Measures of Mortality

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Outline

- Introduction
- Measures of Mortality
  - Crude death rate(CDR)
  - Specific mortality/ death rates: age,sex and cause
  - Proportionate mortality
  - Proportionate mortality ratio
- Determinants of mortality
- Use of mortality data
- Sources of mortality data

Introduction

- Death
  - “The permanent disappearance of all evidence of life at anytime after birth”
- Mortality
  - A Demographic event- average risk of dying of a person in the group during a time span
  - One of the three(03) determinants of a population change : Fertility, Mortality and Migration
- What is a “Rate” ?
  - Measure of speed which events are occuring in a population in specified time period
  - Helps to compare “apples with apples”
  - Need a numerator and a denominator that “appropriately” relates with numerator - population at risk
  - Units - per 1,000 / per 100,000 /per million

Introduction...

- Three levels of rates
  - **Crude rates -** Calculated for the entire population
  - **Specific rates** - Calculated for specific subpopulations
    - Age specific rates - Infant mortality rate
    - Gender specific rates
  - **Standardized rates**
    - Weighted average for category specific rates
    - Also known as adjusted rates
      - Eg: age adjusted rate
    - Others
      - Life Expectancy / Life Tables
      - Multivariable statistical analysis
  - Subdivisions
      - Standardized Mortality Ratio (SMR)
      - Proportionate Mortality Ratio (PMR)
      - Specific Mortality Ratio

Introduction...

- Measurements used,
  - Crude Death Rate(CDR)
  - Age Specific Death Rates(ASDRs)
  - Proportional Mortality Rate(PMR)
  - Infant Mortality Rate(IMR)
  - Life Expectancy(LE)
  - Standardized Mortality Rates(SMRs)

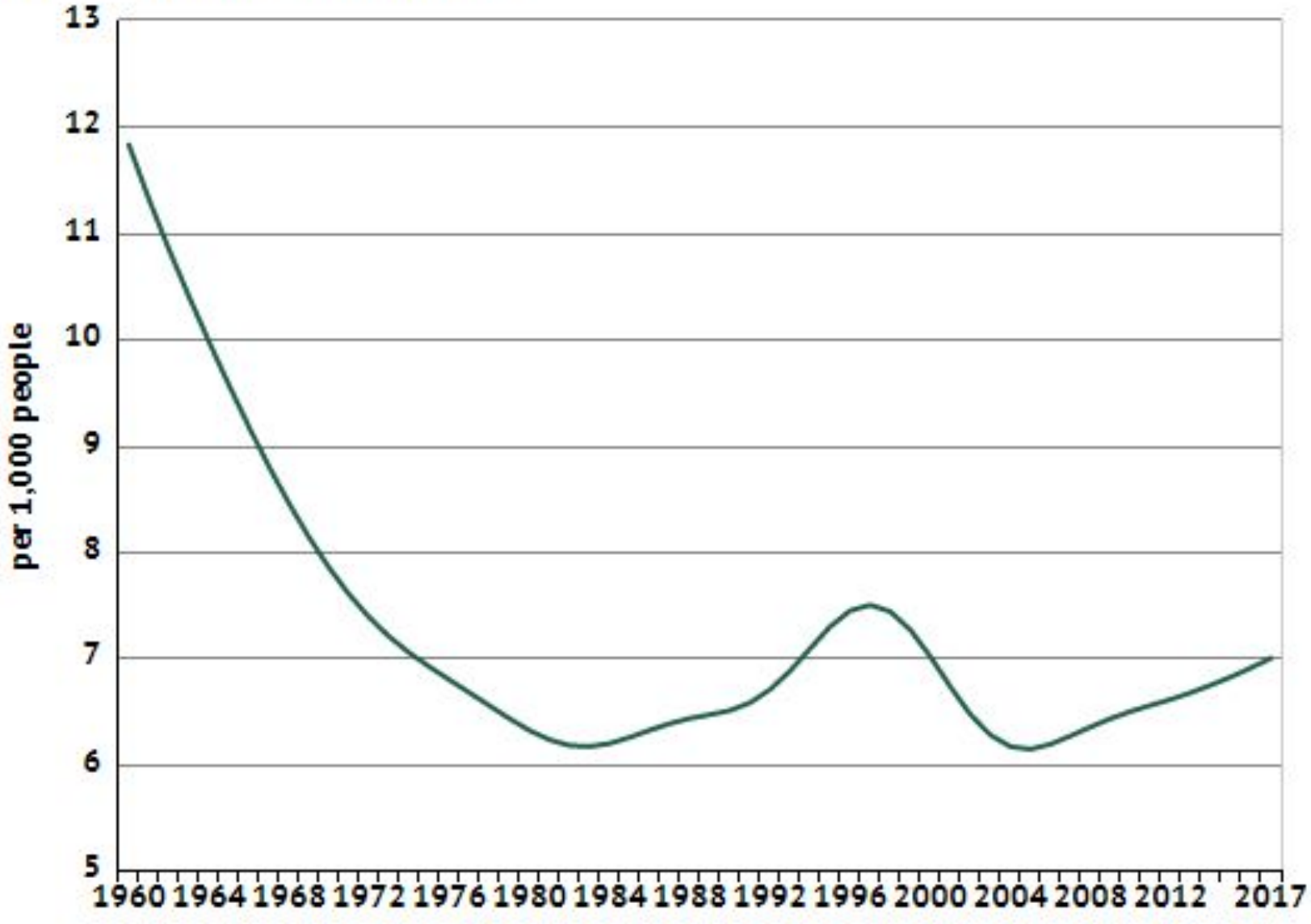
Crude Death Rate(CDR)

- Total number of deaths in a calendar year per 1,000 mid-year estimated population
  - mid-year estimated population - approximation to the average population at risk

$$CDR = \frac{Total\ number\ of\ deaths\ during\ the\ calender\ year}{Mid-year\ estimated\ population} X\ 1,000$$

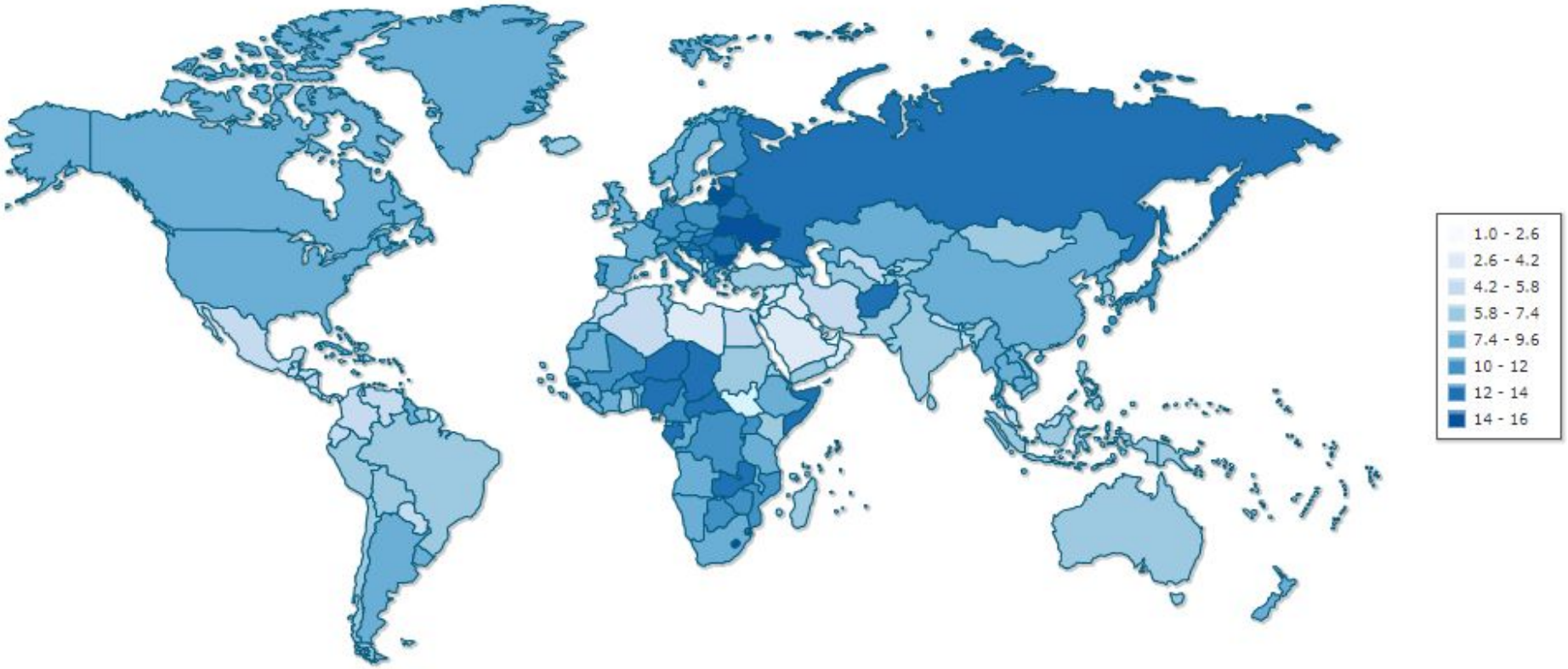
- Advantages
  - Easy and quick to calculate
  - Show levels of mortality in a population
  - Meaning/message can be easily communicated to general public (Easy to interpret)
- Disadvantages
  - Cannot do international comparisons ,different age structures
- Sri Lanka 6.2 (AHB-2016)

Crude Death Rate(CDR) -Sri Lanka



https://knoema.com/atlas/Sri-Lanka/Death-rate

Crude Death Rate(CDR) -World



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Specific Mortality/Death Rates

- Number of deaths of a subpopulation during a calendar year per 1,000 mid-year estimated subpopulation
- Eg Age Specific Mortality Ratio (ASPMR)

$$ASMR = \frac{Total\ number\ of\ deaths\ during\ the\ calender\ year\ of\ age/age\ group}{Mid-year\ estimated\ population\ of\ age/agegroup} X\ 1,000$$

- Can be cause specific , gender specific,etc
- Other Examples
  - Maternal Mortality Ratio (MMR)
  - Perinatal Mortality Ratio
  - Infant Mortality Ratio (IMR)

Specific Death Rates(Age-Sex)

- It measures risk of death among persons in a specific age and sex group
- It is simple to calculate
- It can be used to compare the mortality of two populations of the same specific age and sex (age & sex compositions can be different)
- It gives the essential components for constructing life tables
- It does not summarize total mortality in a single figure
- It takes no account of the differences in the population structure in terms of race, occupation, religion etc
- Comparison of overall mortality conditions in the two populations is cumbersome
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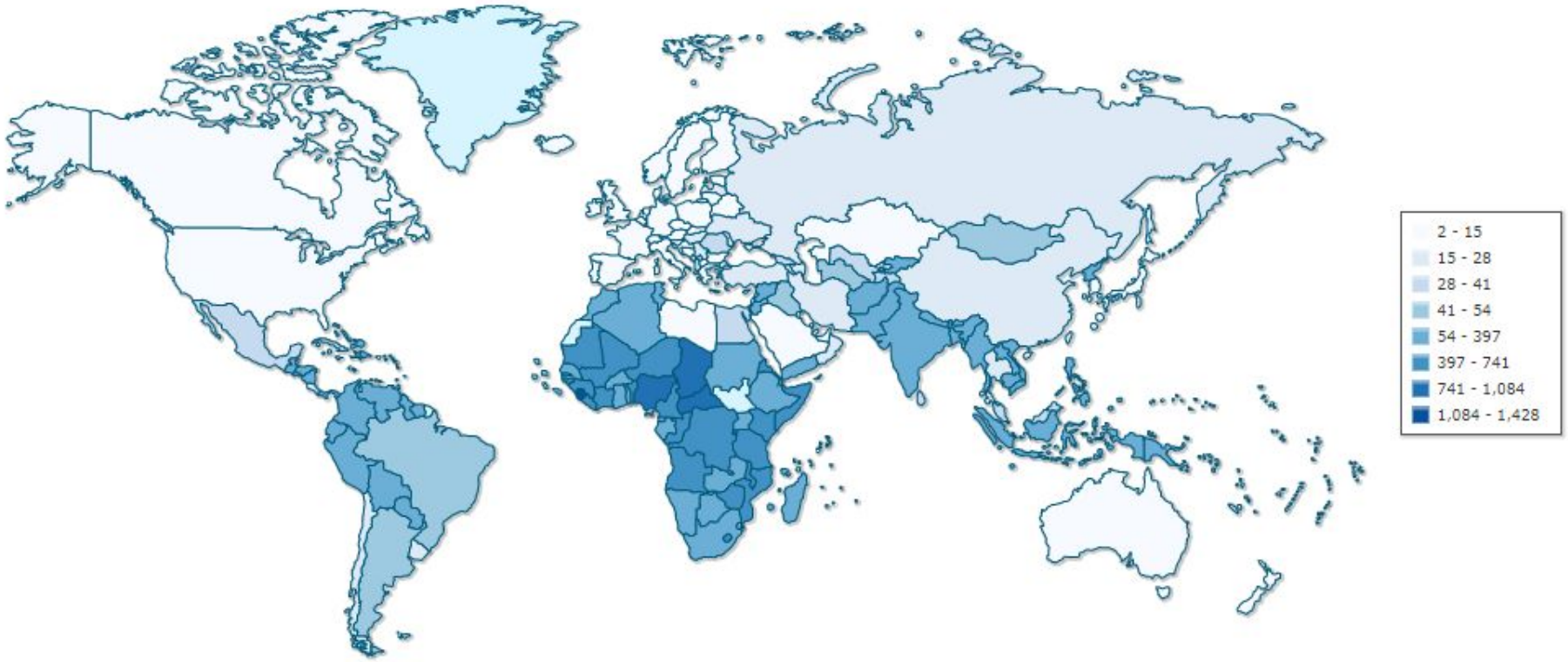
Maternal Mortality Rate(MMR) - World



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Proportionate Mortality

- Describes the **proportion of deaths** in a particular population over a specified period of time, attributable to different causes

$$\textit{Proportionate Mortality of a Disease} = \frac{\textit{Total number of deaths due to the disease during calender year}}{\textit{Total number of deaths of the population during calender year}}$$

- Indicates whether deaths are due to particular disease or an environmental condition is responsible for an unusually high proportion of deaths
- Important for health authorities take necessary preventive actions

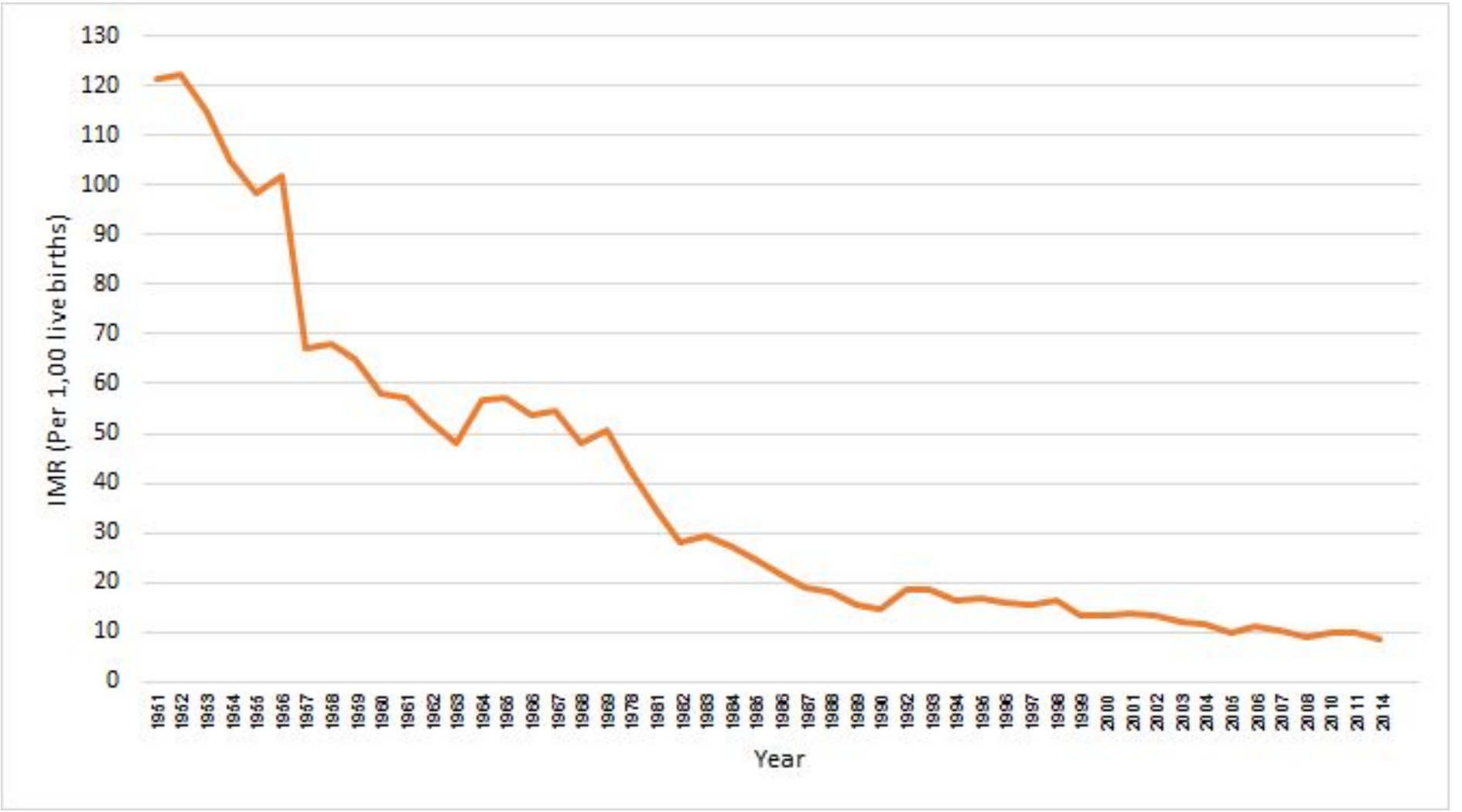
Infant Mortality Rate(IMR)

- Number of infant deaths in a year per 1000 live births in that year

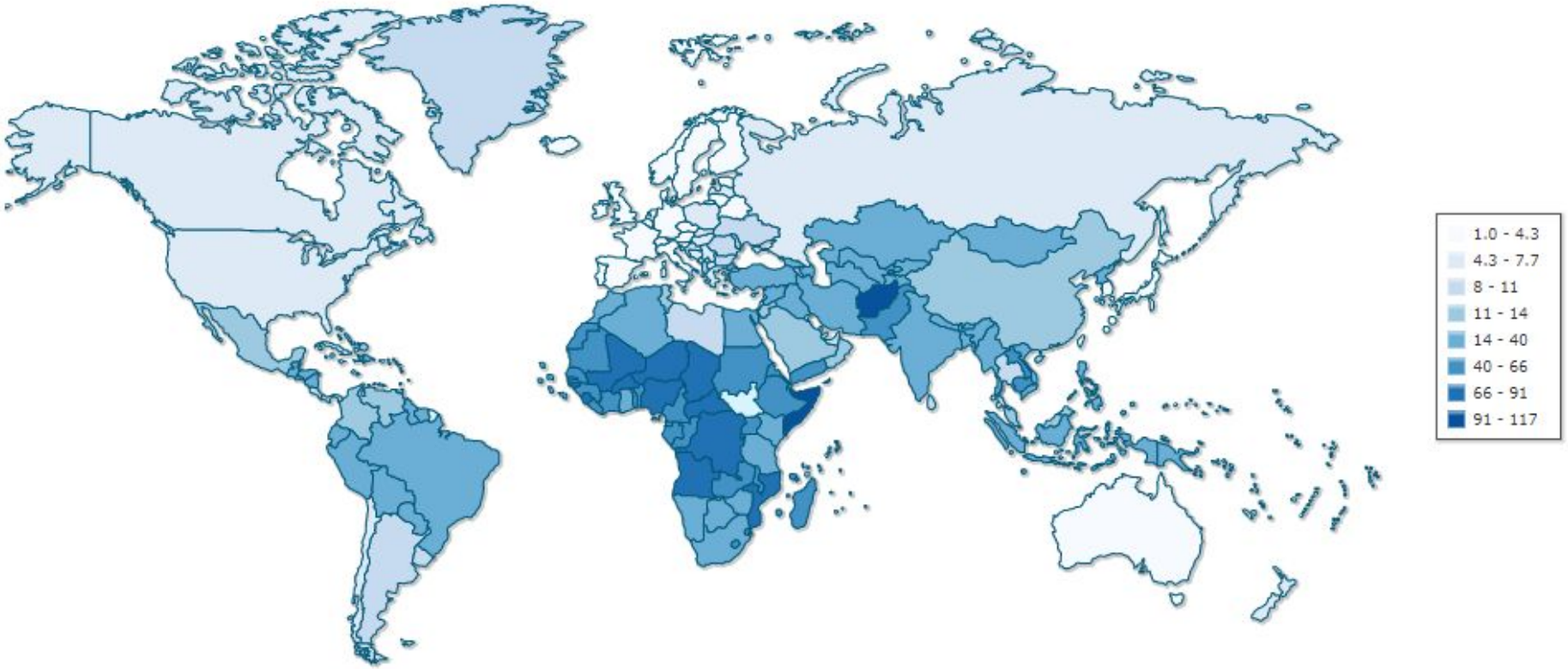
$$IMR = \frac{Total\ number\ of\ infant\ \ deaths\ during\ the\ year}{Total\ number\ of\ live\ births\ during\ the\ year}\ X\ 1,000$$

- Good indicator for health status of a country/population
- Many developing countries having higher values
- Eg
  - **Sri Lanka -8.0** (2014 - Registrar General's Dept)
  - Afghanistan - 51.5 (2017) -WHO
  - India - 32.0 (2017)-WHO
  - U.S.A. - 5.7 (2017)-WHO
  - U.K. - 3.7 (2017)-WHO

Infant Mortality Rate(IMR)- Sri Lanka



Infant Mortality Rate(IMR)- World



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Case Fatality Rate (CFR)

- Proportion of reported cases of a specified disease or condition which are fatal within a specified time
- Measures the severity of the disease that causes death
- Usually calculated for acute infectious diseases. (Usefulness in chronic diseases is limited)

$$CFR = \frac{Total\ number\ of\ deaths\ due\ to\ the\ disease\ \ during\ the\ time\ period}{Total\ number\ of\ \ population\ \ with\ the\ disease\ of\ interest\ \ during\ the\ time\ period}\ X\ 100$$

- Eg
  - Rabies - 100%
  - Ebola - 70–90%
  - Dengue in Sri Lanka - 0.2 %

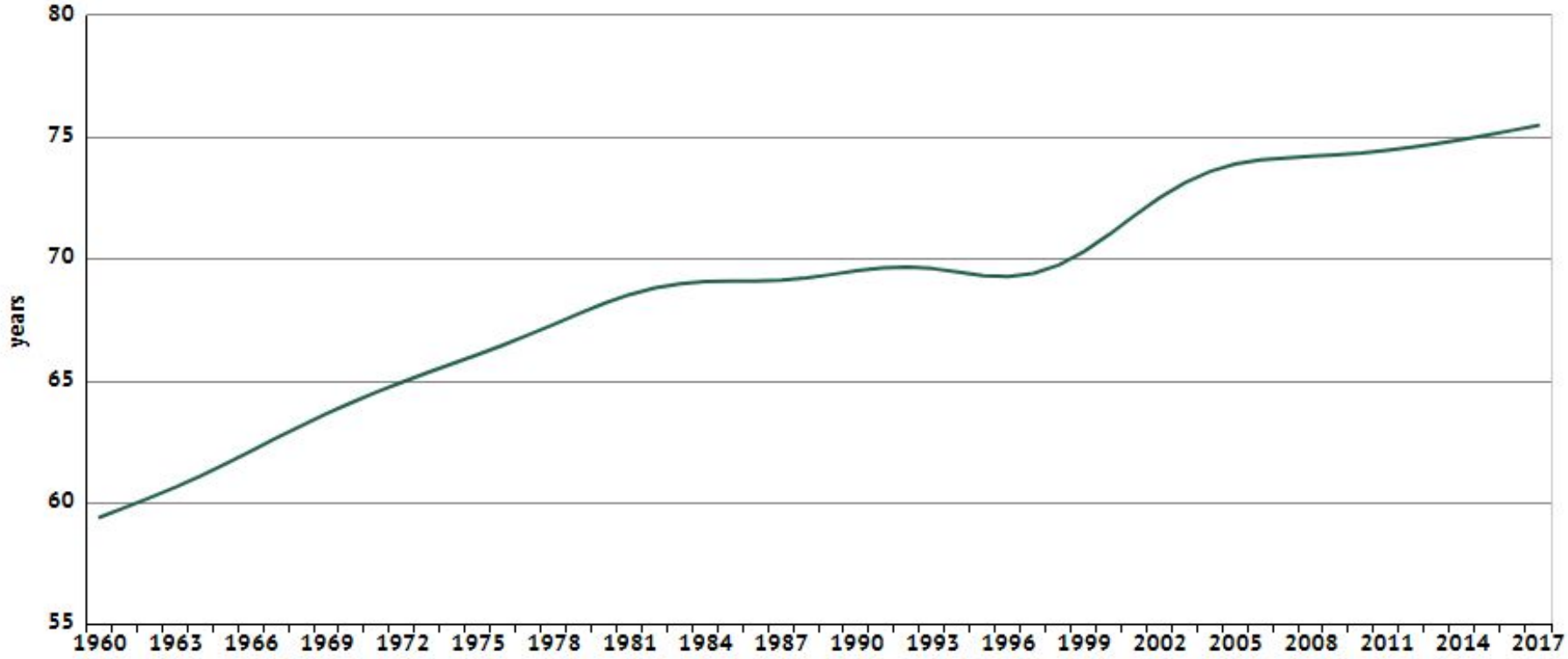
Adjusted/Standardized Rates

- Statistical procedures are carried out to “remove the effect” of differences in composition in various populations
- 2 methods for removing this effect
    1) Direct method
    2) Indirect method

Life Expectancy (LE)

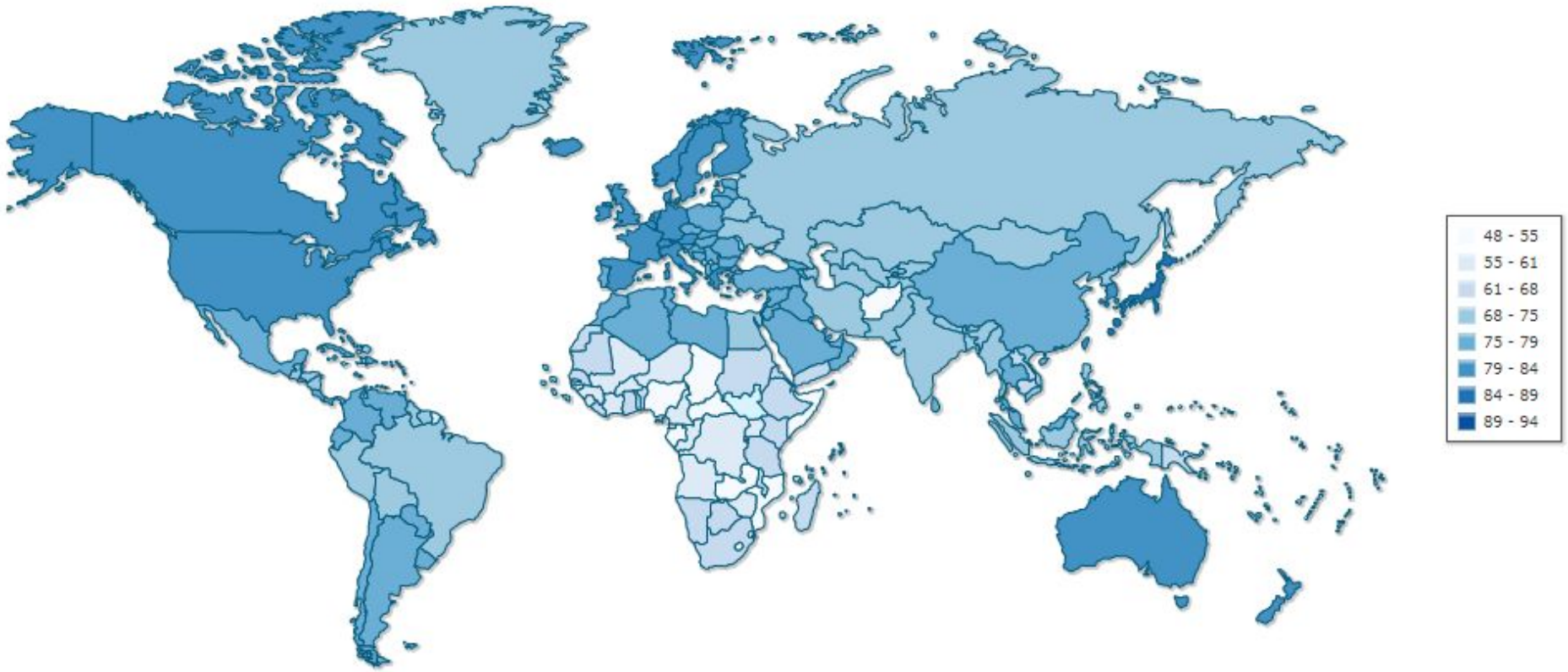
- Average remaining years an individual of a given age expected to live subject to age specific death rates (ASDRs) for the given year
- Depends on
  - Mortality pattern
  - Level of available medical facilities
  - Life Style
  - Emerging and re-emerging diseases
- L.E. can be calculated for any age
  - **LE at birth**(0 years) -**Health indicator of a population**
  - LE at 1 year
- Decreases with age
- Usually calculated with life tables(mortality table/actuarial table)

Life Expectancy at birth - Sri Lanka



https://knoema.com/search?query=sri%20lanka%20life%20expectancy%20at%20birth

Life Expectancy at birth -World



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Uses of Mortality statistics

- Useful for projecting future size of population
- Identify the populations of high risk and needs health services
- Useful for healthcare and other planners and policy makers
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Sources of Mortality data

- Vital registration system,
- National sample surveys,
- Special health surveys,
- Hospital records,
- Revenue agencies,
- Police,
- Village/ community councils
- etc

References

- Annual Health Bulletin -2016
- Demographic and Health Survey -2016
- www.health.gov.lk
- World bank Data from https://data.worldbank.org/indicator/sp.dyn.cdrt.in
- World Map indicators from https://www.indexmundi.com/map/?v=29
- Graphs - https://knoema.com/atlas/Sri-Lanka

Thank you