

Summary Measures of Population Health

An Overview

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Disclosures

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 - Foundation for Informed Medical Decision Making, Boston, MA

Summary Measures of Population Health

- Preference-based, generic measures of health-related quality of life (HRQoL)
 - Main focus of this talk:
 - What these are
 - Their role in a population health data system
 - How they might be implemented in public health

Measures of Health – a quick typology

- Mortality-based measures
 - death rates, life expectancies, etc.



- All the familiar stuff

Measures of Health – a quick typology

- Mortality-based measures
 - death rates, life expectancies, etc.
- Morbidity-based measures
 - indicators



- Indicators:
 - Single, countable things
 - TB rate
 - C-section rates
 - % population who exercise
 - Examples:
 - Healthy People 2010 “Leading Indicators”
 - WHO “Core Health Indicators”
 - America’s Health Rankings
 - Wisconsin County Health Rankings

Measures of Health – a quick typology

- Mortality-based measures
 - death rates, life expectancies, etc.
- Morbidity-based measures
 - indicators
 - health status measures
 - disease-, organ-specific

Health Status Measures: point in time summaries of state of a person's health

Disease-, organ-specific....

Created to be sensitive to changes in symptoms or functional impairment due to a particular disease process

Examples:

- Arthritis Impact Measurement System (AIMS)
- Vision Function Questionnaire (VFQ-25)
- McGill Pain Questionnaire
- NY Heart Association Classification

Some physician-reported, others patient-reported

Many of these are scored by summing across questions in a questionnaire

Measures of Health – a quick typology

- Mortality-based measures
 - death rates, life expectancies, etc.
- Morbidity-based measures
 - indicators
 - health status measures
 - disease-, organ-specific
 - “Generic” health status

Generic Health Status Measures

Most famous: SF-36 health profile

One questionnaire with 36 questions à

Several questions about each of 8 different domains of health

KEY: multiple scales to cover broad scope of health, not tied to one disease or organ system

Scoring:

Psychometric scales based on summing responses to multiple questions

Separate scores for each subscale or health concept

PF, RP, BP, GH, VT, SF, RE, MH
PCS MCS

Measures of Health – a quick typology

- Mortality-based measures
 - death rates, life expectancies, etc.
 - Morbidity-based measures
 - indicators
 - health status measures
 - disease-, organ-specific
 - “generic”
 - health-related quality-of-life (HRQoL) indexes
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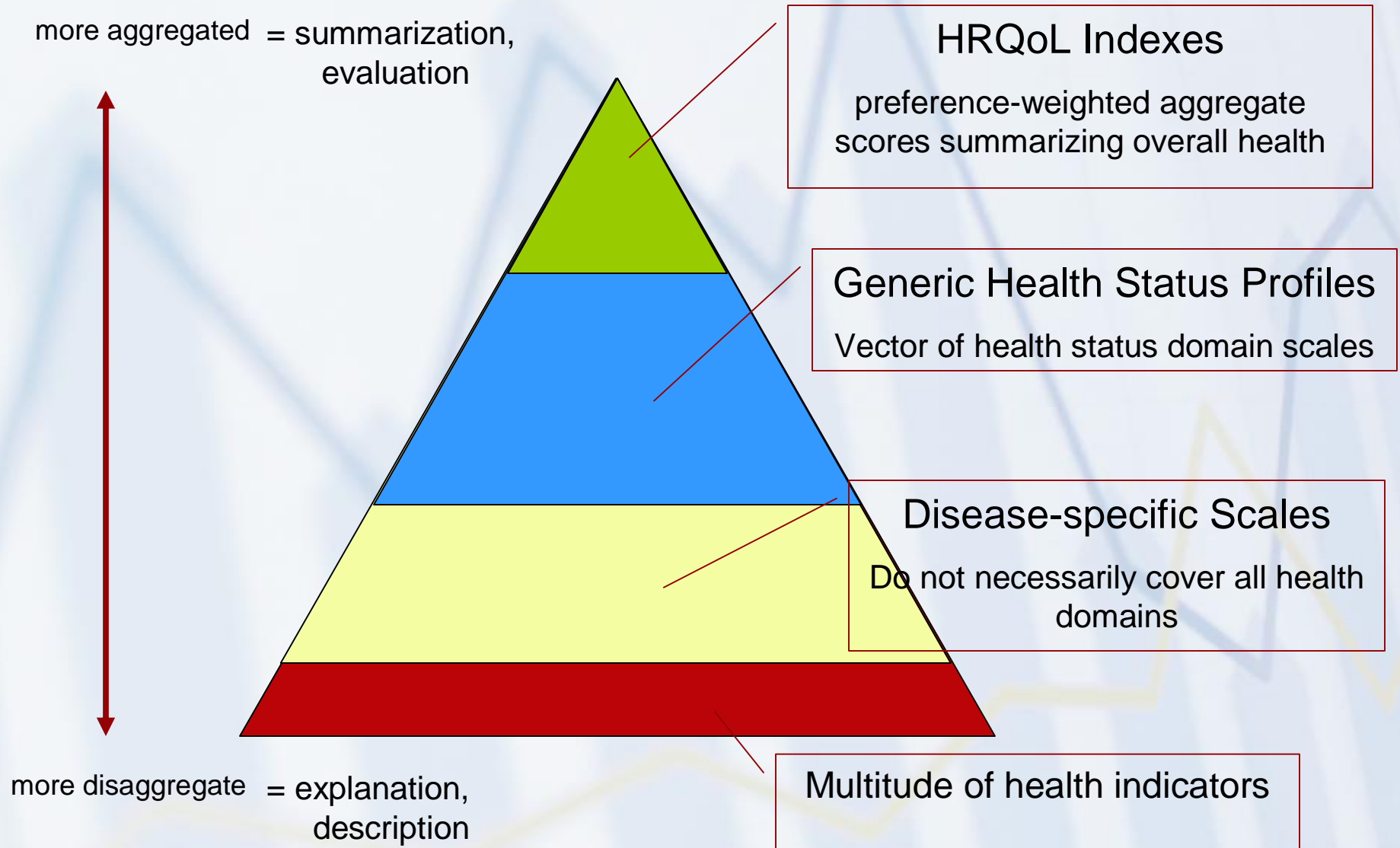
HRQoL indexes

Like generic health status – try to comprehensively cover conceptual basis of health with multiple questions about health

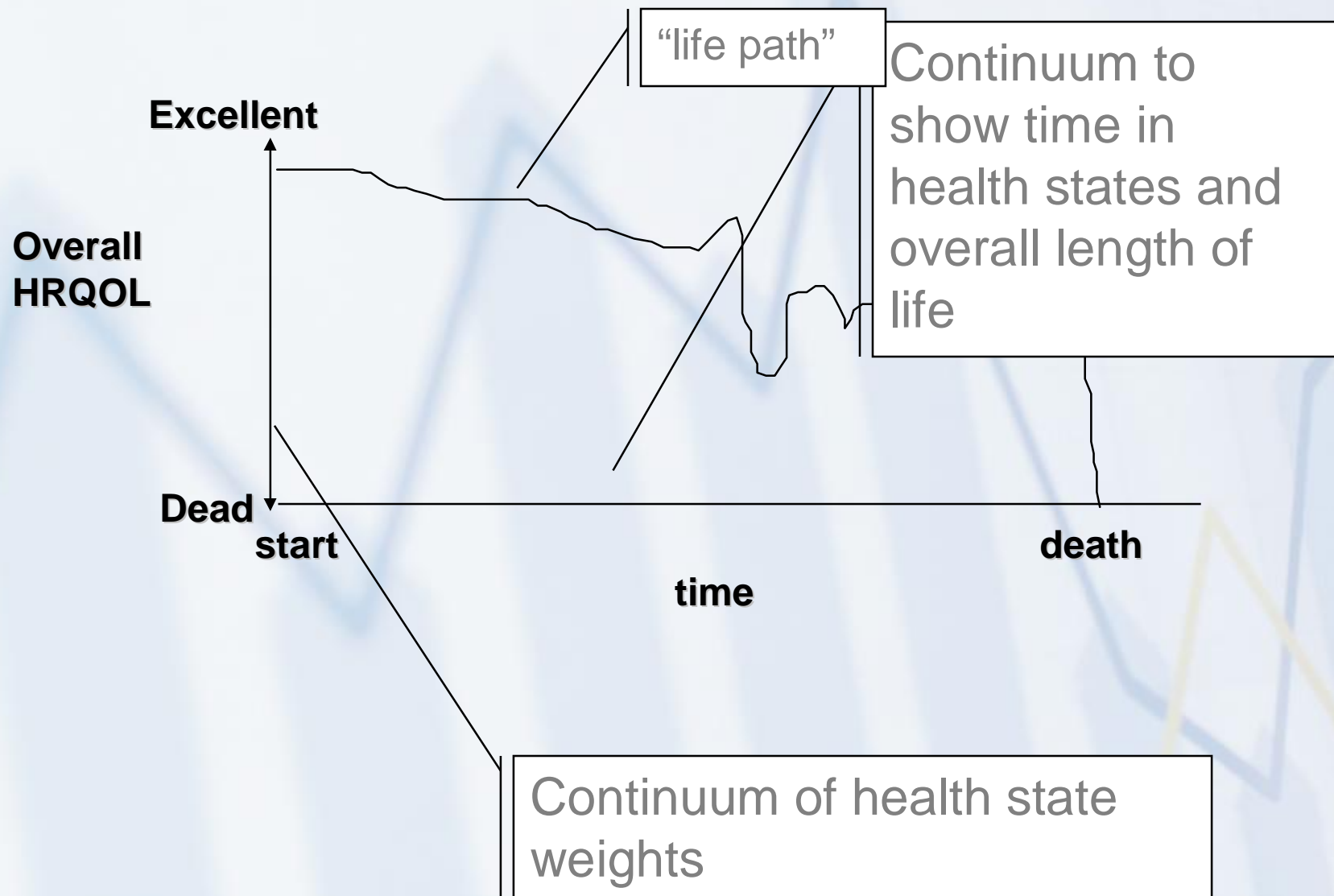
Scoring

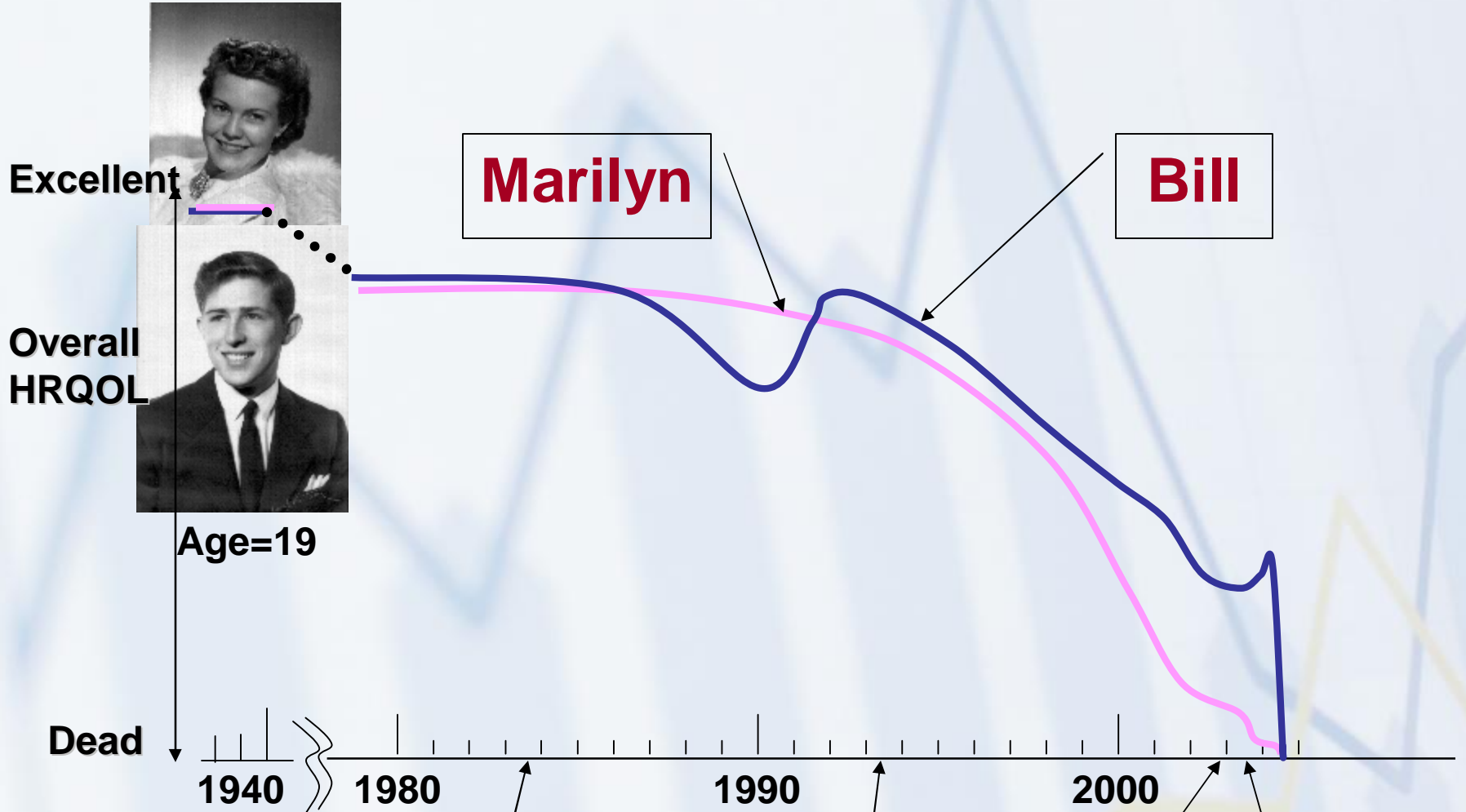
- not simple sums--these are *not* psychometric scales!
- econometric methods used to elicit utility weights (“preferences”) for health states
- 0 = dead, 1= perfect health
- average preference weights from community sample of people

Data Pyramid for Population Health (after Wolfson)

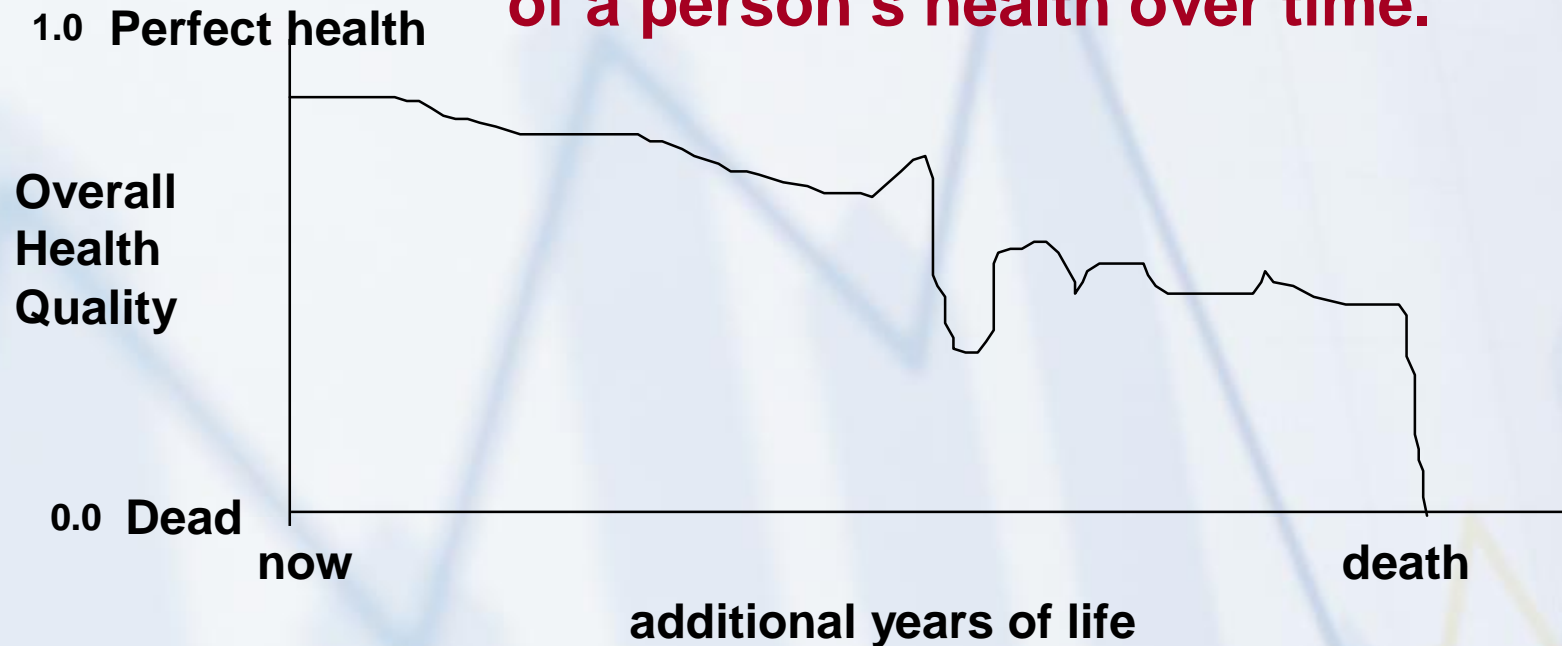


- Two areas of concern in population health — Morbidity and Mortality
 - “Morbidity”: how do people feel, how health problems affect them
 - ability/disability
 - functional capacity
 - independence
 - other aspects of health & well-being
 - “Mortality”: how long people live
 - mortality rates and survival rates
 - life expectancy
- One summary measure, HRQoL, combines major aspects of morbidity into a single number scaled dead=0...perfect health =1
- A second summary measure, QALY, combines HRQOL and mortality into a single number





“Life Path” = the general description of a person’s health over time.



QALYs = area under this curve

**QALE = average number of QALYs experienced by a cohort of the same starting age and quality of life
= best estimate of future health-adjusted life years for random member of the cohort**

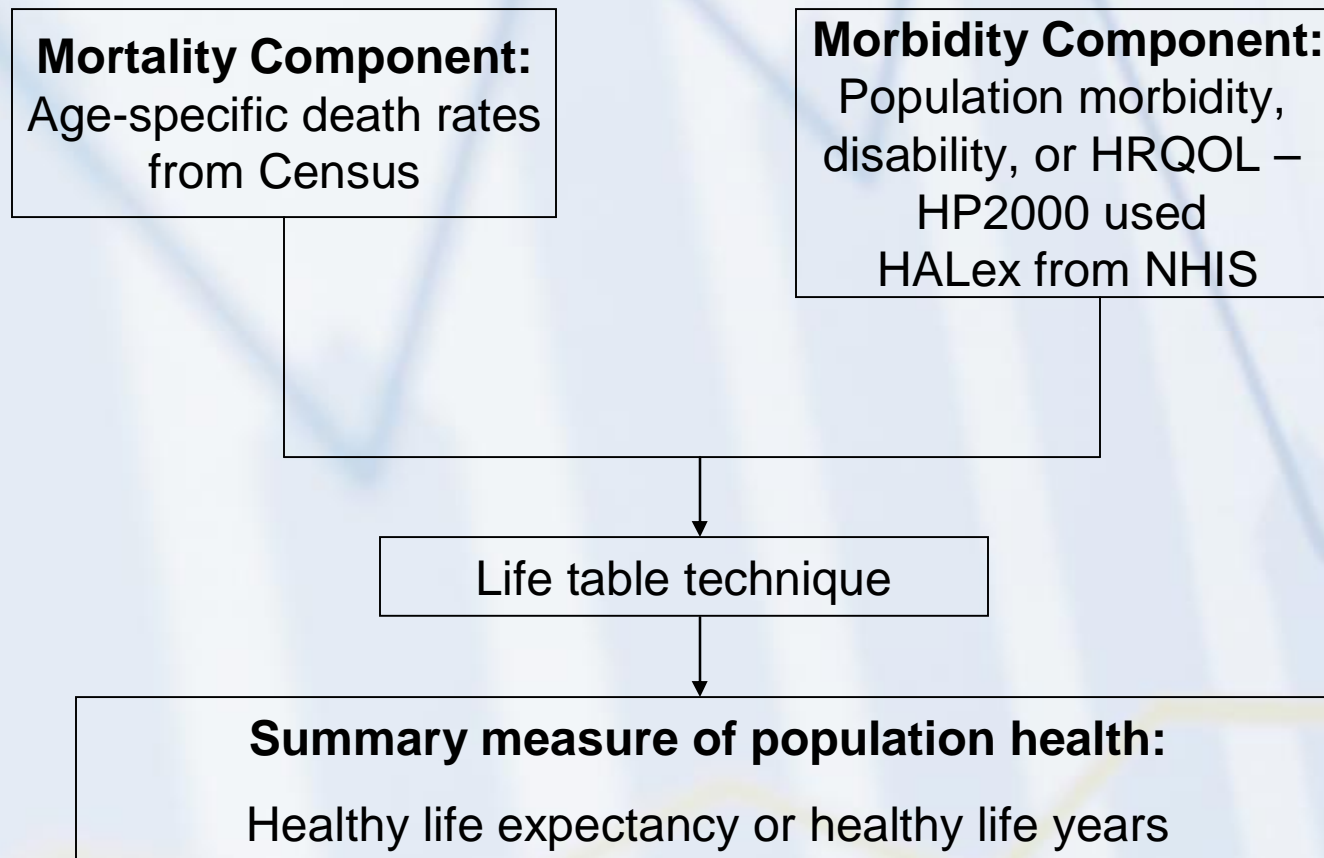
HALE = “health-adjusted life expectancy” ... generalizes from Q as utility measure to H as generic health measure

Cross-sectional samples of individuals HRQoL at a point in time can be used for meaningful population measures

- Community averages for HRQoL summarize health at a point in time (age-, sex-adjusted)
 - One number represents the average community health for time period sampled in a single summary score.
- Cross-sectional HRQoL data can be combined with mortality data
 - old idea, attributed to Sullivan at Bureau of the Census in 1960s
 - elaborated by others since

Summary Measures of Population Health

(Molla et al, NCHS Statistical Note, 2001)



NCHS Table of Health-adjusted Life Expectancy (US females from 2000 census and NHIS)			
Age bracket	LE	HALE	HALE/LE
0–4 years	79.5	69.8	87.8%
5–9 years	75.0	65.4	87.2%
10–14 years	70.1	60.5	86.3%
15–19 years	65.1	55.7	85.6%
20–24 years	60.3	51.0	84.6%
25–29 years	55.4	46.4	83.8%
30–34 years	50.5	41.8	82.8%
35–39 years	45.7	37.2	81.4%
40–44 years	40.9	32.8	80.2%
45–49 years	36.2	28.5	78.7%
50–54 years	31.6	24.3	76.9%
→ 55–59 years	27.1	20.5	75.6%
→ 65–69 years	18.9	13.8	73.0%
70–74 years	15.2	10.8	71.1%
75–79 years	11.8	8.1	68.6%
80–84 years	8.7	5.8	66.7%

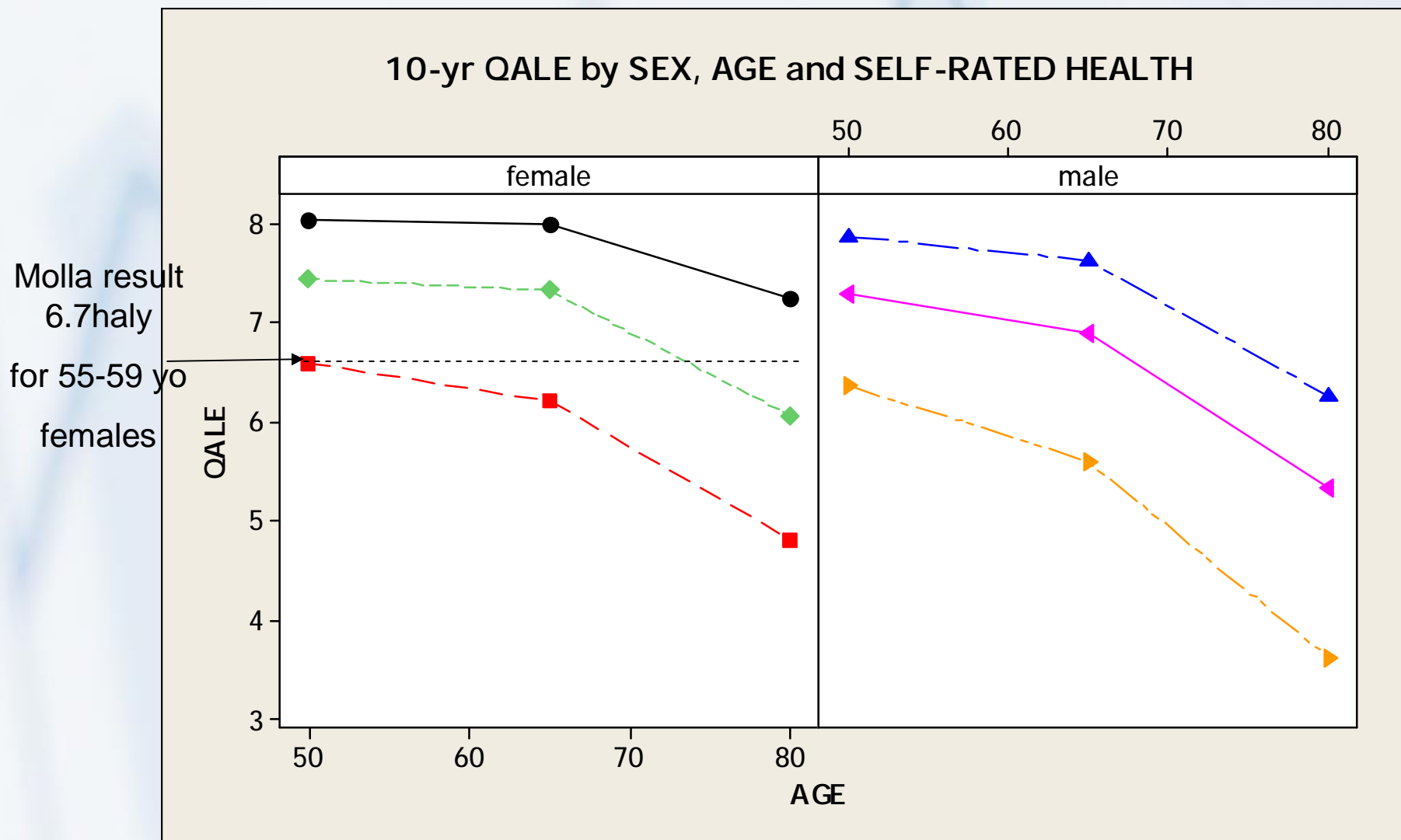
20.5 HALYs

-13.8 HALYs

6.7 HALYs

10-year HALE
for 55-59 yo
female

Computations from 13 yr longitudinal community cohort data (Beaver Dam, WI)



Fryback & Hanmer. "Bayesian Analysis of Health Status and Quality of Life Data." In W.R. Lenderking, .D.Revicki [Eds.] *Advancing Health Outcomes Research Methods and Clinical Applications*. 2005; McLean, VA: International Society for Quality of Life Research, 6728 Old McLean Village Drive, McLean, VA 22101 USA <http://www.isoqol.org/AHROAd.pdf>

Preference-based HRQoL measures are more meaningful for this calculation

- Weights for health states systematically collected
 - econometric elicitation techniques to get weights that correspond to meaningful valuation of health states
 - elicited from population-based sample of people
 - averaged for population/community representation
- Result is HRQoL-weighted life expectancy, or “quality-adjusted life expectancy” (QALE) for short

Population data system should facilitate computing QALE over time

- Allows population tracking and measuring improvement in both survival and HRQoL over time
- If data are sufficiently rich and sample is large
 - compare gains/losses by different sociodemographic groups
 - compare by geography: census regions, states, counties
 - compute HRQoL disease burden for prevalent conditions
- Potential outcome measure for community/population interventions

Key to this computation and making meaningful comparisons

- Systematic collection of HRQoL measure(s) in the population over time
 - Because HRQoL measure is preference-weighted combination of domains of health, it is meaningful summary statistic for overall health
- Sufficient sample sizes to allow comparisons

To date in US, only a few data sets have suitable measures and only one has committed to longitudinal data collection

Small set of potential HRQoL indexes available today

- EQ-5D
- HUI2, HUI3
- SF-6D
- QWB-SA
- HALex

Each has an associated questionnaire varying from 5 to nearly 60 questions; varying times to complete from 2 min to 12 min on average.

Health Domains addressed by these HRQoL indexes

QWB-SA

- Mobility
- Physical activity
- Social activity
- Symptoms/problems

SF-6D (from SF-36 questionnaire)

- Physical function
- Role limitation
- Social function
- Pain
- Mental health
- Vitality

EuroQol EQ-5D

- Mobility
- Self-care
- Usual activities
- Pain/discomfort
- Anxiety/depression

HALex

- Self-rated health
- Physical activity limitations

HUI2

- Sensation
- Mobility
- Emotion
- Cognition
- Self-care
- Pain

HUI3

- Vision
- Hearing
- Speech
- Ambulation
- Dexterity
- Emotion
- Cognition
- Self-care
- Pain

Scale ranges for these HRQoL indexes

QWB-SA

- Mobility
- Physical activity
- Social activity
- Symptoms/problems

0 ... [0.09 ... 1.0]

HALex

- Self-rated health
- Physical activity limitations

0 ... [0.10 ... 1.0]

SF-6D (from SF-36 questionnaire)

- Physical function
- Role limitation
- Social function
- Pain
- Mental health
- Vitality

0 ... [0.31 ... 1.0]

HUI2

- Sensation
- Mobility
- Emotion
- Cognition
- Self-care
- Pain

[-.02 ... 0 ... 1.0]

EuroQoL EQ-5D

- Mobility
- Self-care
- Usual activities
- Pain/discomfort
- Anxiety/depression

[-.11 ... 0 ... 1.0]

HUI3

- Vision
- Hearing
- Speech
- Ambulation
- Dexterity
- Emotion
- Cognition
- Self-care
- Pain

[-.36 ... 0 ... 1.0]

Preference weights source for the HRQoL indexes

QWB-SA

San Diego, CA

SF-6D (from SF-36
questionnaire)

England national
sample

EuroQol EQ-5D

US national
sample

HALex

(ad hoc US for
Healthy People
2000)

HUI2

Ontario, Canada

HUI3

Ontario, Canada

US Norms for Six Generic Health-Related Quality-of-Life Indexes From the National Health Measurement Study

Dennis G. Fryback, PhD, Nancy Cross Dunham, PhD,* Mari Palta, PhD,* Janel Hanmer, PhD,* Jennifer Buechner, AB,* Dasha Cherepanov, BS,* Shani A. Herrington, MS,* Ron D. Hays, PhD,†§ Robert M. Kaplan, PhD,‡ Theodore G. Ganiats, MD,¶ David Feeny, PhD,||** and Paul Kind, MPhil††*

Background: A number of indexes measuring self-reported generic health-related quality-of-life (HRQoL) using preference-weighted scoring are used widely in population surveys and clinical studies in the United States.

Objective: To obtain age-by-gender norms for older adults on 6 generic HRQoL indexes in a cross-sectional US population survey and compare age-related trends in HRQoL.

Methods: The EuroQol EQ-5D, Health Utilities Index Mark 2, Health Utilities Index Mark 3, SF-36v2™ (used to compute SF-6D), Quality of Well-being Scale self-administered form, and Health and Activities Limitations index were administered via telephone interview to each respondent in a national survey sample of 3844 noninstitutionalized adults age 35–89. Persons age 65–89 and telephone exchanges with high percentages of African Americans were oversampled. Age-by-gender means were computed using sampling and poststratification weights to adjust results to the US adult population.

Results: The 6 indexes exhibit similar patterns of age-related HRQoL by gender; however, means differ significantly across indexes. Females report slightly lower HRQoL than do males across all age groups. HRQoL seems somewhat higher for persons age

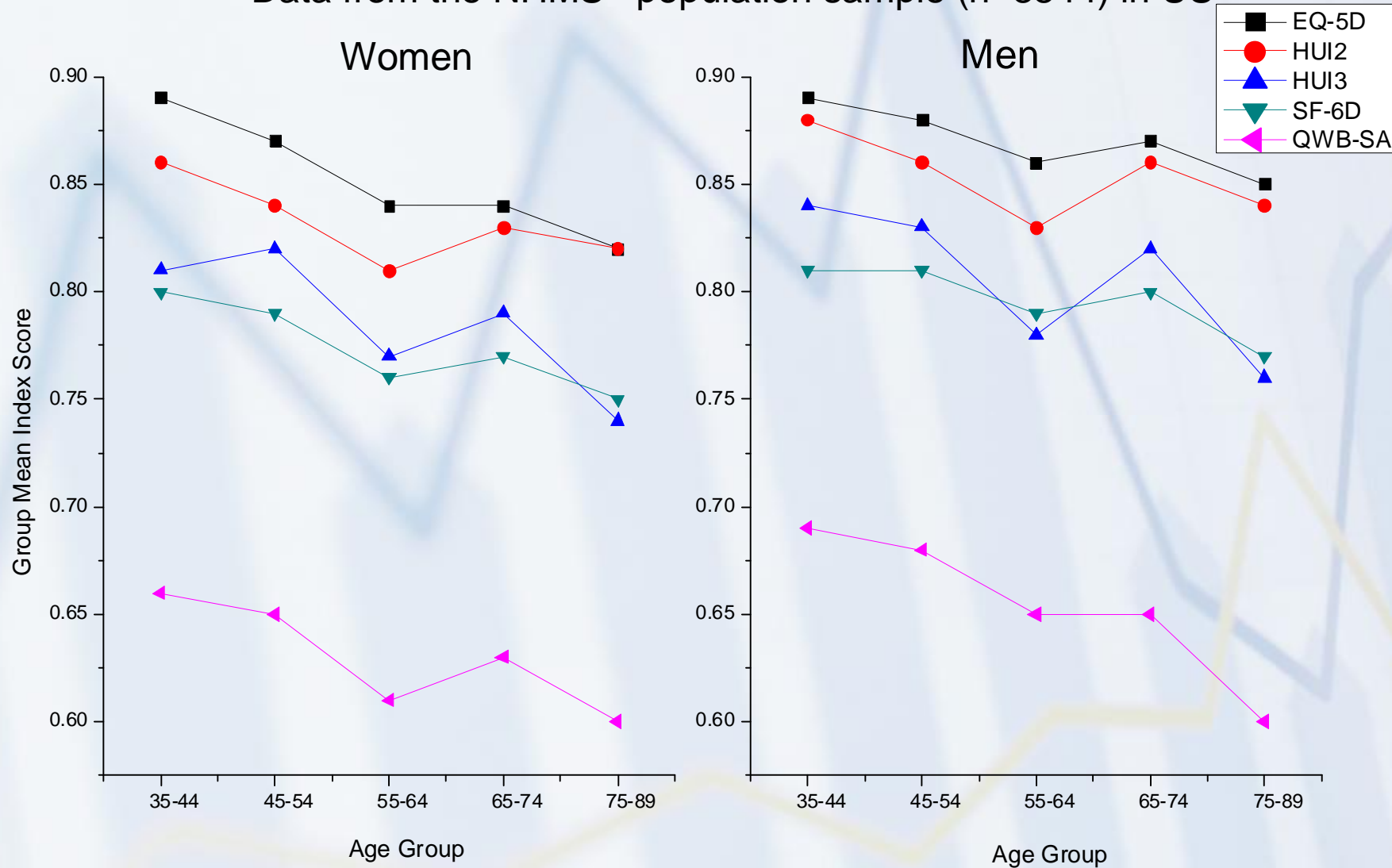
65–74 compared with people in the next younger age decade, as measured by all indexes.

Conclusions: Six HRQoL measures show similar but not identical trends in population norms for older US adults. Results reported here provide reference values for 6 self-reported HRQoL indexes.

Key Words: health-related quality-of-life, health status, EQ-5D, SF-6D, QWB-SA, SF-6D, Health Utilities Index, HUI2, HUI3, SF-36, population survey, adults, aging, patient-reported outcomes, health outcomes measures, comparative studies

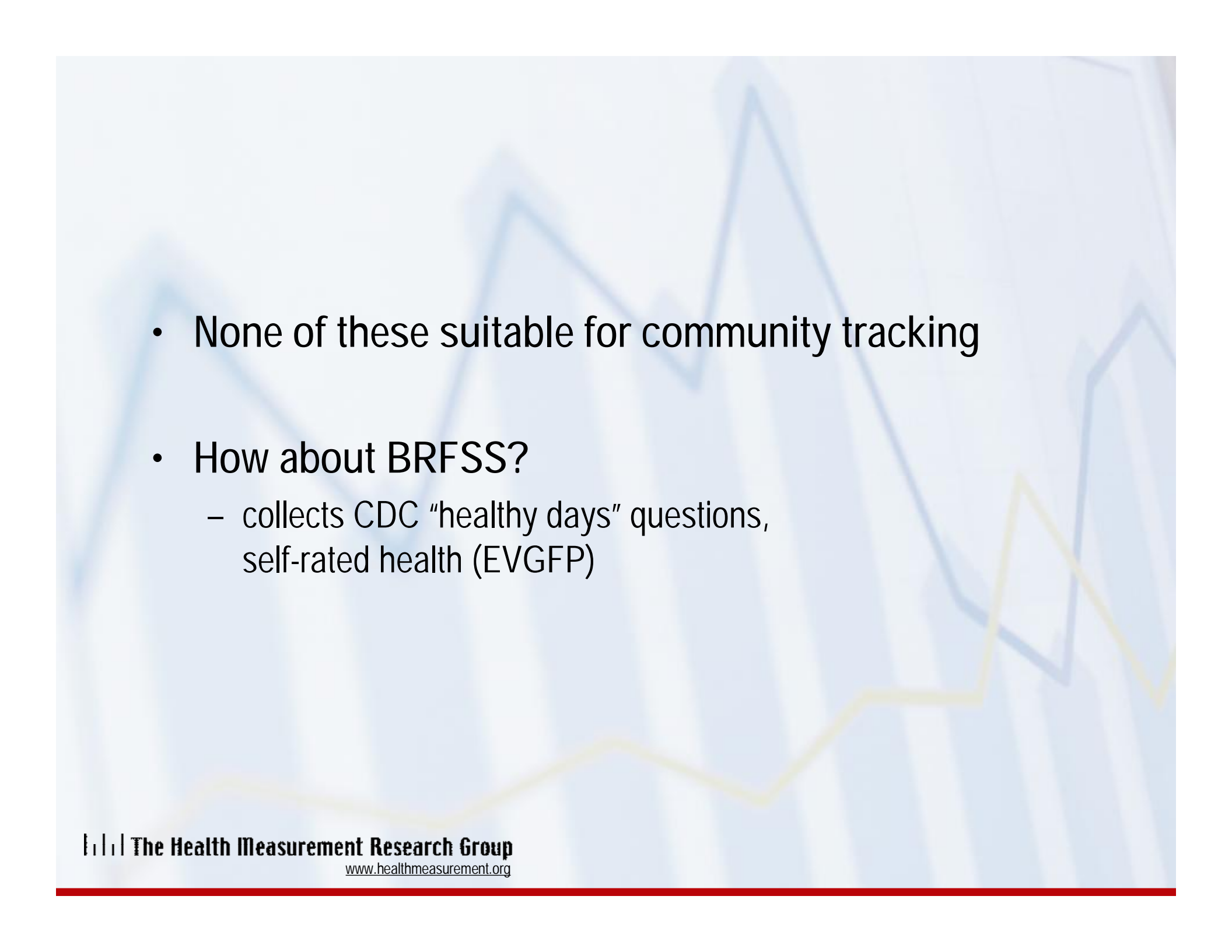
(Med Care 2007;45: 1162–1170)

Data from the NHMS –population sample (n=3844) in US

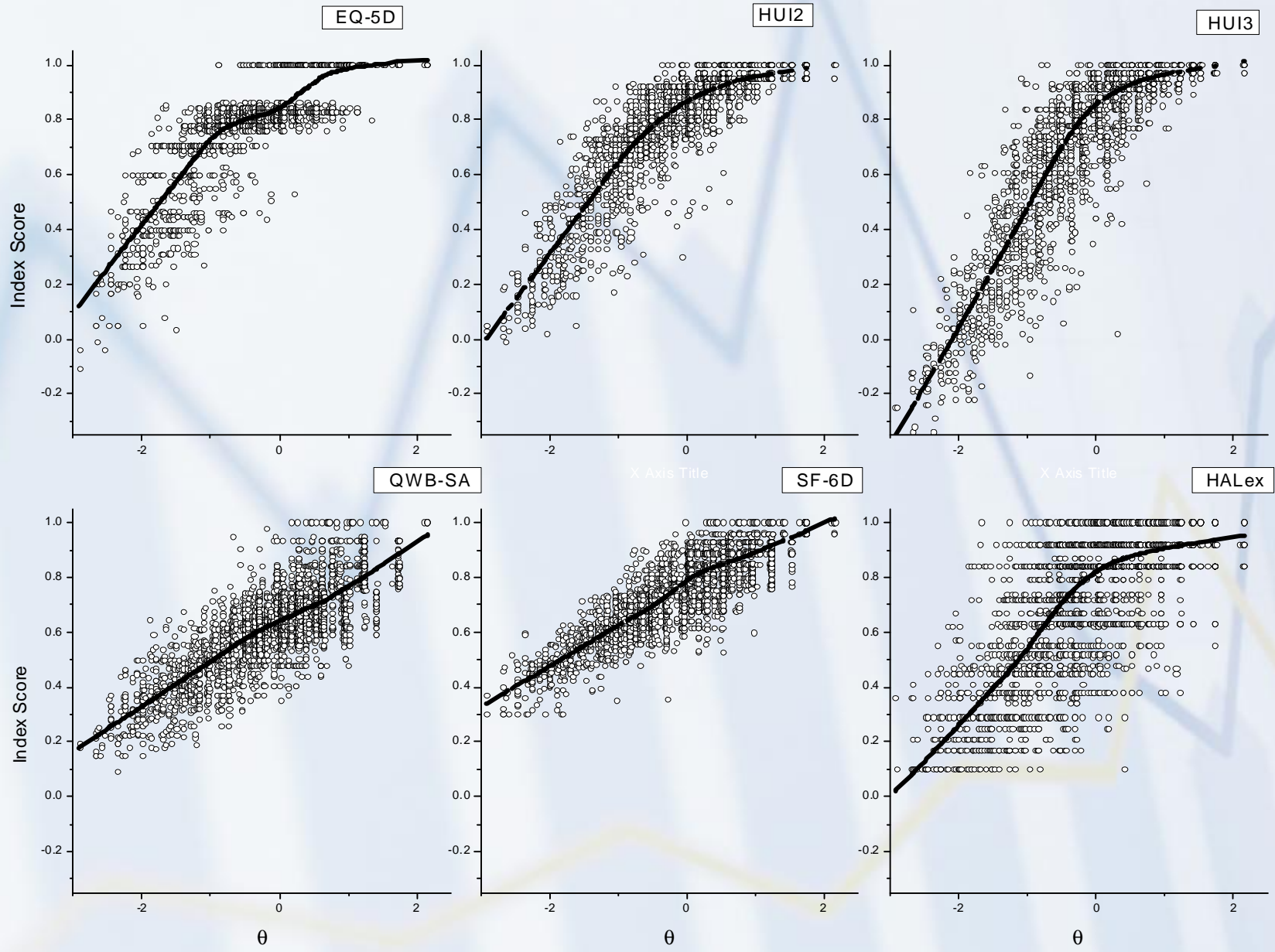


US data sets with HRQoL index

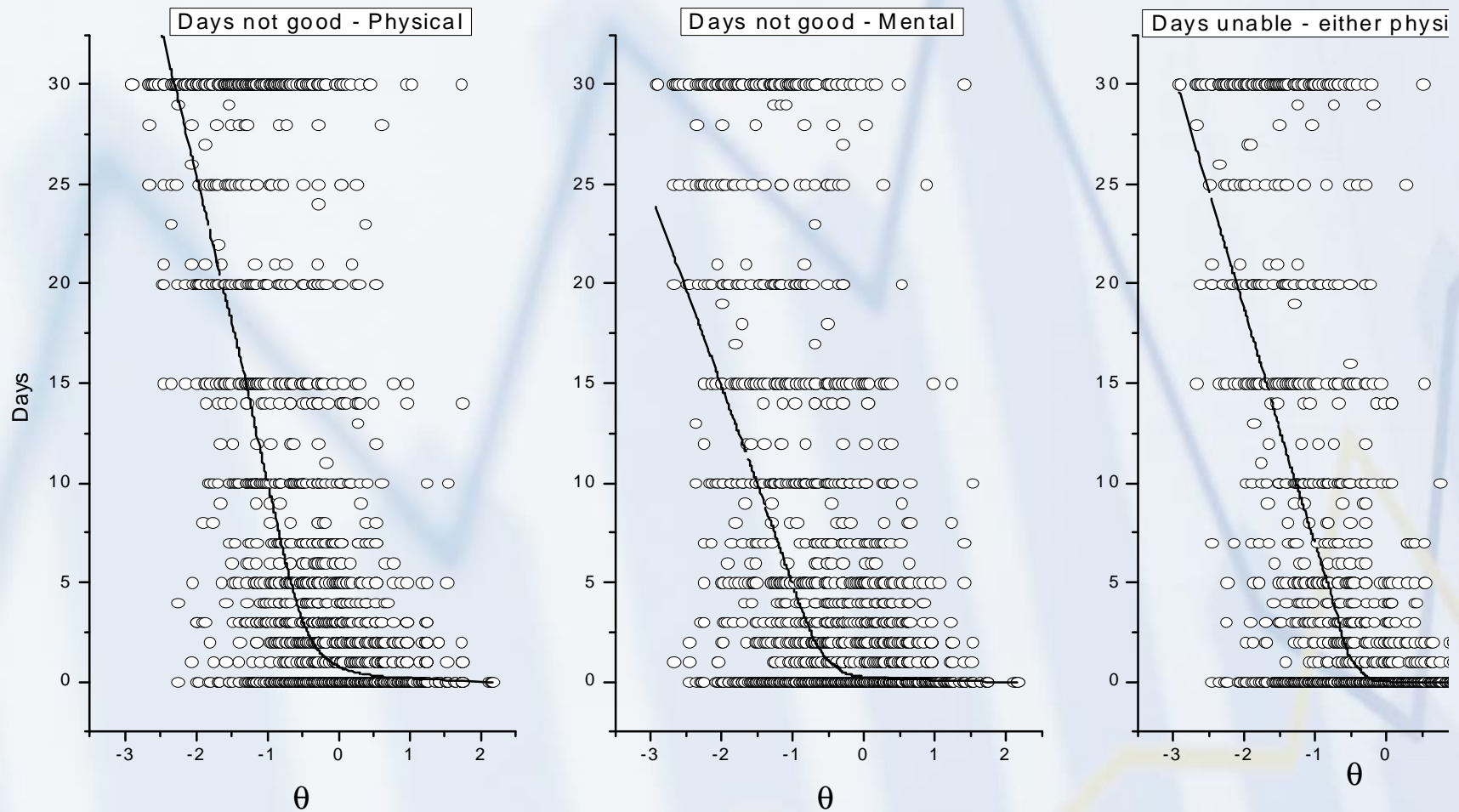
- One-time data sets
 - National Health Measurement Study
 - EQ-5D, HUI2, HUI3, SF-6D, QWB-SA, HALex
 - US Valuation of the EQ-5D (USVEQ)
 - EQ-5D, HUI2, HUI3
 - Joint Canada US Survey of Health (JCUSH)
 - HUI3
- Continuing data sets
 - Medical Expenditure Panel Study (MEPS)
 - EQ-5D (2000-2003)
 - SF-12 (a reduced form of SF-36 that can still be used to compute the SF-6D HRQoL index) (2000-present)
 - National Health Interview Survey (NHIS)
 - data subsuming HALex

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- None of these suitable for community tracking
 - How about BRFSS?
 - collects CDC “healthy days” questions, self-rated health (EVGFP)

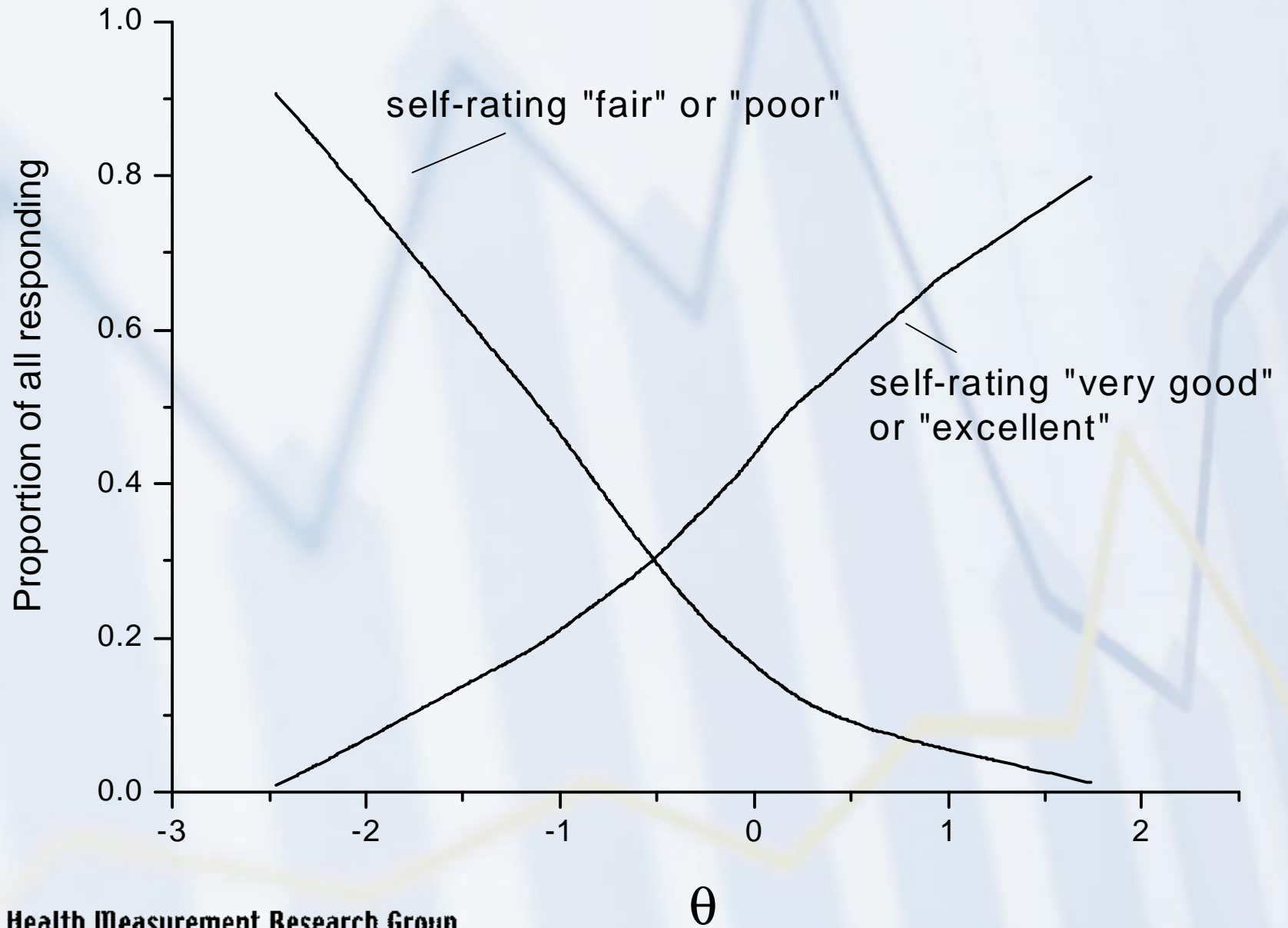
NHMS: Relation between summary health and 6 HRQoL indexes



NHMS: Relation between (Un-)Healthy Days questions and underlying summary health
... HD questions not sensitive to changes in health above population average...



NHMS: Relation between self-rated health (EVGFP) and underlying latent summary health



- BRFSS/CDC data (Healthy Days) now not sufficient to measure summary health across population spectrum of health – misses variation in upper half of population.
 - Even though there is mapping of HD \rightarrow EQ-5D (Jia et al) HD ceiling effect negates usefulness of this. Besides, why not collect HRQoL measure directly?
- With addition of SF-12 or SF-36 could get SF-6D and this would give sufficient basis for QALE computations at any geographic level where life tables are available. Life tables updated only periodically at state level (10 years?)
- Community cohort data could be used to update both HRQoL and life expectancy data over interim times

Summary

- Summary population HRQoL measures add a way to aggregate health measures of morbidity and mortality in population data sets
 - several good HRQoL indexes exist
 - collection of these in ongoing US data sets is sporadic
 - insufficient to apply to state level or below
 - *(aside: Canada uses HUI3 in ongoing population health data system)*
- BRFSS may be good place to insert ongoing collection of one or more HRQoL indexes
 - adds capability to track QALE at state level (+ perhaps smaller areas) to summarize health changes over time.
- Data “pyramid” with these measures can be used for
 - summary tracking of overall health and impact of health programs
 - summary burden of disease measurement
 - explanation of health changes
 - prioritization of targeted programs