Larochelle, DT.P., R. Motchula, DT. P., J. McCans, MD, P. J. McLeod, MD, R. Repa Fortier, DT. P., J. A. Stewart, MD, from the Montreal General Hospital; and D. W. Blank, MD, F. Charbonneau, MD, B. M. Gilfix, MD, M. Sami, MD, M. H. Sherman, MD, and M. Smilovitch, MD, from the Royal Victoria Hospital, Montreal, Quebec, Canada.

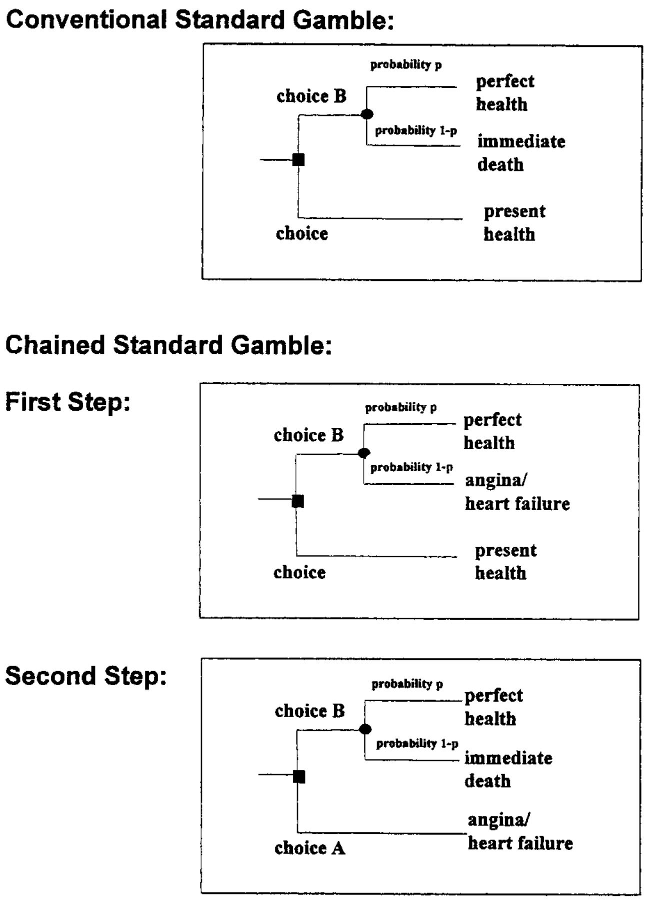

FIGURE 1. Conventional and chained standard gambles.

participant's risk attitude in the assessment of preferences is often seen as an advantage and is used to justify the selection of this scaling technique over the non-risky valuational instruments in cost–effectiveness analyses.[7,8]

Decisions involving risky outcomes have been shown to be influenced by the distortion-of-probabilities phenomenon.[9,10] This phenomenon describes how people perceive probabilities; small probabilities are usually overweighted, while intermediate and high probabilities are underweighted. Tversky and Kahneman have empirically measured how the probabilities of monetary outcomes are transformed and provided a mathematical function describing how probabilities of monetary outcomes are transformed into weights.[10,11]

According to Tversky and Kahneman, when people are faced with a risky decision, the probability of each outcome is first transformed. For example, imagaine a patient needs to choose between living with his or her impaired health state or undergoing a risky surgical procedure where the risk of dying during the operation is equal to 20%. In this situation, if we apply the weighting function reported by Tversky and Kahneman,[10] the probability of death would be overweighted and perceived as being equal to 36%. This overweighting of probabilities would contribute to decreasing the attractiveness of surgery.

We expect that participants involved in primary prevention programs may value their *current health* as being very good and consequently, be tempted to choose the lottery outcome of a conventional SG only when the probability of *immediate death* is around or below 5%. In addition, the overweighting of low probabilities and the underweighting of high probabilities may contribute to decreasing the attractiveness of the SG lottery outcome. Consequently, a large proportion of participants may choose their current health over the lottery alternative even when the probability of *immediate death* is small. In these circumstances, the measured utility for the *current health* of participants involved in preventive interventions may be very high and close or equal to the utility for *perfect health*. If this were the case, it would be very difficult to discriminate between respondents who were involved in primary preventive programs and those who were not.

The chained SG approach has been proposed as a solution to improve the accuracy of the SG for the measurement of health states with high utility.[8] It consists of replacing the worse outcome of the lottery (*immediate death*) by a less severe condition. In a second step, the less severe condition is assessed using *perfect health* and *immediate death* as the lottery outcomes. To our knowledge, the chained approach has rarely been used or compared with other scaling techniques.[12–14]

The objective of this study was to measure the health-related quality of life of healthy participants with and without treatment for dyslipidemia and angina patients with the conventional SG and a chained SG, the time tradeoff (TTO), the rating scale (RS), and the SF-36 General Health Perception (GHP) subscale. The abilities of these scaling techniques to discriminate these groups of participants were compared.

Method

STUDY POPULATION

This study was part of a large cross-sectional, hospital-based survey designed to assess the valuational quality-of-life measures of health states involved in coronary heart disease prevention and treatment. Participants were recruited among outpatients attending the cardiology and the internal medicine clinics. We also evaluated accompanying friends and family members of patients undergoing outpatient surgery and hospital workers at a major university hospital in Montreal.

Study participants were recruited between April 1995 and October 1995. Men and women 30 to 74 years old were classified into three study groups: Healthy, Dyslipidemia, and Angina. Participants were classified in the Angina group if a diagnosis of angina was reported on a hospital discharge summary or on a clinic note, had been present for at least six months, and had entailed a prescription for nitroglycerin. Participants without a heart problem were assigned to the Dyslipidemia group if they reported following, for at least one month, a prescribed diet to lower their serum cholesterol and if they were not taking lipid-lowering agents. Participants without heart problems and dyslipidemia were included in the Healthy group.

Specific eligibility criteria were used to control for comorbidity. We excluded pregnant women, all subjects with temporary illnesses such as a cold, and Healthy and Dyslipidemia subjects currently trying to quit smoking. In addition, subjects were asked to report any other health problem confirmed by a physician. Subjects in the Dyslipidemia and Healthy groups who reported symptoms from comorbid conditions in the preceding four weeks were not eligible for enrollment. We also asked the Angina patients which health problem had most affected their quality of life in the preceding four weeks. They were eligible for participation only if they answered *none* (meaning they had not been bothered by any health problem), *angina*, or *a coronary heart disease risk factor* (hypertension or dyslipidemia).

OUTCOME MEASURES

During the interviews, various questionnaires were administered. Participants first completed the SF-36 Health Survey. Thereafter, the medical history was reviewed in a face-to-face interview, and the valuational quality-of-life assessment was administered by one of four trained interviewers.

The SF-36 Health Survey is a generic quality-of-life questionnaire describing eight different aspects of the quality of life.[15–17] Among those, the SF-36 GHP subscale represents an overall evaluation of health, including current health, health outlook, and resistance to illness.[18] This subscale is the most closely related to the valuational assessment and was used as a comparative scaling technique.

The valuational quality-of-life assessment included the RS, the TTO, the conventional SG, and the chained SG. The RS was administered first, and the orders of presentation of the TTO and the SG were randomized. For each scaling technique, participants were first asked to rate a hypothetical health state, *blindness*, to familiarize themselves with the assessment.

Before the valuational assessments, participants read a narrative description, written in the second person, of five health states: *perfect health*, *immediate death*, *blindness*, their *present health*, and either *angina* for participants in the Healthy and the Dyslipidemia groups or *heart failure* for participants in the Angina group. The participants were told that each health state would last for a specific duration of time, after which they would die without pain. The duration of each health state was based on the Canadian age- and gender-specific life expectancy for the Healthy and the Dyslipidemia groups.[19] A shorter duration was used for the Angina participants. Health-state descriptions and duration were kept constant across all scaling techniques.

For the RS, we used a 30-cm feeling thermometer with 100 graduations.[8] *Perfect health* and *immediate death* were placed by the interviewer at the top (score = 100) and bottom (score = 0) of the scale, respectively. The participants were asked where they would place their *present health* on the thermometer. The RS score was the distance between the location of their *present health* and *immediate death*. The Healthy and the Dyslipidemia participants also rated the hypothetical health state *angina* and the Angina participants rated *heart failure*. For simplicity, health states considered to be worse than death were given a score of zero. This procedure had no or very little impact on our results, because no participant rated *present health* as being worse than death, and only three participants rated *angina* or *heart failure* as being worse than death.

For the TTO, participants were given the choice between living in *perfect health* for time t or living with their *present health* for time x, where $t < x$. Time t was varied in a three-step ping-pong approach until the participant became indifferent between the two choices. In the first step, time t varied across the maximum ($t = x$) and the minimum (t = *immediate death*) duration to identify the indifference point area within a five-year period. In the second step, time t was varied within the indifference-point area with a precision of one year. Those refusing to give up one year of life underwent a third step where they were asked if they would be willing to give up 3, 6, or 9 months of life. The value of the participant's *present health* was equal to $[(t/x)100]$ at the indifference point. To facilitate the assessment, we used a visual aid similar to the one developed by the McMaster group.[8]

The SG assessment was administered using conventional and chained procedures (figure 1). The conventional SG was always administered first and consisted of offering participants the choice between their *present health* (choice A) and a lottery (choice B) with a probability p of *perfect health*, and a probability $(1 - p)$ of *immediate death*. The probability p was changed, using a two-stage ping-pong approach, until the participants were indifferent between the two choices. At the indifference point, the utility of the participant's *present health* [*u*(*present health*)] was equal to:

$$u(\textit{present health}) = [pu(\textit{perfect health})] + [(1 - p)u(\textit{immediate death})]$$

We assumed the utilities of *perfect health* and *immediate death* to be equal to 100 and 0, respectively, so that the utility of the participant's *present health* was equal to (100 *p*), where *p* was the probability of *perfect health* at the indifference point.

The chained SG consisted of a two-step procedure (figure 1). In the first step, participants were asked to choose between their *present health* (choice A) and a lottery (choice B) with a probability p_1 of *perfect health* and a probability $(1 - p_1)$ of either *angina* or *heart failure*. We used *angina* for the participants in the Healthy and the Dyslipidemia groups and *heart failure* for the participants in the Angina group. The probability p_1 was changed, using a two-stage ping-pong approach, until the participants were indifferent between the two choices. For the participants in the Healthy and the Dyslipidemia groups, the utility of the participant's *present health* was equal to:

$$u(\textit{present health}) = [p_1u(\textit{perfect health})] + [(1 - p_1)u(\text{angina})]$$

and for the participants in the Angina group it was equal to:

$$u(\textit{present health}) = [p_1u(\textit{perfect health})] + [(1 - p_1)u(\textit{heart failure})]$$

The second step of the chained SG consisted of assessing the utility of the hypothetical health state, *angina* or *heart failure*, using a lottery with extreme outcomes: *perfect health* and *immediate death*. Again, we assumed the utilities of *perfect health* and *immediate death* were equal to 100 and 0, respectively, and the utility of the health state under evaluation was defined to be equal to:

$$u(\textit{angina or heart failure}) = 100p_2$$

By combining the results of the first and the second steps, we estimated the utility of the participant's *present health*:

$$u(\textit{present health}) = 100p_1 + [(1 - p_1)100p_2]$$

All SG assessments were administered by first varying the probability of the worse outcome of the lottery across the lower (0%) and the upper (100%) levels of probability with a precision of 10% to identify the indifference-point area. Then, the probability was varied within the specific indifference area with a precision of 1%. The lowest probability of the worse outcome was equal to 1%. A visual aid was used to facilitate the understanding of probability where each 1% risk of the worse outcome of the lottery was represented by shading one of one hundred faces.[20]

Table 1 • Characteristics of Participants

Total sample	104 (100%)
Healthy	39 (38%)
Diet	35 (34%)
Angina	30 (29%)
Age (mean ± SD)	54 ± 12 years
Gender male	48 (46%)
Education	
Secondary school incomplete	19 (19%)
Secondary school	23 (23%)
C.E.G.E.P. or equivalent	33 (33%)
University	26 (26%)
Occupation	
Employed	52 (52%)
Unemployed	3 (3%)
Retired	29 (29%)
Keeping house or student	16 (16%)
Current marital status	
Single	12 (12%)
Married	75 (73%)
Divorced/separated	11 (11%)
Widowed	5 (5%)
Current language	
French	27 (26%)
English	64 (62%)
Other	12 (12%)
Annual household income	
<$20,000.00	9 (10%)
$20,000.00 and <$40,000.00	21 (24%)
$40,000.00 and <$60,000.00	26 (30%)
>$60,000.00	30 (35%)

STATISTICAL ANALYSIS

We computed the difference between the mean score of the Healthy group and that of either the Dyslipidemia group or the Angina group and the 95% confidence interval (CI) around the mean difference. We obtained almost identical results when the 95% CIs were computed assuming equal and unequal variances. Only the results assuming unequal variances are reported.

Results

We performed a total of 104 interviews with eligible participants. We report in table 1 the sociodemographic profile of the participants. Their mean age was 54 years. Men and women were equally represented, and they reported various levels of education, occupation, marital status, language, and income. The face-to-face interviews lasted, on average, 42 minutes (SD = 12 min). All participants completed the interview. We rejected 11 (11%) TTO assessments because errors were retrospectively detected in the sequences of the presentation of the choices. Two SF-36 GHP subscale scores were missing because of incomplete information. Scores from all other valuational assessments were obtained from all participants.

The participants in the Dyslipidemia group reported, on average, lower scores than did those in the Healthy group on the RS, the TTO, and the SF-36 GHP subscale (figure 2). However, the 95% CI around the mean TTO difference was large and included zero. There was no difference between these two groups on the conventional SG and the chained SG.

With all scaling techniques, the participants in the Angina group reported lower mean scores than the participants in the Healthy group. However, the smallest difference was observed with the conventional SG, and the 95% CI around the mean difference included zero. The chained approach slightly increased the mean difference between the Healthy and the Angina groups. However, as reported in table 2, the median chained SG score of the Healthy group and the median chained SG score of the Angina group were almost identical (99.8 versus 99.0), suggesting that the observed mean difference between these two groups was mainly influenced by marginal observations. These results demonstrate that, in contrast to the SF-36 GHP subscale and the non-risky valuational techniques, the conventional SG and the chained SG poorly discriminated Healthy participants from those in the Dyslipidemia and Angina groups.

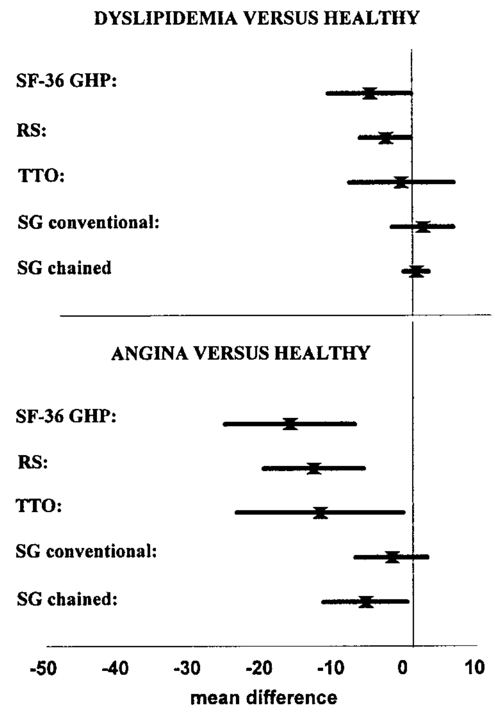

FIGURE 2. Mean difference (95% confidence interval) between scores from participants with dyslipidemia or patients with angina and healthy participants measured on the SF-36 General Health Perception (SF-36 GHP) subscale, the rating scale (RS), the time tradeoff (TTO), and the conventional and chained standard gamble (SG) scales.

As shown in figure 3, the distribution of the chained SG scores was more skewed than that of the conventional SG scores, the non-risky techniques, and the SF-36 GHP subscale. These results indicate that the chained approach did not increase the attractiveness of the SG lotteries.

Table 2 • Mean (Median) Valuational and SF-36 General Health Perception Subscale Scores by Study Group

	Healthy (n = 39)	Diet (n = 35)	Angina (n = 30)
SF-36 General Health Perception	83.5 (85.0)	76.7 (75.0)	67.5 (70.0)
Rating scale	93.7 (95.0)	89.0 (90.0)	81.0 (82.5)
Time tradeoff	92.1 (99.5)	89.6 (95.6)	80.3 (85.0)
Standard gamble conventional	94.2 (98.5)	94.7 (100.0)	92.4 (98.3)
Standard gamble chained	98.3 (99.8)	97.9 (100.0)	92.8 (99.0)
First step*	95.3 (99.0)	90.6 (100.0)	82.6 (93.5)
Second step	72.8 (79.5)†	77.1 (79.5)†	51.8 (54.3)‡

*Probability of *perfect health* at the indifference point.
†Assessment of the hypothetical health state *angina* against a gamble with extreme outcomes (*perfect health* and *immediate death*).
‡Assessment of the hypothetical health state *heart failure* against a gamble with extreme outcomes (*perfect health* and *immediate death*).

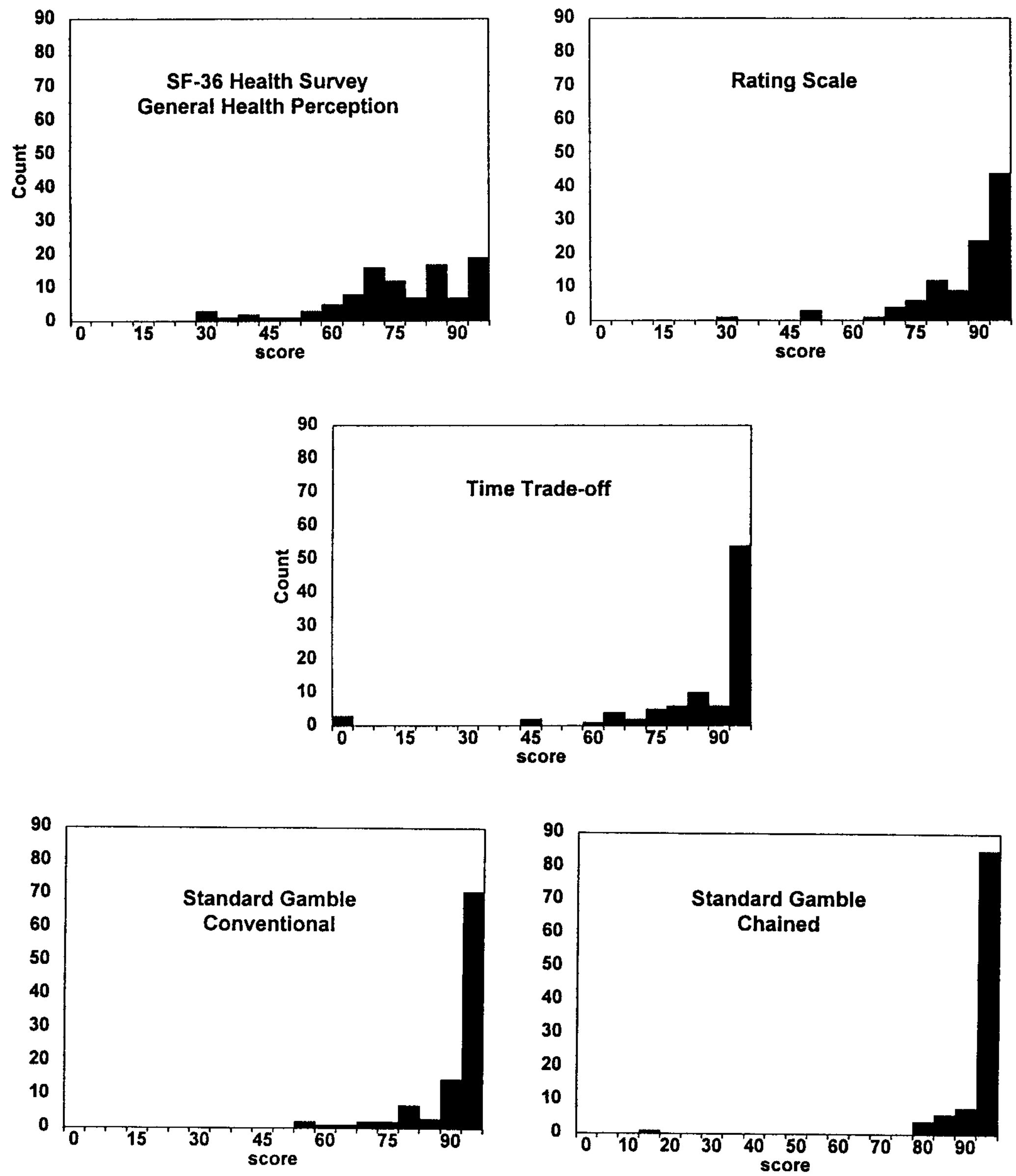

FIGURE 3. Histograms of the health-related quality-of-life measures for the participants' current health (n = 104).

We compared the gambling strategy of each participant in the conventional SG and the first step of the chained approach. We observed that the proportion of participants who did not change their gambling strategy between the conventional SG and the chained SG was high, equal to 33% for the Angina group and 46% for the Healthy and Dyslipidemia groups. Although all participants but three rated *angina* or *heart failure* as being better than *immediate death* on the RS, 23% of the participants were less willing to gamble when the worse outcome of the lottery was less severe. These results provide evidence that, for the majority of participants, the use of the chained approach to assess the utility of their current health did not increase their willingness to gamble.

Discussion

Healthy, Dyslipidemia, and Angina participants rated their current health using a conventional SG and a chained SG, non-risky valuational scales, and the SF-36 GHP subscale. The mean difference between the Healthy and either the Dyslipidemia or the Angina participants on the RS, the TTO, and the SF-36 GHP subscale suggests that participants in the Dyslipidemia and Angina groups did not perceive themselves as being as healthy as the participants in the Healthy group. The conventional SG detected no difference between the Healthy and Dyslipidemia groups and a small, nonsignificant difference between the Healthy and Angina groups. The use of the chained approach did not improve the ability of the SG to discriminate Healthy participants from those in either the Dyslipidemia or the Angina group.

We anticipated that the overweighting of the probability of *immediate death* would decrease the attractiveness of the SG lottery outcome, and the capability of the conventional SG to discriminate Healthy participants from those in the Dyslipidemia and Angina groups. We observed that the conventional SG had very poor discriminant ability compared with non-risky valuational measures, which seems to be related to the skewness of the distribution of the SG scores, where most participants, even those with angina, rated their *current health* as being equal or very close to *perfect health*.

We designed the chained SG to reproduce more realistically the participants' attitudes when faced with the decision to treat dyslipidemia. Because untreated dyslipidemic subjects have a higher risk of developing coronary heart disease, we replaced the worse outcome of the lottery, *immediate death*, by *angina*. Similarly, we changed *immediate death* by *congestive heart failure* for angina patients. Changing the *immediate death* outcome by a less severe condition did not increase the willingness of the majority of the participants to gamble, and resulted in an even more skewed distribution. This may be explained by an increase of the intensity of the distortion of probabilities, by a misunderstanding of the chained SG assessment, and by a strong certainty effect.

The chained SG may increase the distortion of probabilities by moving down the indifference point. Tversky and Kahneman have shown that the overweighting of low probabilities and the underweighting of high probabilities for monetary outcomes are maximal when the probabilities are around 15% and 85%, respectively.[10,11] If this is applicable in a medical context, the chained approach may amplify the distortion of probabilities by moving the indifference point in a probability area where the distortion of probabilities is even more important than at the extremities of the probability scale. In addition, the distortion of probabilities may influence each step of the chained SG. For these reasons, the chained approach may exacerbate the distortion of probabilities and increase the participants' risk aversion. Our results provide some evidence that the probability transformation curve of Tversky and Kahneman for monetary outcomes may apply to health-state assessment. However, this study was not specifically designed to test this hypothesis, and other explanations may explain these results as well.

Although all participants except three rated the less severe lottery outcome (*angina* or *heart failure*) as being better than *immediate death* on the RS, 23% of the participants were less willing to gamble when the worse outcome of the SG lottery was less severe. These choices were inconsistent and may reflect the misunderstanding of the chained approach by a substantial proportion of participants.

Finally, it has been shown that people underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty.[9] Consequently, in the conventional SG and the chained SG, most people who are undergoing dyslipidemia treatment will choose the sure outcome (their *current health*) unless the advantages of the risky choice are considered to be substantial. The SG assessments imply that if participants choose their current health and continue their current dyslipidemia treatment, the risk of dying immediately (conventional SG) or having angina (chained SG) is null. This certainty effect may be so strong that modifying the severity of the worst lottery outcome is insufficient to decrease the participant's risk aversion. In real-life situations, for people with dyslipidemia, this certainty effect does not exist; treating dyslipidemia does not abolish the risk of having a heart problem but simply reduces it. Consequently, we may seriously question the ability of the conventional SG and the chained SG to incorporate risk attitude in a realistic and relevant fashion. Techniques such as the SG paired gamble, which consists of replacing the sure outcome by another lottery alternative, have been designed to avoid the certainty effect and may have the ability to reproduce participants' risk attitudes in a more descriptive manner.[7,21] A simpler alternative may consist of including each participant's current risk of coronary heart disease in the description of the participant's current health. These techniques may be more suitable for the assessment of primary prevention interventions.

We conclude that the conventional SG and the chained SG approach poorly discriminate groups of participants involved in coronary heart disease prevention or treatment. Descriptive and non-risky valuational scaling techniques provide more intuitively reasonable results and appear to be more sensitive than the conventional SG and the chained SG. However, non-risky valuational techniques do not incorporate individuals' attitudes toward risk and are suboptimal for use as quality weights in a cost–effectiveness analysis. Research should continue to find ways to measure the strengths of preferences for health conditions that incorporate the respondents' risk attitudes in a realistic and relevant fashion.

References

1. Krahn M, Naylor CD, Basinski A, Detsky AS. Comparison of an aggressive (U.S.) and a less aggressive (Canadian) policy for cholesterol screening and treatment. Ann Intern Med. 1991;115:248–55.

2. Drummond MF, Heyse J, Cook J, McGuire A. Selection of end points in economic evaluations of coronary-heart disease interventions. Med Decis Making. 1993;13:184–90.
3. Weinstein MC, Siegel JE, Gold MR, Kamlet MS, Russell LB, for the Panel on Cost–Effectiveness in Health and Medicine. Recommendations of the Panel on Cost–Effectiveness in Health and Medicine. JAMA. 1996;276:1253–8.
4. Feeny DH, Torrance GW. Incorporating utility-based quality-of-life assessment measures in clinical trials. Two examples. Med Care. 1989;27:S190–S204.
5. Froberg DG, Kane RL. Methodology for measuring health-state preferences—II: Scaling methods. J Clin Epidemiol. 1989;42:459–71.
6. Gold MR, Patrick DL, Torrance GW, et al. Identifying and valuing outcomes. In: Gold MR, Siegel JE, Russell LB, Weinstein MC (eds). Cost–Effectiveness in Health and Medicine. New York: Oxford University Press, 1996:82–134.
7. Farquhar PH. Utility assessment methods. Management Science. 1984;30:1283–300.
8. Furlong W, Feeny D, Torrance G, et al. Guide to Design and Development of Health-state Utility Instrumentation. CHEPA Working Paper Series. Hamilton, Ontario, Canada: McMaster University, 1990.
9. Kahneman D, Tversky A. Prospect theory: an analysis of decision under risk. Econometrica, 1979;47:263–91.
10. Tversky A, Kahneman D. Advances in prospect theory: cumulative representative of uncertainty. Journal of Risk and Uncertainty. 1992;5:297–323.
11. Wakker P, Stiggelbout AM. Explaining distortions in utility elicitation through the rank-dependent model for risky choices. Med Decis Making. 1995;15:180–6.
12. Nichol G, Llewellyn-Thomas HA, Thiel EC, Naylor CD. The relationship between cardiac functional capacity and patients' symptom-specific utilities for angina: some findings and methodologic lessons. Med Decis Making. 1996;16:78–85.
13. Nease RF. Comorbidities and utility for angina symptoms. Med Decis Making. 1996;16:300–1.
14. Jansen SJT, Stiggelbout AM, Wakker PP, et al. Patient preferences for cancer treatments: a study on the feasibility of a chained procedure for time trade-off and standard gamble (abstr). Med Decis Making. 1997;17:523.
15. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30:473–83.
16. McHorney CA, Ware JE, Raczek AE. The MOS 36-item short-form health survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. Med Care. 1993;31:247–63.
17. McHorney CA, Ware JE, Lu JFR, Sherbourne CD. The MOS 36-item short-form health survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. Med Care. 1994;32:40–66.
18. Ware JE, Snow KK, Kosinski M, Gandek B. SF-36 Health Survey Manual and Interpretation Guide. Boston, MA: Medical Outcomes Trust, 1993.
19. Life Tables, Canada and Provinces, 1990–1992. Catalog # 84-537. Ottawa, Ontario, Canada: Statistics Canada, Health Statistics Division; 1995.
20. Morss SE, Lenert LA, Faustmann WO. The side effects of anti-psychotic drugs and patients' quality of life: patient education and preference assessment with computers and multimedia. Proceeding of the 17th Annual Symposium on Computer Applications in Medical Care. New York: McGraw Hill, 1993: 17–33.
21. Clarke AE, Goldstein MK, Michelson D, Garber AM, Lenert LA. The effect of assessment method and respondent population on utilities elicited for Gaucher disease. Quality of Life Research. 1997;6:169–84.