

# Summary Measures of Population Health

Dr. Rajaa Al-Raddadi

# Summary Measures of Population Health

- Rationale for summary measures
- Measure of Morbidity
- Mortality-based measures
- Combined disability & mortality methods

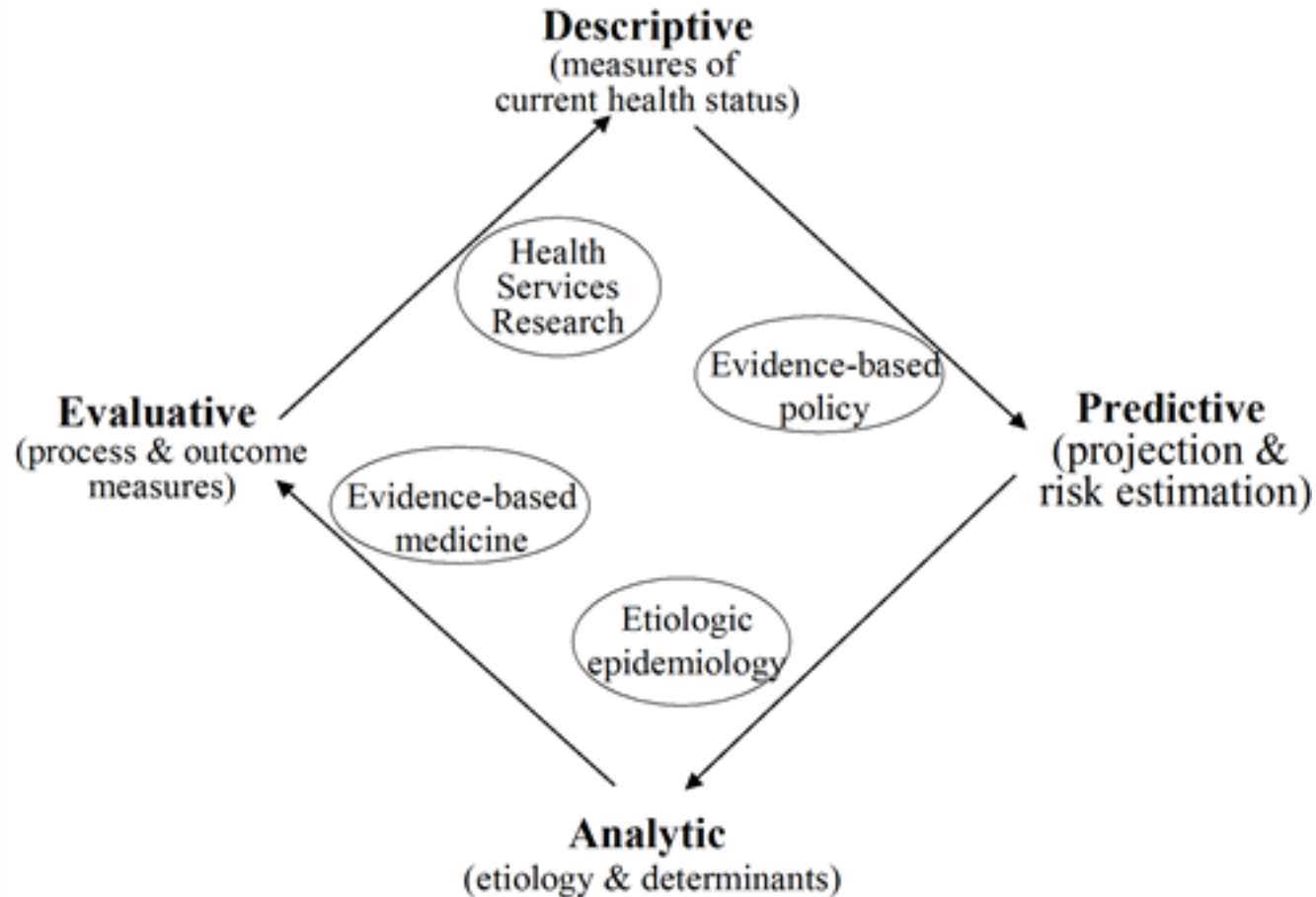
# Why do we need measures of population health?

- We wish to monitor health of citizens ...
  - To set priorities for health services & policies
  - To evaluate social and health policies
  - To compare health of different regions
  - To identify pressing health needs
  - To draw attention to inequalities in health
  - Highlight balance between length and quality of life

# Classifying Population Health Measures by their Purpose

1. *Descriptive* measures:
  - i. Current health status (e.g., health surveys)
  - ii. *Evaluative* measures (e.g., to assess outcomes of health policies)
2. *Analytic* measures include an implicit time dimension:
  - iii. *Predictive* methods (risk assessment; projections of disease burden) look forward;
  - iv. *Explanatory* measures (income inequality or social structure).

These purposes may correspond to different types of research (shown in the ellipses)



Note: the figure is intended to show the typical blend of methods you might use in a particular type of study: HSR would use descriptive and analytic, for example.

# Classifying Population Health Measures by their Focus

1. *Aggregate* measures combine data from individual people, summarized at regional or national levels. E.g., rates of smoking or lung cancer.
2. *Environmental* indicators record physical or social characteristics of the place in which people live and cover factors external to the individual, such as air or water quality, or the number of community associations that exist in a neighborhood. These can have analogues at the individual level.
3. *Global* indicators have no obvious analogue at the individual level. Examples include contextual indicators such as the existence of healthy public policy; laws restricting smoking in public places, or social equity in access to care; social cohesion, etc.

Morgenstern H. Ecologic studies in epidemiology: concepts, principles, and methods. *Annu Rev Public Health* 1995; 16:61-81.

# History of changing approaches to measuring population health

- Originally based on mortality rates. IMR is often used to describe level of development of a country
- With declining mortality, people with chronic disease survive; morbidity & disability gain importance. Then . . .
- Concern with quality of life, not mere survival
- To compare populations at different stages of economic development, it may be desirable to combine mortality and morbidity in a single, composite index

# Aggregate Measures: Mortality-Based Indicators

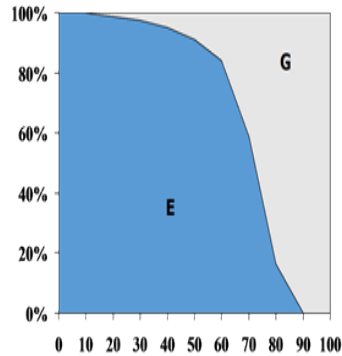
Life expectancy

Expected years of life lost

Potential years of life lost



# Expectancies versus Gaps



- From a typical survival curve, we can either consider the life expectancy (“E”), or the gap (“G”) between current life expectancy and some ideal (here, the outer rectangle).
- Expectancies are generic; gaps can be disease-specific

# Life Expectancy

- Summarizes all age-specific mortality rates
- Estimates hypothetical length of life of a cohort born in a particular year
  - This assumes that current mortality rates will continue

# Potential Years of Life Lost (PYLL)

- $PYLL = e_r$  ( “normal age at death” – actual age at death).  
Doesn't much matter what age is chosen as reference;  
typically 75
- Attempts to represent impact of a disease on the population: death at a young age is a greater loss than death of an elderly person
- Focuses attention on conditions that kill younger people (accidents; cancers)
- All-causes or cause-specific PYLL

# Aggregate Measures: Indicators that Combine Mortality & Morbidity

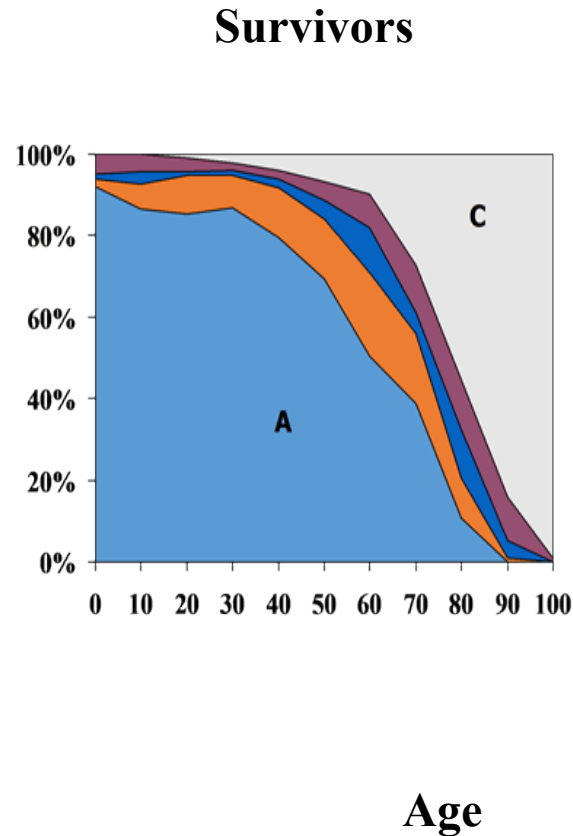
Health expectancies

Health gaps

# Composite Measures

- Composite measures combine morbidity and mortality into a health index. An index is a numerical summary of several indicators of health
- Aims to represent overall health of a population
- Mortality data typically derived from life tables; morbidity indicators from health surveys, e.g.
  - Self-rated health
  - Disability or activity limitations
  - A formal health index

# Survivorship Functions for Health States



This diagram illustrates the composite health of a population.

The lower area 'A' shows the proportion of people in good health (however defined); it shows healthy life expectancy. The top curve shows deaths; intermediate curves represent various levels of disability.

Area 'C' represents the deficit of this population compared to an arbitrary ideal; this refers back to the notion of health gaps.

# More details on the combined indicators

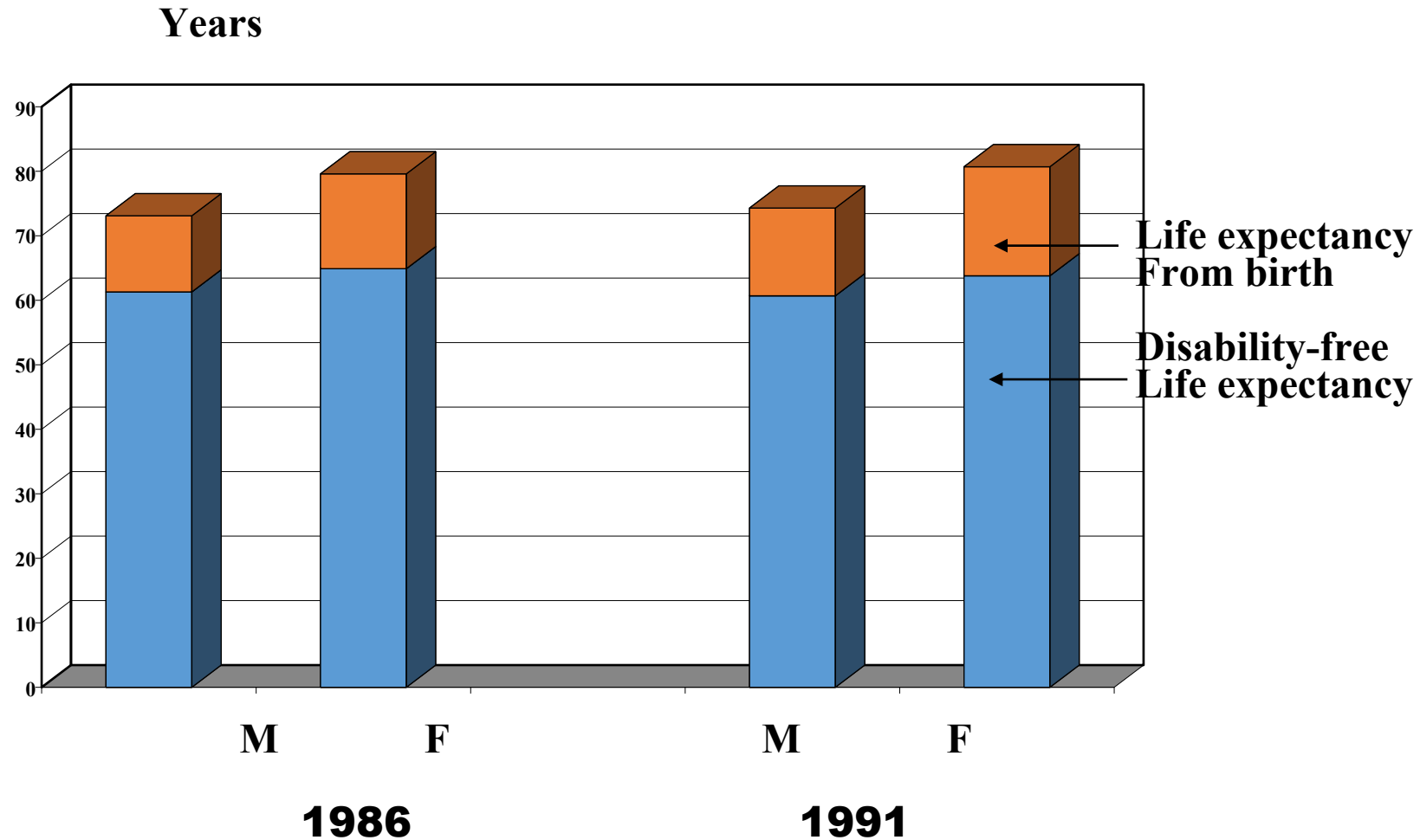
- From the previous chart:
  - You can read from the bottom, and talk of “health expectancies.”
  - Or you can read from the top, and focus on the gap between current state and the ideal .
  - The bands in the middle indicate that the value of a life lived in less than perfect health is less than a healthy life-year. These are “health-adjusted life expectancies”
  - The indicators will fall in a descending sequence: overall life expectancy, then health-adjusted life expectancy, then healthy life expectancy.

# Health expectancies

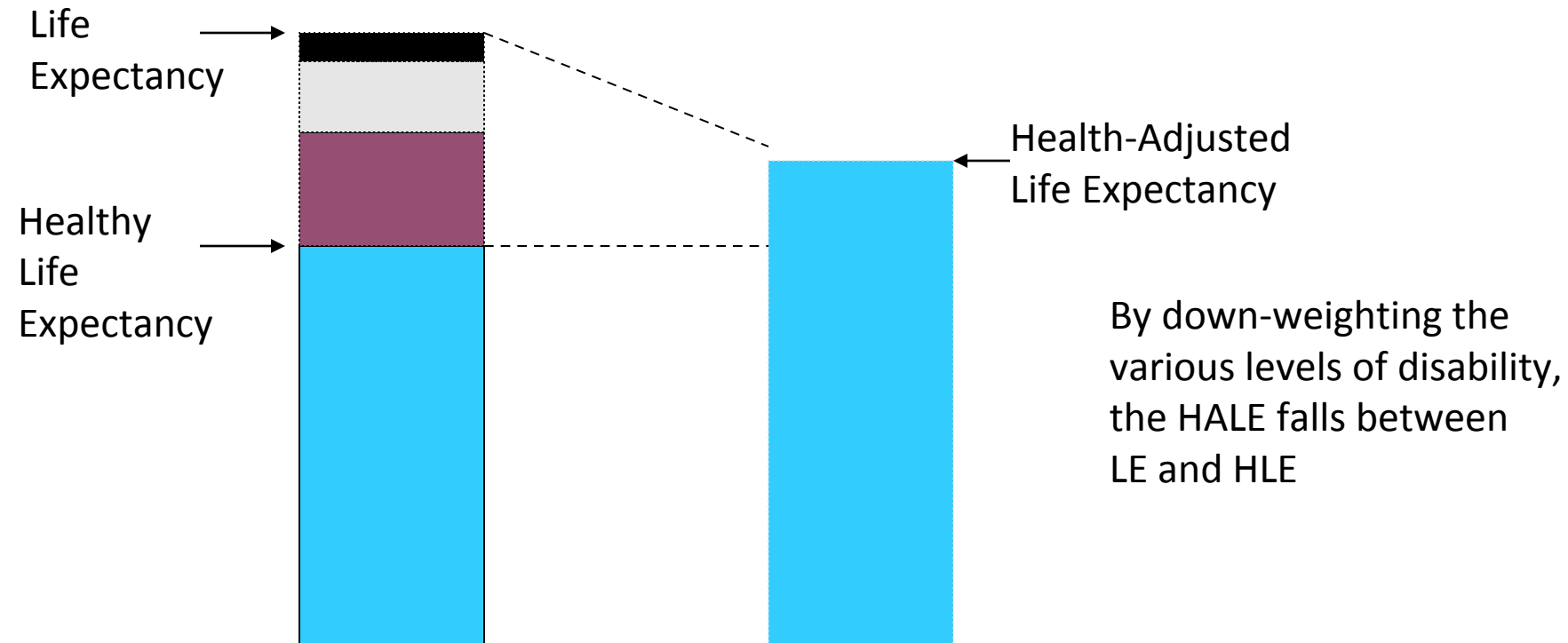
- Generic term: any expectation of life in various states of health.



# Illustrating dichotomous weights: Life Expectancy and Disability-Free Life Expectancy, Canada, 1986-1991



# Relationship between Life Expectancy, Health Expectancy and Health-Adjusted Life Expectancy



# Examples of Health Gap Measures

- Gap measures use a weighting for intermediate health states. This is necessary to combine time lost due to ill health with time lost due to premature mortality
- Quality Adjusted Life Years (QALYs)
  - Common outcome measurement in clinical trials, program evaluation
  - Record extra years of life provided by therapy and quality of that life
  - Typically use utility scale running from 0 to 1
- DALYS (disability-adjusted life years)

**Thank you**