Options for Summarizing the SF-36 Health Survey in Health-Related Quality of Life Research

Ron D. Hays, Ph.D.

NCI, March 29, 2007 (11:00-11:59 am)

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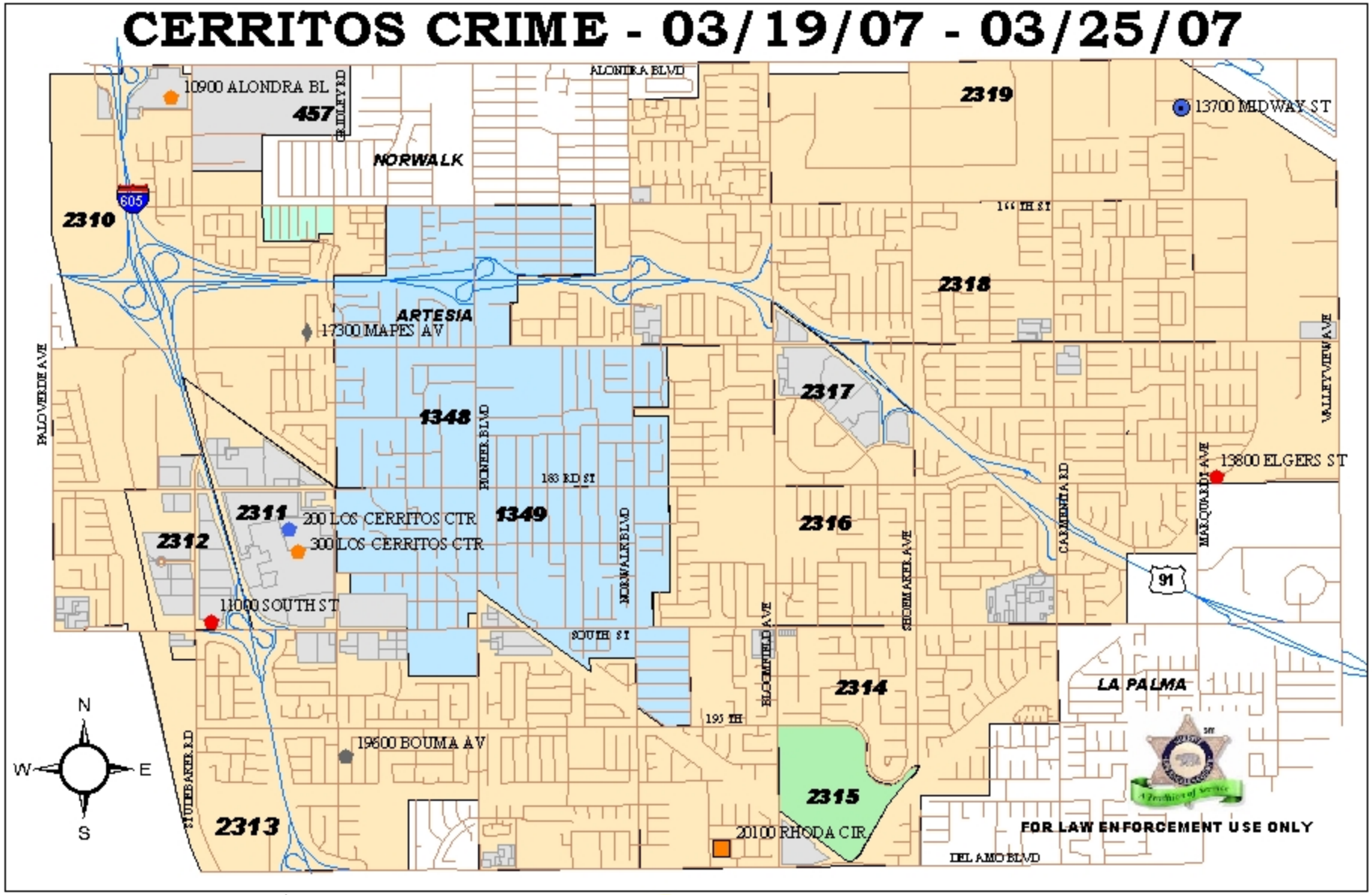
CERRITOS CRIME - 03/19/07 - 03/25/07



☆ ROBBERY (0)

■ BURGLARY: RESIDENCE (1)

▲ BURGLARY: OTHER (0)

⊙ BURGLARY: VEHICLE (1)

AGGRAVATED ASSAULT (0)

⬟ GRAND THEFT VEHICLE (6)

ATTEMPT BURGLARY: VEHICLE (0)

® RECOVERED VEHICLE (0)

♦ ATTEMPT GRAND THEFT: VEHICLE (1)

COLOR SCHEME:

DAYs

EMs

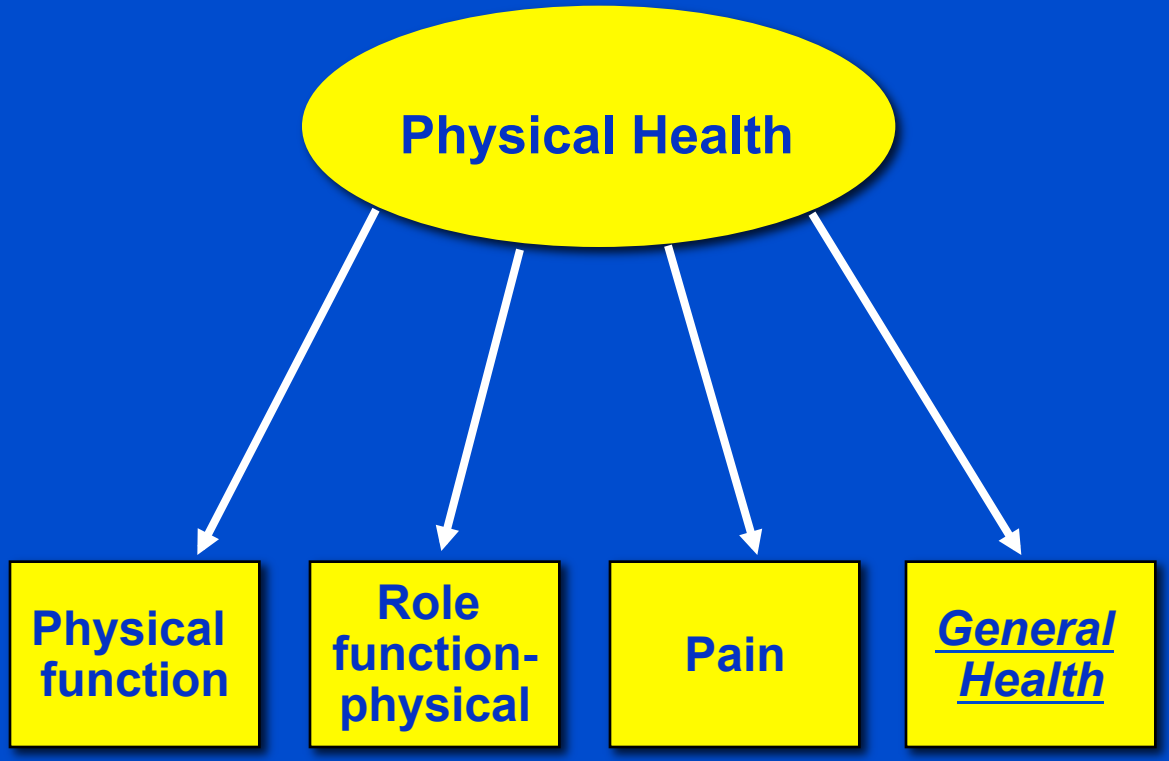
PMs

UNK

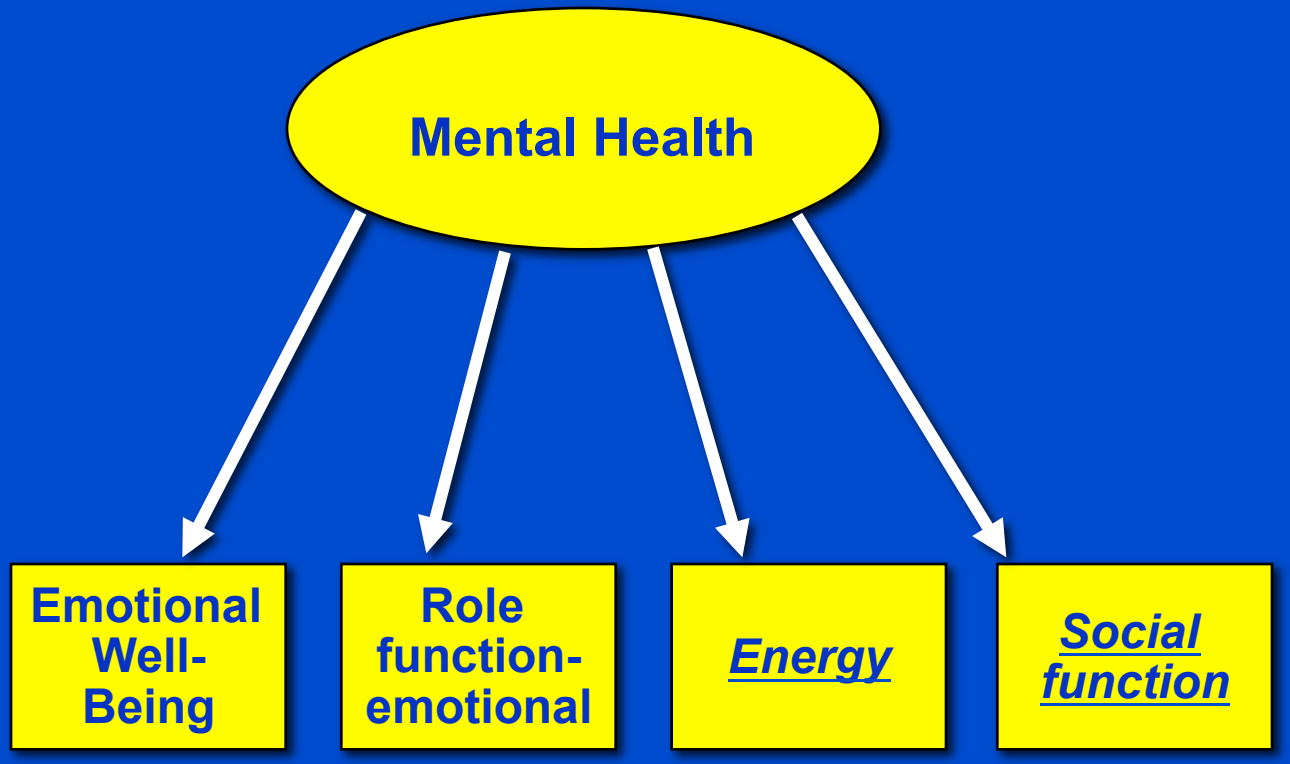
SF-36 Generic Profile Measure

- Physical functioning (10 items)
- Role limitations/physical (4 items)
- Pain (2 items)
- General health perceptions (5 items)
- Social functioning (2 items)
- Energy/fatigue (4 items)
- Role limitations/emotional (3 items)
- Emotional well-being (5 items)

Physical Health



Mental Health



SF-36 PCS and MCS

PCS = (PF_Z * .42402) + (RP_Z * .35119) +
(BP_Z * .31754) + (GH_Z * .24954) +
(EF_Z * .02877) + (SF_Z * -.00753) +
(RE_Z * -.19206) + (EW_Z * -.22069)

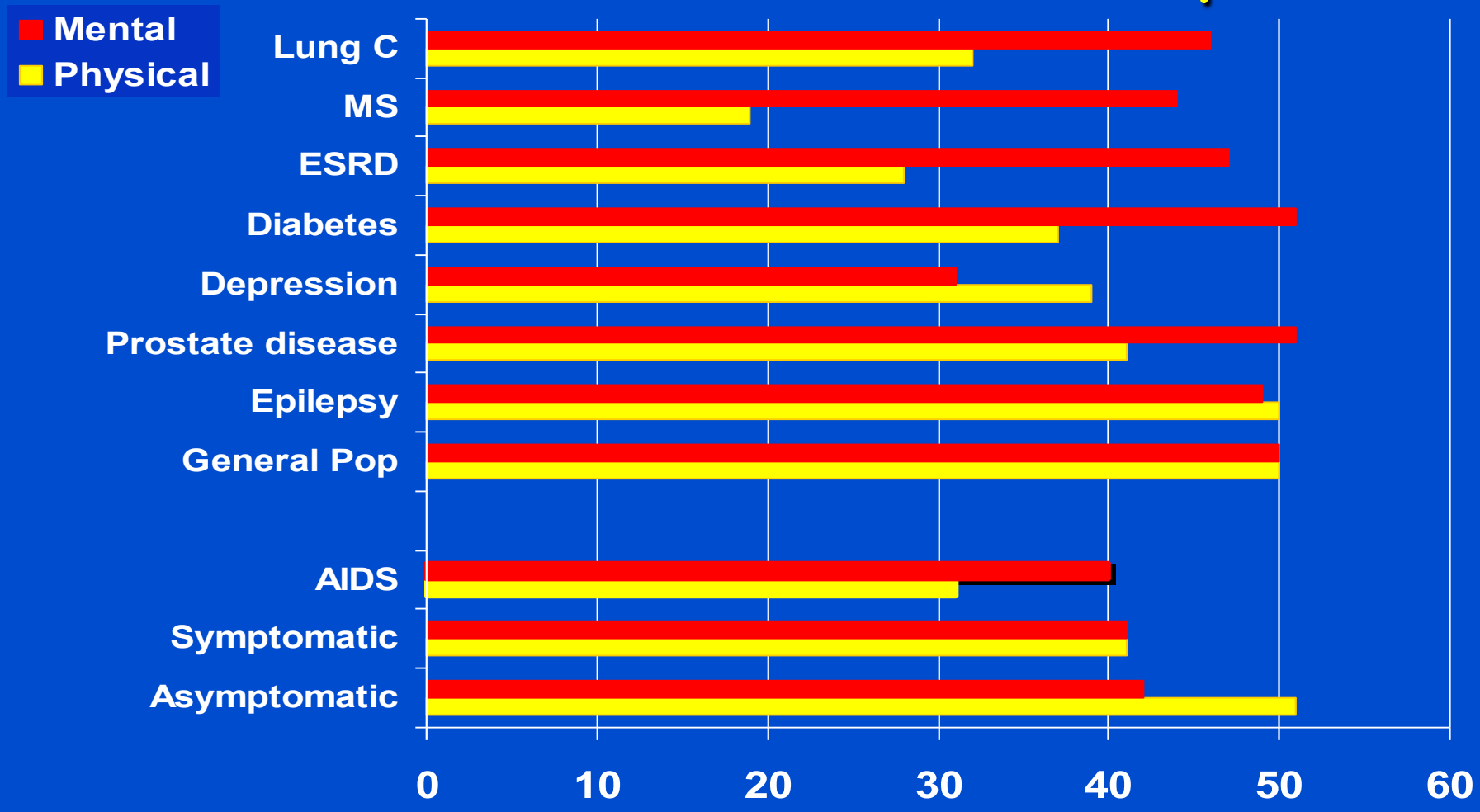
MCS = (PF_Z * -.22999) + (RP_Z * -.12329) +
(BP_Z * -.09731) + (GH_Z * -.01571) +
(EF_Z * .23534) + (SF_Z * .26876) +
(RE_Z * .43407) + (EW_Z * .48581)

T-score Transformation

PCS = (PCS_z*10) + 50

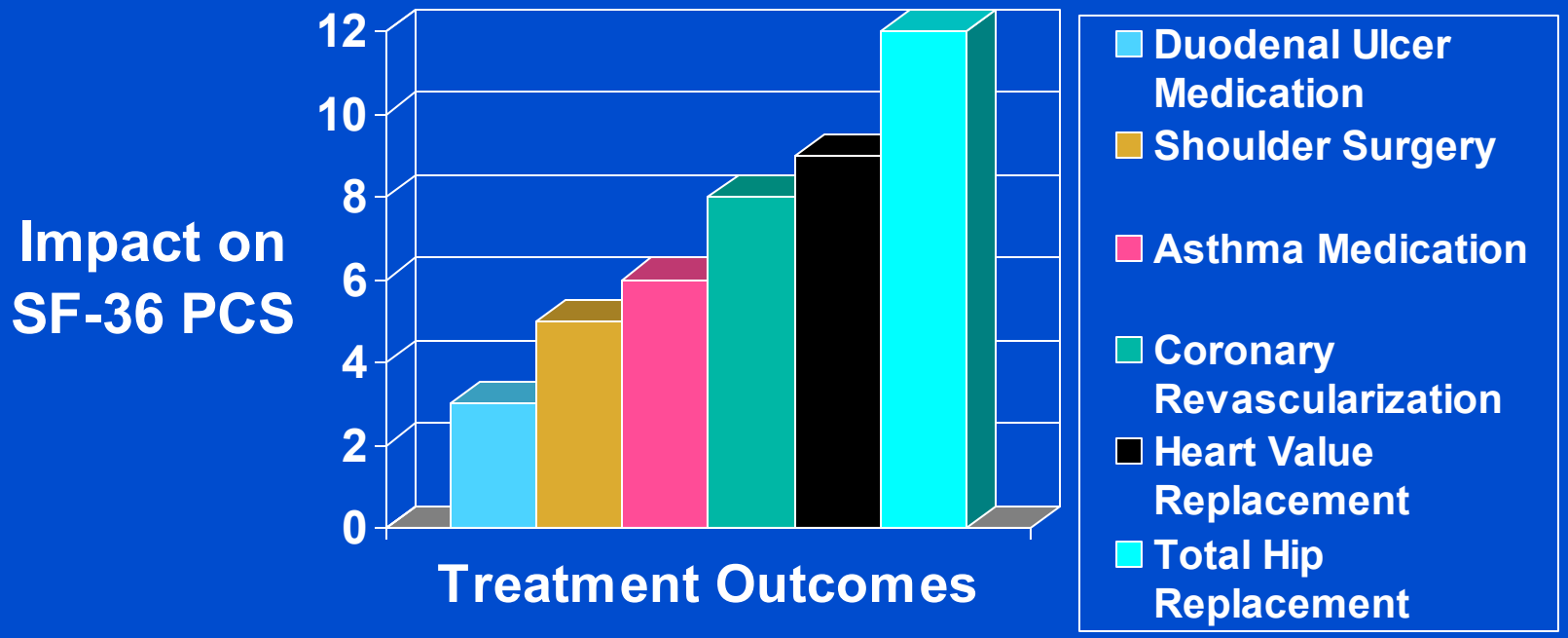
MCS = (MCS_z*10) + 50

HRQOL for HIV Compared to other Chronic Illnesses and General Population

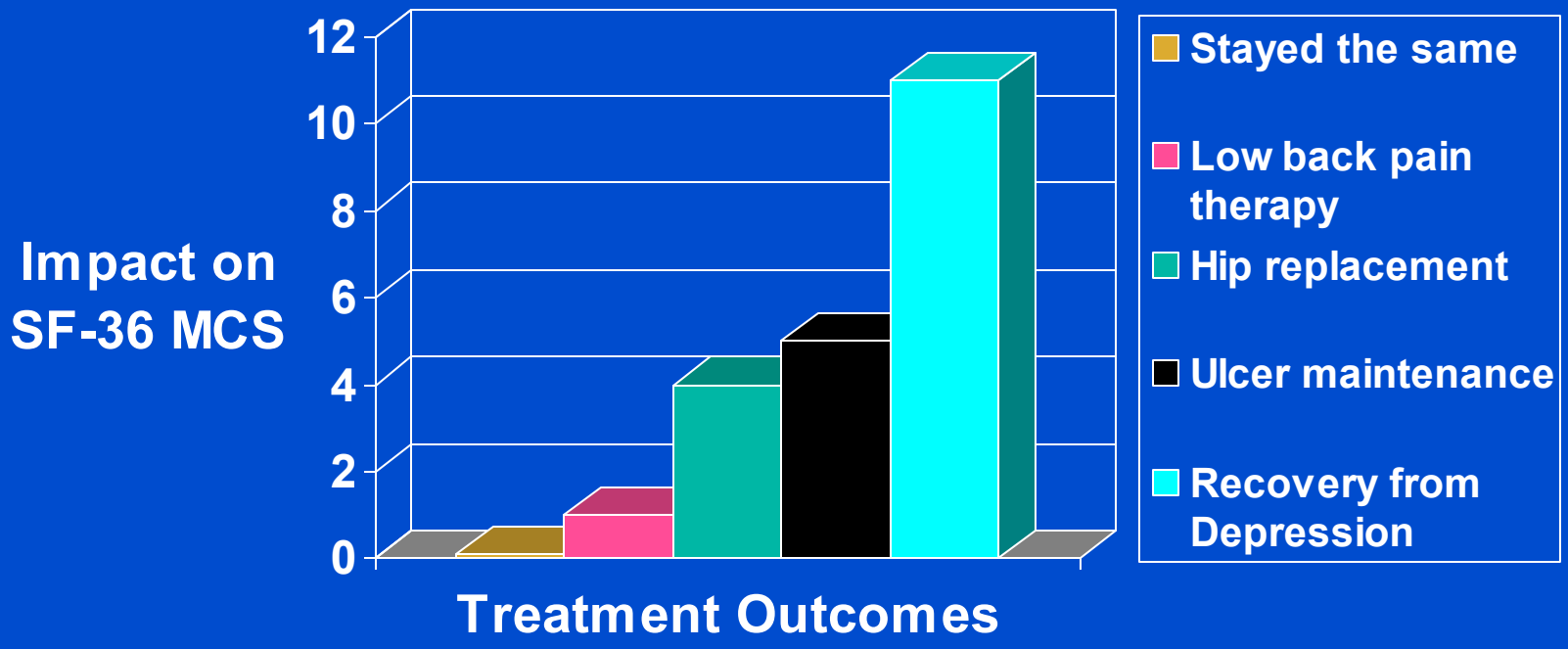


Hays et al. (2000), American Journal of Medicine

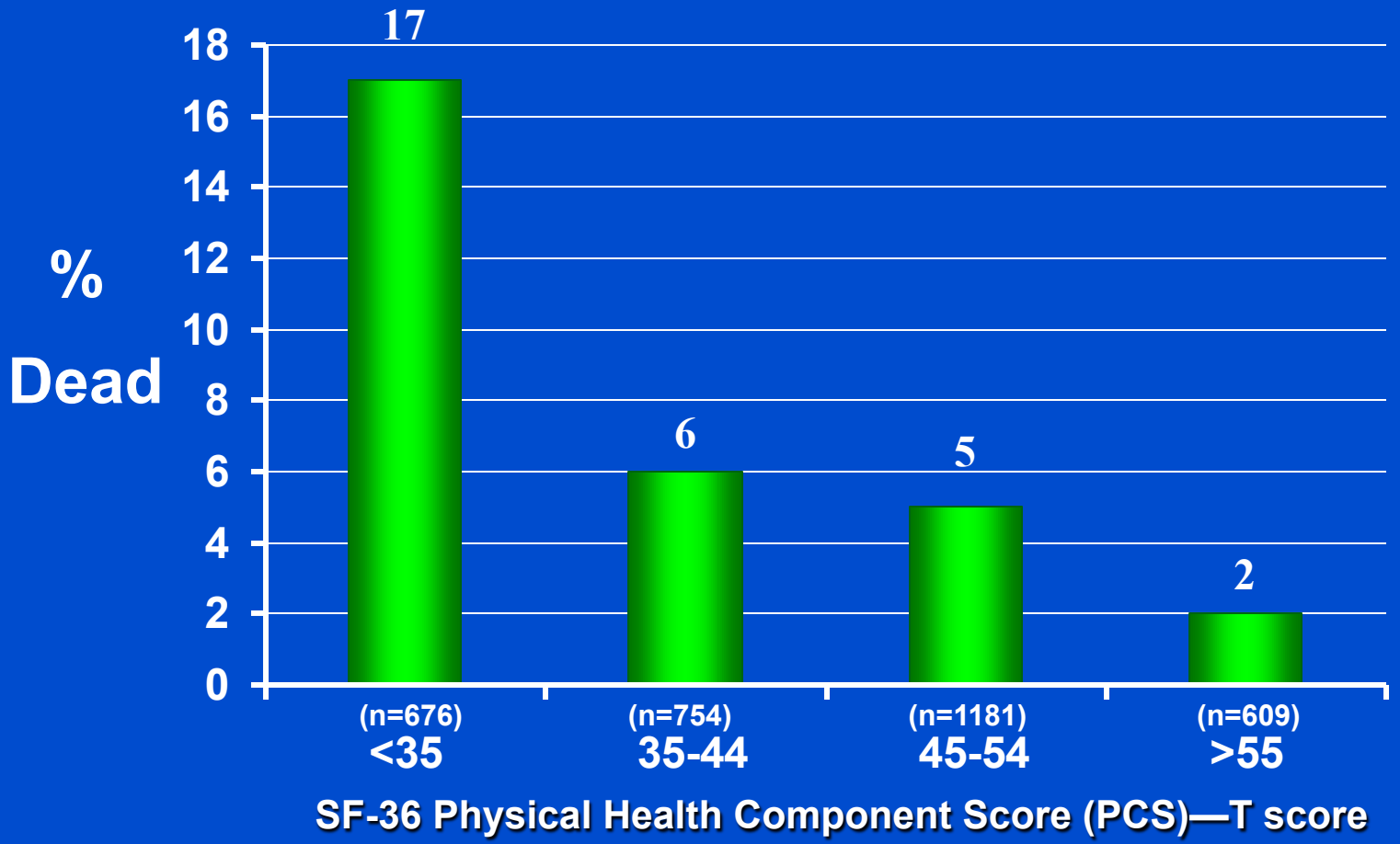
Treatment Impact on Physical Health



Treatment Impact on Mental Health



Self-Reports of Physical Health Predictive of Five-Year Mortality Rates



Ware et al. (1994). SF-36 Physical and Mental Health Summary Scales: A User's Manual.

Weights

Summary scores for SF-36 derived from uncorrelated (orthogonal) two factor (physical and mental health) solution

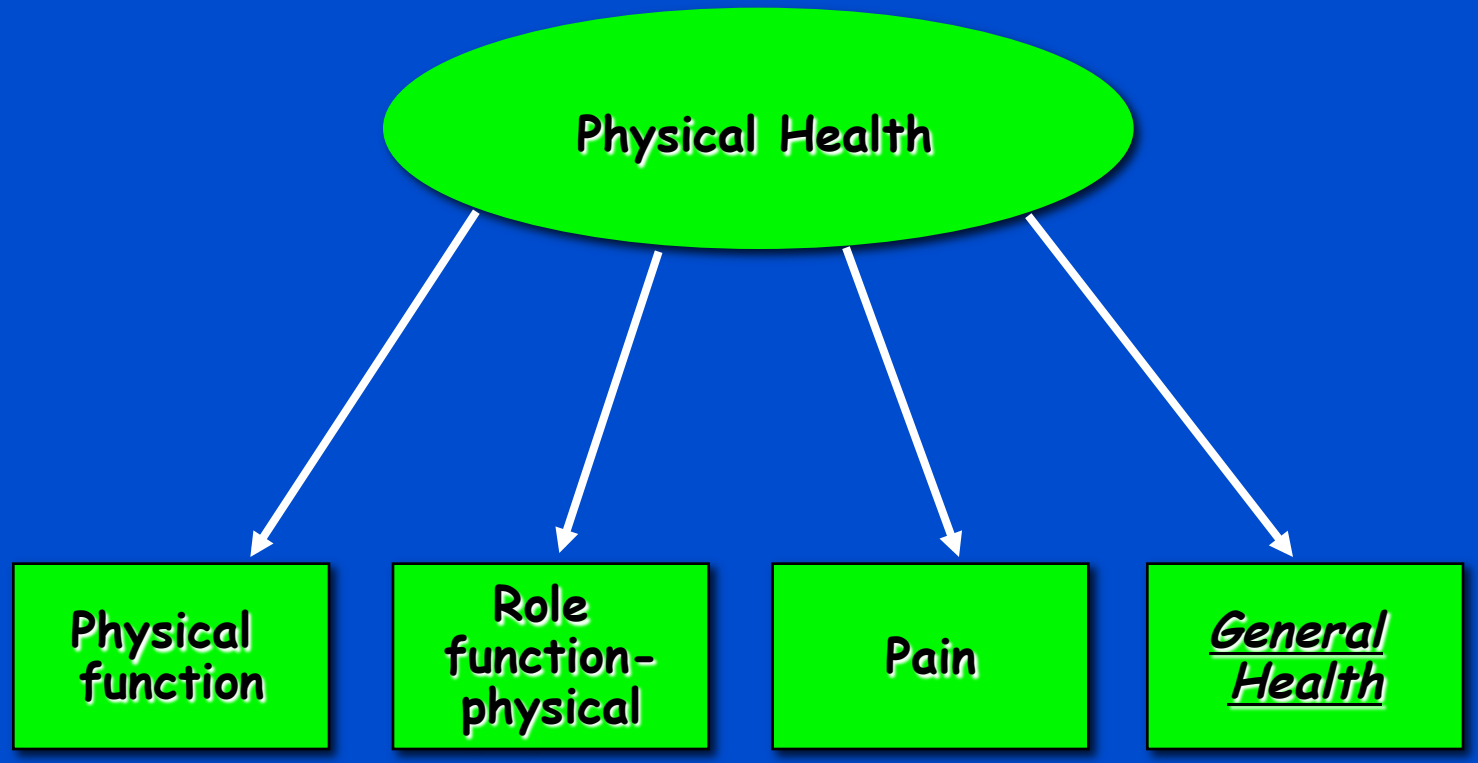
PCS_z = (PF_z*.42) + (RP_z*.35) + (BP_z*.32) + (GH_z*.25) + (EF_z*.03) + (SF_z*-.01) + (RE_z*-.19) + (EW_z*-.22)

MCS_z = (PF_z*-.23) + (RP_z*-.12) + (BP_z*-.10) + (GH_z*-.02) + (EF_z*.24) + (SF_z*.27) + (RE_z*.43) + (EW_z*.49)

Debate About Summary Scores

- Taft, C., Karlsson, J., & Sullivan, M. (2001). Do SF-36 component score accurately summarize subscale scores? Quality of Life Research, 10, 395-404.
- Ware, J. E., & Kosinski, M. (2001). Interpreting SF-36 summary health measures: A response. Quality of Life Research, 10, 405-413.
- Taft, C., Karlsson, J., & Sullivan, M. (2001). Reply to Drs Ware and Kosinski. Quality of Life Research, 10, 415-420.

Four scales improve 0.28-0.49 SD, but physical health summary score doesn't change

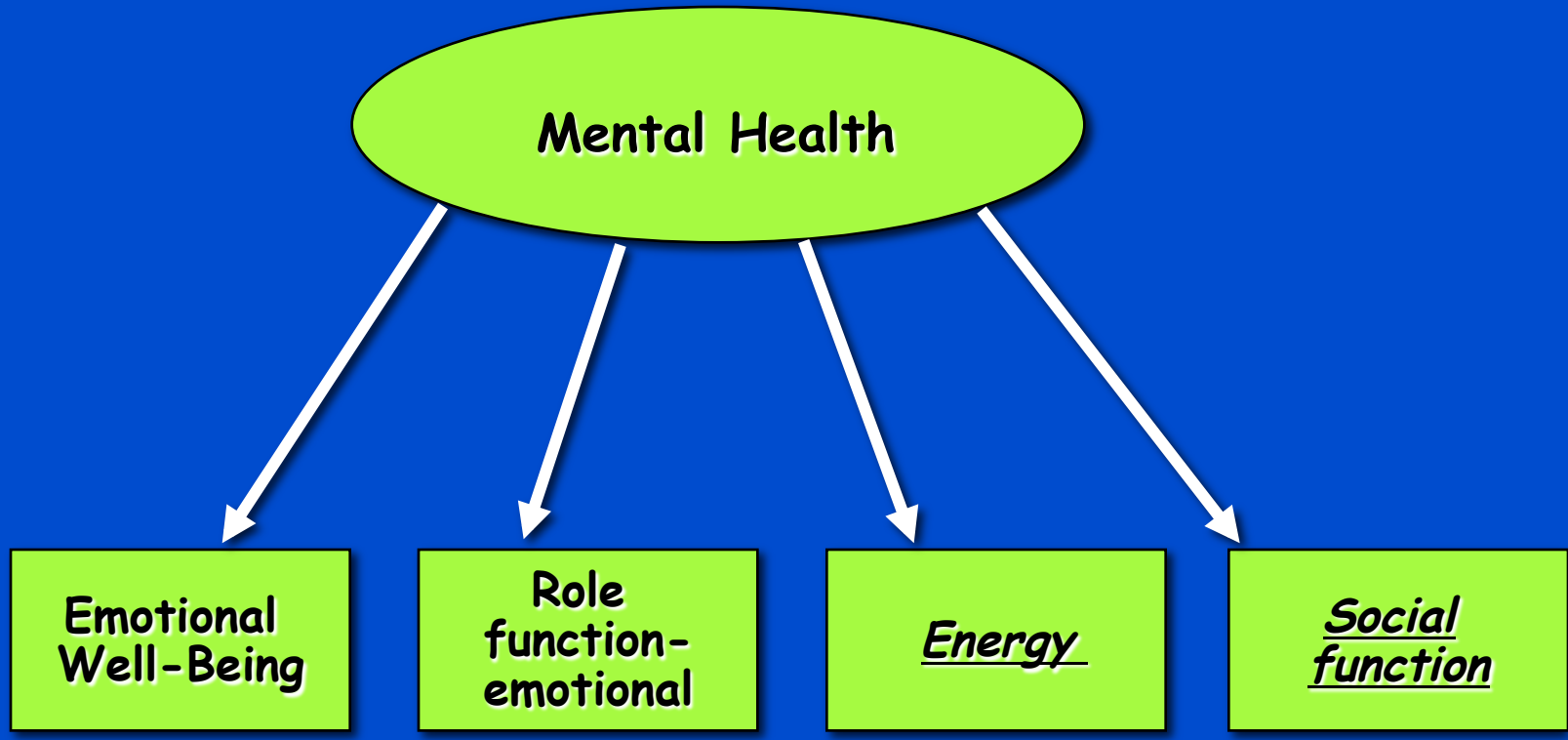


n = 194 with Multiple Sclerosis

- Lower scores than general population on
  - Emotional well-being (↓ 0.3 SD)
  - Role—emotional (↓ 0.7 SD)
  - Energy (↓1.0 SD)
  - Social functioning (↓1.0 SD)
- Yet SF-36 MCS was only 0.2 SD lower.

Nortvedt et al. (Med Care, 2000)

Four scales 0.3-1.0 SD lower, but mental health summary score only 0.2 SD lower



Farivar et al. (in press) alternative weights

PCS_z = (PF_z * .20) + (RP_z * .31) + (BP_z * .23) +
(GH_z * .20) + (EF_z * .13) + (SF_z * .11) +
(RE_z * .03) + (EW_z * -.03)

MCS_z = (PF_z * -.02) + (RP_z * .03) + (BP_z * .04) +
(GH_z * .10) + (EF_z * .29) + (SF_z * .14) +
(RE_z * .20) + (EW_z * .35)

Farivar, S. S., Cunningham, W. E., & Hays, R. D. (in press). Correlated physical and mental health summary scores for the SF-36 and SF-12 health survey, V. 1. Health and Quality of Life Outcomes. "Unofficial IF = 2.00"

Physical health = 1 and Mental health = 0.3

PCS_u = 62 (1.2)

PCS_c = 60 (1.0)

MCS_u = 50 (0.0)

MCS_c = 55 (0.5)

Background: The SF-36 and SF-12 summary scores were derived using an uncorrelated (orthogonal) factor solution. We estimate SF-36 and SF-12 summary scores using a correlated (oblique) physical and mental health factor model.

Methods: We administered the SF-36 to 7,093 patients who received medical care from an independent association of 48 physician groups in the western United States. Correlated physical health (PCSc) and mental health (MCSc) scores were constructed by multiplying each SF-36 scale z-score by its respective scoring coefficient from the obliquely rotated two factor solution. PCSc-12 and MCSc-12 scores were estimated using an approach similar to the one used to derive the original SF-12 summary scores.

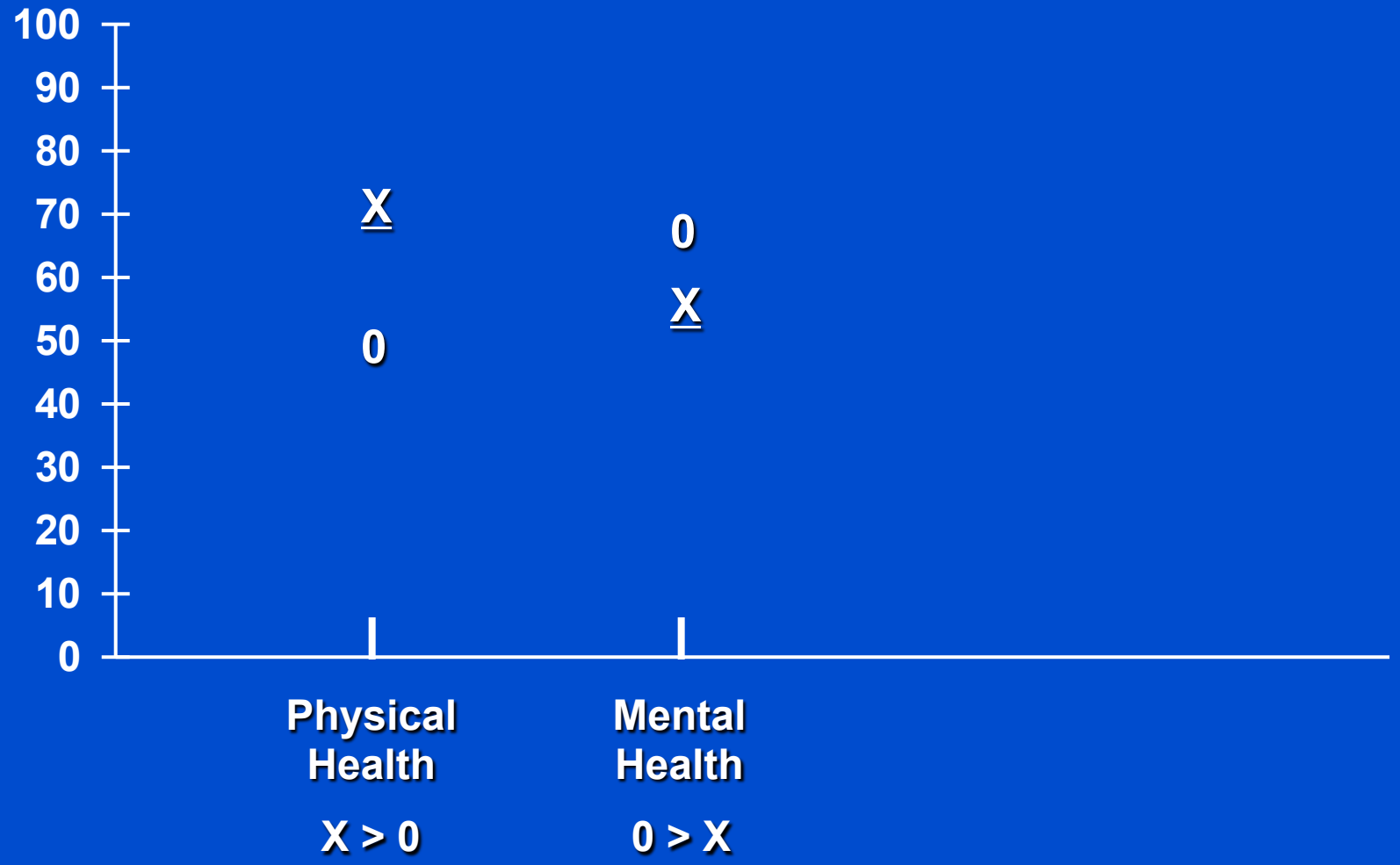
Results: The estimated correlation between SF-36 PCSc and MCSc scores was 0.62. There were far fewer negative factor scoring coefficients for the oblique factor solution compared to the factor scoring coefficients produced by the standard orthogonal factor solution. Similar results were found for PCSc-12, and MCSc-12 summary scores.

Conclusion: Correlated physical and mental health summary scores for the SF-36 and SF-12 derived from an obliquely rotated factor solution should be used along with the uncorrelated summary scores. The new scoring algorithm can reduce inconsistent results between the SF-36 scale scores and physical and mental health summary scores reported in some prior studies.

Ultimate Use of HRQOL Measures--Helping to Ensure Access to Cost-Effective Care

$$\frac{\text{Cost } ?}{\text{Effectiveness } ?}$$

Is New Treatment (X) Better Than Standard Care (O)?



Single Weighted Combination of Scores

Perceived Health Index (n = 1,862; reliability = 0.94)

Highest	Lowest	Quartile on Index
35%	84%	at least 1 moderate symptom
7%	70%	at least 1 disability day
1%	11%	hospital admission
2%	14%	performance of invasive diagnostic procedure

Perceived Health Index = 0.20 Physical functioning + 0.15 Pain + 0.41 Energy + 0.10 Emotional well-being + 0.05 Social functioning + 0.09 Role functioning.

Bozzette, S.A., Hays, R.D., Berry, S.H., & Kanouse, D.E. (1994). A perceived health index for use in persons with advanced HIV disease: Derivation, reliability, and validity. Medical Care, 32, 716-731.

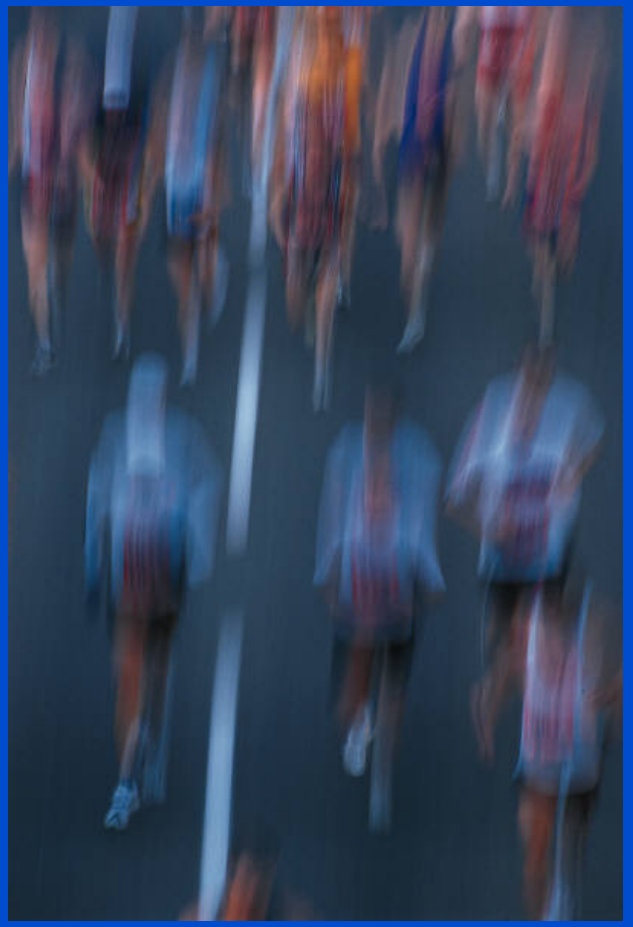
Is Medicine Related to Worse HRQOL?

Person	Medication Use	HRQOL (0-100 scale)
1	No	dead
2	No	dead
3	No	50
4	No	75
5	No	100
6	Yes	0
7	Yes	25
8	Yes	50
9	Yes	75
10	Yes	100

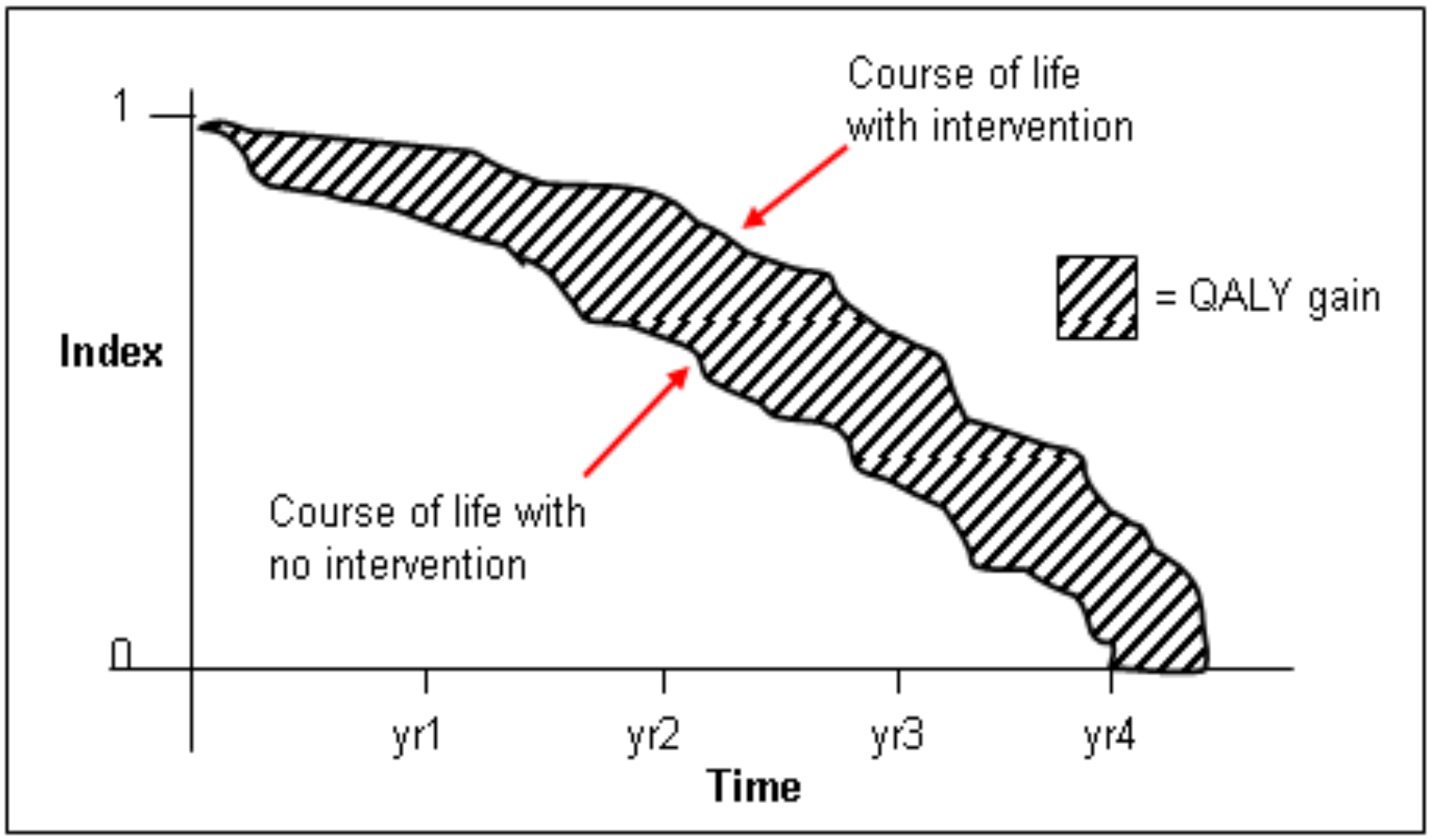
Group	n	HRQOL
No Medicine	3	75
Yes Medicine	5	50

Survival Analysis

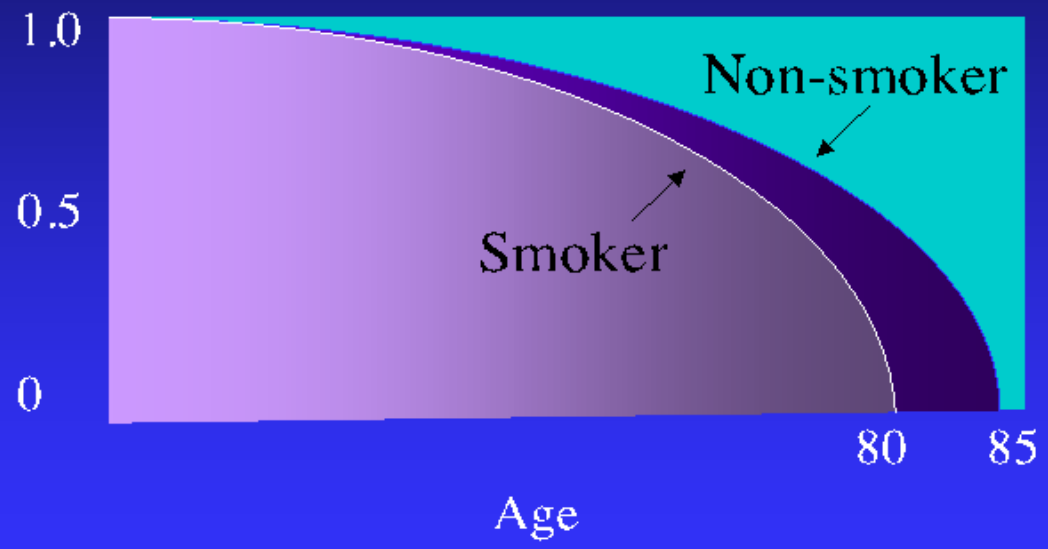
Marathoner	1.0
Person in coma	1.0



http://www.ukmi.nhs.uk/Research/pharma_res.asp



Quality-adjusted life-years (QALYs)



Tengs, T. Presented at Health Services Research Seminar, VA Hospital, San Diego, July, 2000

Cost/QALY (1993 US dollars)

- $0 Seat belt laws
- $2k Pneumonococcal vaccine
- $6k Smoking cessation counseling
- $12k Oral gold for rheumatoid arthritis
- $40k CABG, 2-vessel disease; hemodialysis
- $167k Mammography screening
- $293k Hip replacement
- $663k CABG, 1-vessel disease

Overall Health Rating Item

Overall, how would you rate your current health?

(Circle One Number)

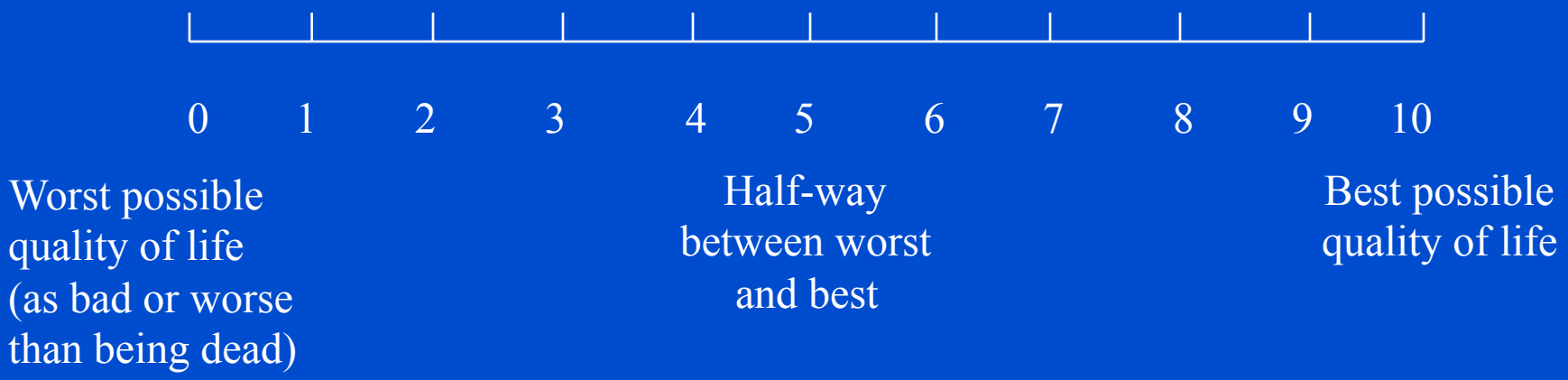
Worst possible health (as bad or worse than being dead)

Half-way between worst and best

Best possible health

Overall Quality of Life Item

Overall, how would you rate your quality of life?



SF-6D Summary Measure

- Brazier et al. (1998, 2002)
  - —6-dimensional classification (collapsed role scales, dropped general health)
  - — Uses 11 SF-36 items (8 SF-12 and 3 additional physical functioning items)
  - — 18,000 possible states
  - —249 states rated by sample of 836 from UK general population

SF-6D Items

The following item is about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

1. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports *[Yes, limited a lot /Yes, limited a little/No, not limited at all]*
2. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf *[Yes, limited a lot/Yes, limited a little/No, not limited at all]*
3. Bathing or dressing yourself *[Yes, limited a lot/Yes, limited a little/No, not limited at all]*
4. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health? Were limited in the kind of work or other activities? *[All of the time/Most of the time/Some of the time/A little of the time/None of the time]*
5. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)? Accomplished less than you would like
   [All of the time/Most of the time/Some of the time/A little of the time/None of the time]
6. How much bodily pain have you had during the past 4 weeks? *[None/Very mild/Mild/Moderate/Severe/Very severe]*
7. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)? *[Not at all/A little bit/Moderately/Quite a bit/Extremely]*

These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the past 4 weeks:

8. Have you been very nervous? *[All of the time/Most of the time/Some of the time/A little of the time/None of the time]*
9. Did you have a lot of energy? *[All of the time/Most of the time/Some of the time/A little of the time/None of the time]*
10. Have you felt downhearted and blue? *[All of the time/Most of the time/Some of the time/A little of the time/None of the time]*
11. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)? *[All of the time/Most of the time/Some of the time/A little of the time/None of the time]*

Health State 111111

Health state 111111

Your health does not limit you in **vigorous activities** (e.g. running, lifting heavy objects, participating in strenuous sports).

You have no problems with your work or other regular daily activities as a result of your **physical health or any emotional problems.**

Your health limits your **social activities** (like visiting friends or close relatives) a little or none of the time

You have no **pain**

You feel **tense or downhearted and low** a little or none of the time.

You have a lot of **energy** all of the time

Health state 424421 (0.59)

- Your health limits you a lot in moderate activities (such as moving a table, pushing a vacuum cleaner, bowling or playing golf)
- You are limited in the kind of work or other activities as a result of your physical health
- Your health limits your social activities (like visiting friends, relatives etc.) most of the time.
- You have pain that interferes with your normal work (both outside the home and housework) moderately
- You feel tense or downhearted and low a little of the time.
- You have a lot of energy all of the time

Pediatric Blood & Cancer, Volume 44, Issue 3 (p 201-204)
Abstract | References | Full Text: HTML, PDF (61k) Save Article to My Profile

TABLE II. Average HRQL Utility Scores[a] for Chronic Outcome Health States Among Survivors of Cancer in Childhood and Adolescence

Primary cancer	Utility score[b]
Standard risk ALL	0.95
Wilms tumor	0.93
High risk ALL	0.91
Non-Hodgkins lymphoma	0.91
Advanced neuroblastoma	0.87
Hodgkins disease	0.85
Brain tumors	0.69

[a]As determined by the health utilities index.
[b]Utility score for general population: 0.95.
Utility scores such as these can be used as quality weights to adjust duration of survival.

Health Economics, Volume 12, Issue 11 (p 975-981)
Abstract | References | Full Text: PDF (138k) Save Article to My Profile

the mean score for SF-6D was 0.58 (95%CI 0.54–0.62); the mean difference in score was 0.03 ($p = 0.03$ by paired t-test). The SF-6D scores passed the Kolmogorov-Smirnoff test for normality at the 5% level but this was not true for HUI3 scores which show a skewed and bi-modal distribution (Figure 1). The SF-6D had a minimum value of 0.30 and a maximum value of 0.95; this was a much smaller range than HUI3 which had a minimum of −0.21 and a maximum of 1.00.

A scatterplot of SF-6D against HUI3 is presented in Figure 2. Also plotted in Figure 2 are results from a bivariate regression indicating a positive linear association between the two measures with an R^2 goodness-of-fit value of 0.34. This corresponds to a Pearson Correlation Coefficient of 0.58 (95% CI 0.48–0.68). Also shown in Figure 2 is the 45° line of perfect agreement between the two instruments. The intraclass correlation coefficient for agreement was 0.42 (95% 0.31–0.52).

Correlation matrices between dimensions of functioning for both SF-6D and HUI3 are presented in Table 1. All dimensions of SF-6D have significant ($p<0.05$) positive correlation ranging from 0.12 (mental vs physical) to 0.40 (vitality vs social). In contrast, for HUI3 of 28 correlations between dimensions only 14 are

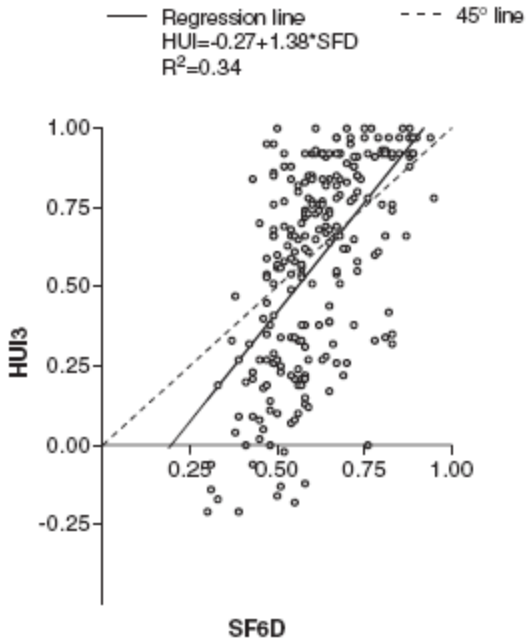


Figure 2. Scatterplot of HUI3 and SF-6D utility scores with linear regression line and 45° (perfect agreement) line

significant ($p<0.05$) and these range from 0.11 (hearing vs emotion) to 0.34 (ambulation vs

A View from

Table 1. C

(a) Health
Vision
Hearing
Speech
Emotion
Pain
Ambulatic
Dexterity
Cognition

(b) Short-
Physical
Role
Social
Pain
Mental
Vitality

[a] Correlatio
[b] Correlatio

disagreem
HUI3 va
SF-6D va
left of th
the corr

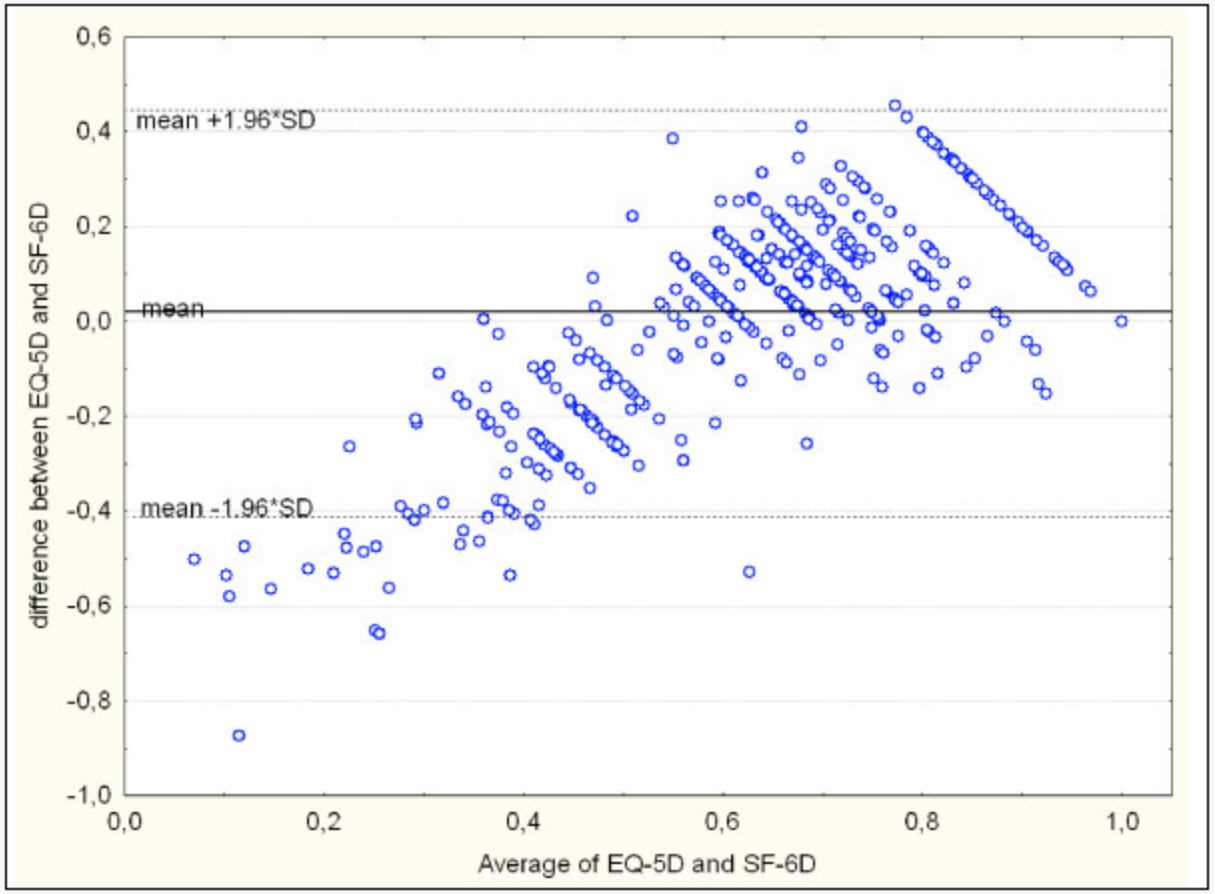


Figure 3

Bland-Altman plot of EQ-5D and SF-6D.

•“New Developments in Calculating DALYs and QALYs: Applications for the U.S.

Jürgen Rehm, Ph.D.

•On March 30, you are invited to join us in welcoming Dr. Jürgen Rehm, who will

•be discussing recent advances in the calculation of two measures used to

•estimate the impact of attributable risk factors on disease: DALYs

•(disability-adjusted life years) and QALYs (quality-of-life-adjusted life

•years). Dr. Rehm will describe how these measures are calculated and why they

•are better than simple years of life lost for estimating the burden of disease

•attributable to risk factors such as alcohol and tobacco use. His talk will

•focus on the applications of these measures to major medical conditions in the

•U.S., including heart disease, cancer and alcoholism.

Questions?


ADVANCING SCIENCE TO IMPROVE PUBLIC HEALTH
10
YEARS
1997
DCCPS
2007

Ron D. Hays, Ph.D.

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NIH Bio [PDF] [WORD] (updated on 1/8/07)
Other Support [PDF] [WORD] (updated 1/8/07)
Curriculum Vitae [PDF] [WORD] (updated 6/16/06)

What's new?

Syllabus for HS249F "Quality Assessment and Assurance" - Winter 2007 (updated 1/29/2007)

~*~

Citations for NEI-RQL-42 off of NEI-RQL section of surveys page (added 1/4/2007)

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Website has been updated to consolidate access to all surveys from one page: UMGA Patient's View on Health Questionnaire, MOS Sleep Survey and NEI-RQL Survey and materials can now be found on "Surveys" page along with other co-developed surveys.

~*~

Syllabus for "The Essentials of Clinical Investigation: Developing a Research Proposal" - July 2006

~*~

2005 Quality of Life Research Impact Factor = 1.915

~*~

Direct Preference Measures: Standard Gamble

Classical method of assessing preferences

- Choose between certain outcome and a gamble
- Conformity to axioms of expected utility theory
- Incorporates uncertainty (thus, more reflective of treatment decisions).

Standard Gamble (SG)

Choice #1: Your present state (e.g., paralysis)

Choice #2: X probability of complete mobility
1-X probability of death

Preference Value: Point at which indifferent between choices, varying X

[X = QALY]

Standard Gamble (SG)

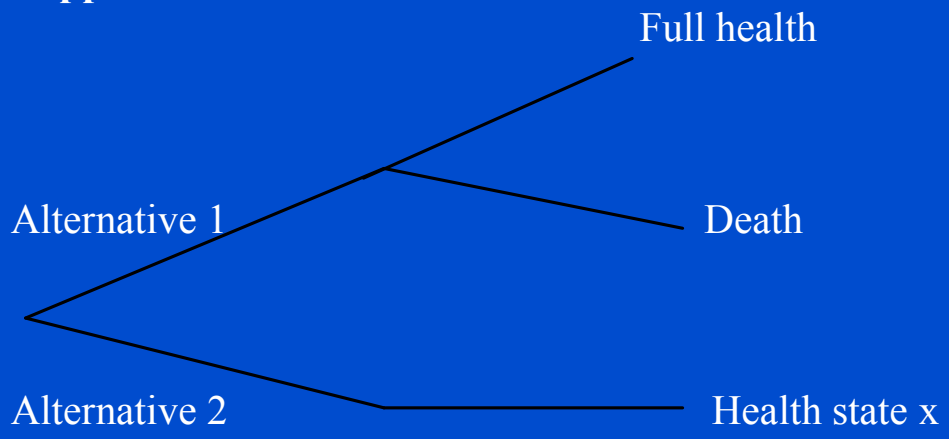
X probability of complete mobility

X = 1.00 → QALY = 1.00

X = 0.50 → QALY = 0.50

X = 0.00 → QALY = 0.00

Standard Gamble approach



Alternative 1: probability (p) of living full health for individual's remaining life expectancy otherwise immediate death.

Alternative 2 is the certainty of living in a given intermediate health state x.

Direct Preference Measures: Time Tradeoff (TTO)

- Choice between two certain outcomes
- Years of life traded for quality of life
- Simple to administer alternative to SG

Time Tradeoff

Choice #1: Your present state (e.g., paralysis)

Life Expectancy: 10 years

Choice #2: Complete mobility

How many years (x) would you give up in your current state to be able to have complete mobility?

$$[\ 1 - \frac{X}{10} = \text{QALY}\ ]$$

Time Tradeoff

How many years (x) would you give up in your current state to be able to have complete mobility?

X = 0 → QALY = 1

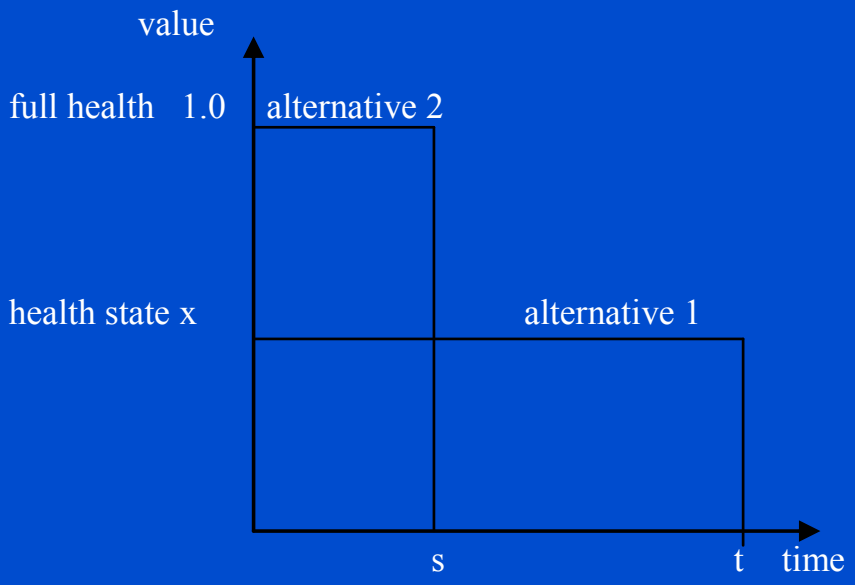
X = 1 -> QALY = 0.9

X = 5 -> QALY = 0.5

X = 10 -> QALY = 0

$$\left[\ 1 - \frac{X}{10} = \text{QALY}\ \right]$$

Time Trade-off approach:



Alternative 1: intermediate health state x, for time t, followed by death.
Alternative 2: full health for time s where s<t, followed by death.

Time t is given and the individual is asked to state s. The preference score is then worked out as s/t.

Ad Hoc Preference Score Estimates

Comprehensive Geriatric Assessment (n = 363 community-dwelling older persons) lead to improvements in SF-36 energy, social functioning, and

- Physical functioning (4.69 points) in 64 weeks
- Cost of $746 over 5 years beyond control group

Keeler, E. B., et al. Cost-effectiveness of outpatient geriatric assessment with an intervention to increase adherence. Med Care, 1999, 37 (12), 1199-1206.

Is CGA worth paying for?

Change in QALYs associated with 4.69 change in SF-36 physical functioning

- r = 0.69 -> b = .003
- △QWB = 4.69 x .003 = .014
- .014 x 5 yrs. = 0.07 QALYs
- Cost/QALY: $10,600+

<$20,000 per QALY worthwhile