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# **Mortality data and methodological approaches in estimating mortality in developing countries**

## **INTRODUCTION**



MAX-PLANCK-INSTITUT  
FÜR DEMOGRAFISCHE  
FORSCHUNG

MAX PLANCK INSTITUTE  
FOR DEMOGRAPHIC  
RESEARCH

# QUO VADIS, HMD?

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- HMD covers almost all developed countries with fully functioning vital registries.
- Further expansion of the main HMD is limited due to strict requirements for coverage and quality of statistics.
- A growing demand for more reliable and real data-based mortality estimates for developing countries.

**The objective of the meeting:** to discuss possibilities to extend the HMD approach to China, India, and other middle- & low-income developing countries.

# Momentum of a global health transition

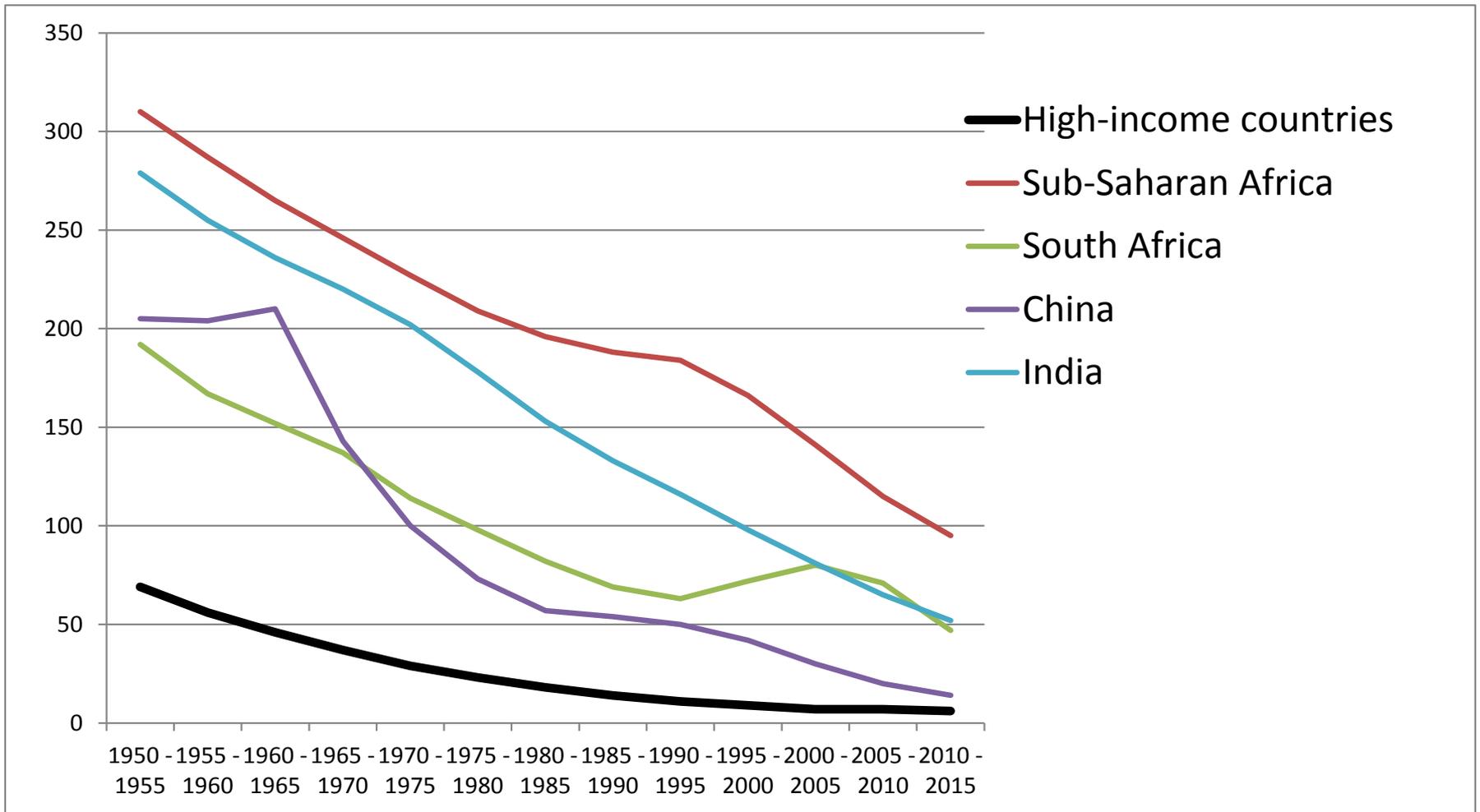
## ➔ Health transition framework (Vallin & Meslé 2004, 2005)

- ➔ a wider concept, **not just epidemiological change**.
- ➔ a process of **subsequent divergence-convergence cycles**, a divergence following each major health progress.
- ➔ changing **vanguards and laggards**.
- ➔ **complex processes**: new cycle can start without completion of the previous cycle.

## Developing countries:

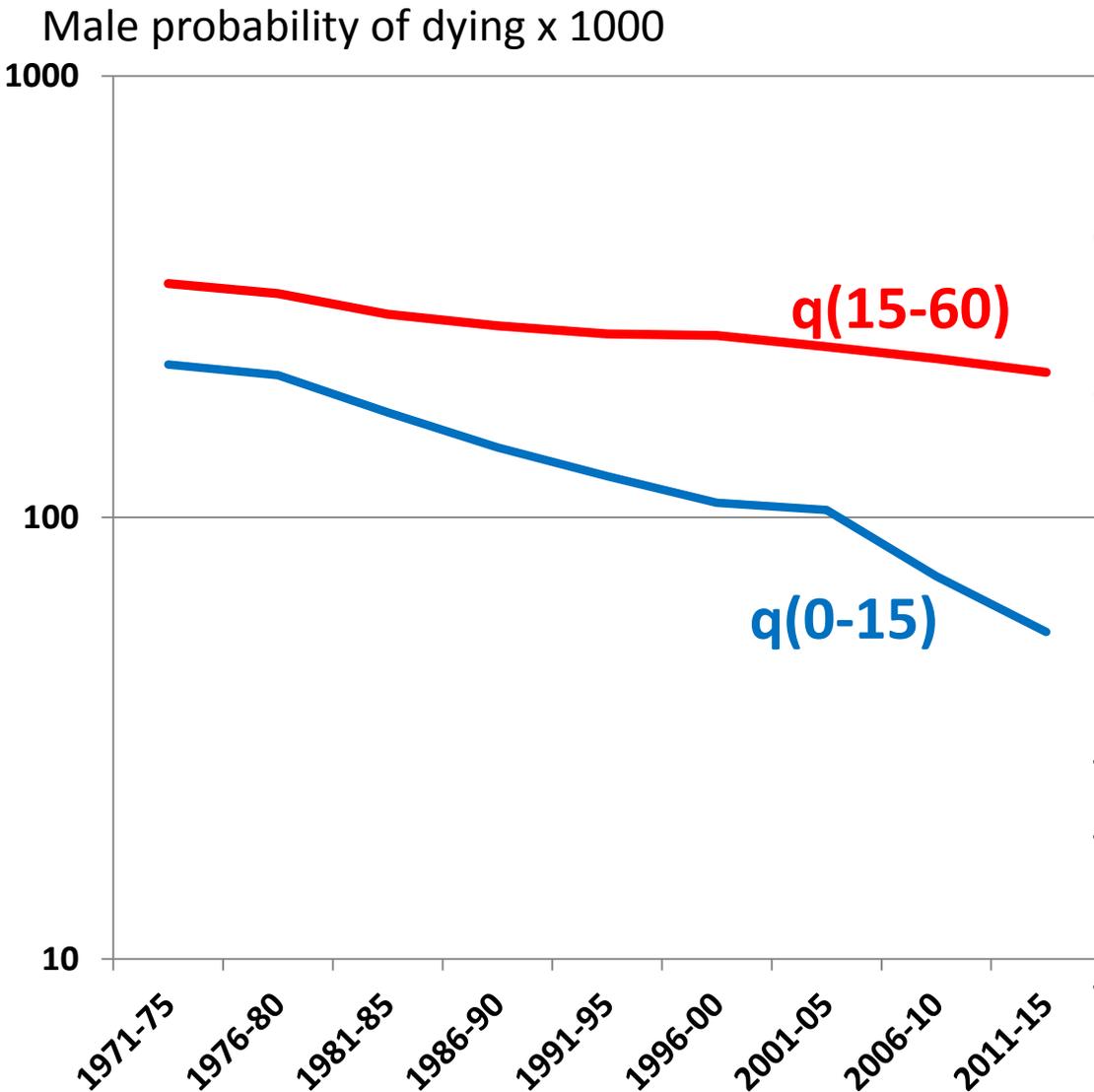
- ➔ Shift from child to adult / old-age mortality.
- ➔ Ongoing transition from infectious to non-communicable diseases.
- ➔ Huge shifts in cohort composition: early life conditions, education, and modern health risks – smoking, alcohol, obesity,...
- ➔ **Uneven progress and scenarios across/within countries.**

# Decline in child (0-5 yrs) mortality in selected developing countries: UN estimates, 1950-2015.



Source: UN Population Division, 2019.

# AN EXAMPLE OF INDIA



Life expectancy still mainly driven by child mortality, much slower progress at adult ages.

→ limited scope for future improvements:

Recent threats:

- Smoking epidemics
- Unfavorable patterns in other risk factors.
- Huge social and regional disparity

# IMPLICATIONS FOR MONITORING MORTALITY IN DEVELOPING COUNTRIES

- ➔ **A need for more comprehensive national data sources** beyond standard surveys primary focusing on child and maternal mortality.
- ➔ **A need for a change in modeling strategies:**
  - more emphasis on adult and (even) old-age mortality based on real (observed) data.
  - from heavy modeling and “global” approaches to more precise approach taking into account variations & country specifics.
- ➔ **Proved solutions for obtaining reliable evidence base on mortality profiles**
  - Sample registration systems (e.g. India)
  - Surveillance points systems (INDEPTH)
- ➔ **New initiatives**
  - Bill Gates Foundation: *Countrywide Mortality Surveillance for Action (COMSA) & Child Health & Mortality Prevention Surveillance Network (CHAMPS)*.

# THE LANCET

Log in

GBD 2017 Mortality Collaborators  
*The Lancet*, Vol. 392, No. 10159  
Published: November 10, 2018  
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**Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the Global Burden of Disease Study 2017**

GBD 2017 Causes of Death Collaborators  
*The Lancet*, Vol. 392, No. 10159  
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GBD 2017 Disease and Injury Incidence and Prevalence Collaborators  
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**Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017**

GBD 2017 DALYs and HALE Collaborators  
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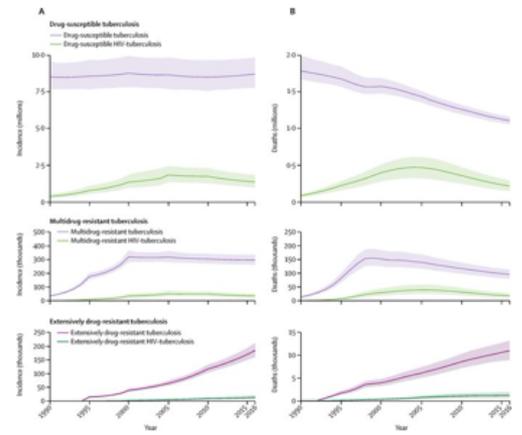


## Twitter

**Global Burden of Disease**  
Curated Tweets by @TheLancet  
#GBDstudy

**IHME at UW**  
@IHME\_UW

Published recently in @TheLancetInfDis, an analysis of the #GBDstudy explores levels and trends of the burden of #tuberculosis between 1990 and 2016. Read the study: [bit.ly/2DNS40n](https://doi.org/10.1016/S1473-3099(18)30400-0)



Dec 10, 2018

## How Do You Count the Dead?

Gretchen Vogel

*Science* **336** (6087), 1372-1374.  
DOI: 10.1126/science.336.6087.1372

HEALTH METRICS

*Science* **338** (6113), 1414-1416.  
DOI: 10.1126/science.338.6113.1414

# A Controversial Close-Up Of Humanity's Health

Kudos and criticism greet a landmark new report, filling the largest ever issue  
of *The Lancet*, on the global burden of disease

OPEN  ACCESS Freely available online

PLoS MEDICINE

Essay

## The Imperfect World of Global Health Estimates

Peter Byass<sup>1,2\*</sup>

# Potential contribution of the HMD

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→ Focus on quality instead of “quantity” [global coverage]

→ Implementing fundamental HMD principles:

- transparent and well documented methodology;
- exploiting local expertise;
- systematic and extensive data quality checks;
- careful documentation of data and their problems;
- more data, less model;
- open data principles (input data, scripts, ...).

→ A country-specific approach:

- general approach + country-specific methods;
- maximal usage of real data;
- employing alternative data sources.

# Principal data sources on mortality in China

## CENSUSES OR SURVEYS BY NATIONAL BUREAU OF STATISTICS (NBS)

- *Population censuses: 1982, 1990, 2000, and 2010.*
  - enumeration of people **who died** in a household one year or 18 months before the census or survey. Inter-censal 1% sample surveys: 1987, 1995, and 2005
- *Annual Population Change Surveys.* Smaller surveys for inter-censal years.

## HOUSEHOLD REGISTRY (“HUKOU”) BY MINISTRY OF PUBLIC SECURITY

- each resident is legally required to register in the household registration system, registration to be cancelled within a month after death. Serves as basis for census.

## VITAL REGISTRATION / SURVEILLANCE SYSTEMS BY HEALTH MINISTRY

- *Nationwide Vital Registration System:* 8 % of the national population, ca. 110 million people (2005 est.), mostly urban, Eastern China (Rao et al. 2005).
- *Disease Surveillance Points (DSP):* 161 surveillance points, ~10 mill. people.
- *National Child and Maternal Mortality Surveillance Points:* 336 counties / urban districts covering 140 mill. people, child and maternal mortality.

# Principal data sources on mortality in India:

## SAMPLE REGISTRATION SYSTEM AND NFHS&DLHS SURVEYS

### Sample Registration System (SRS)

- a nationwide system by Office of the Registrar General.
- a dual record vital registration system for a **sample of urban blocks and villages to produce continuous demographic data.**
- **representative**, covers all major states, sample size ~10 mill. pop.

### National Family Health Survey (NFHS): (1992-93, 1998-99, 2005-06, and 2015-16)

- Includes **deaths occurring 3 years prior the survey reported by household head.**

### District Level Household Surveys (DLHS) (1998-99, 2001-02, 2005-07, 2012-14) :

- **DLHS 2-4: deaths occurring 1-4 years prior the survey rep. by household head.**
- *NFHS and DLHS: different waves not consistent in terms of coverage and methods.*

**The million death study:** biannual survey covering 14 mil. people and 1 mill. deaths by cause of death (verbal autopsy). Register General, India & Centre for Global Health Research, University of Toronto, Canada).

# India: a variety of data quality problems

## Coverage

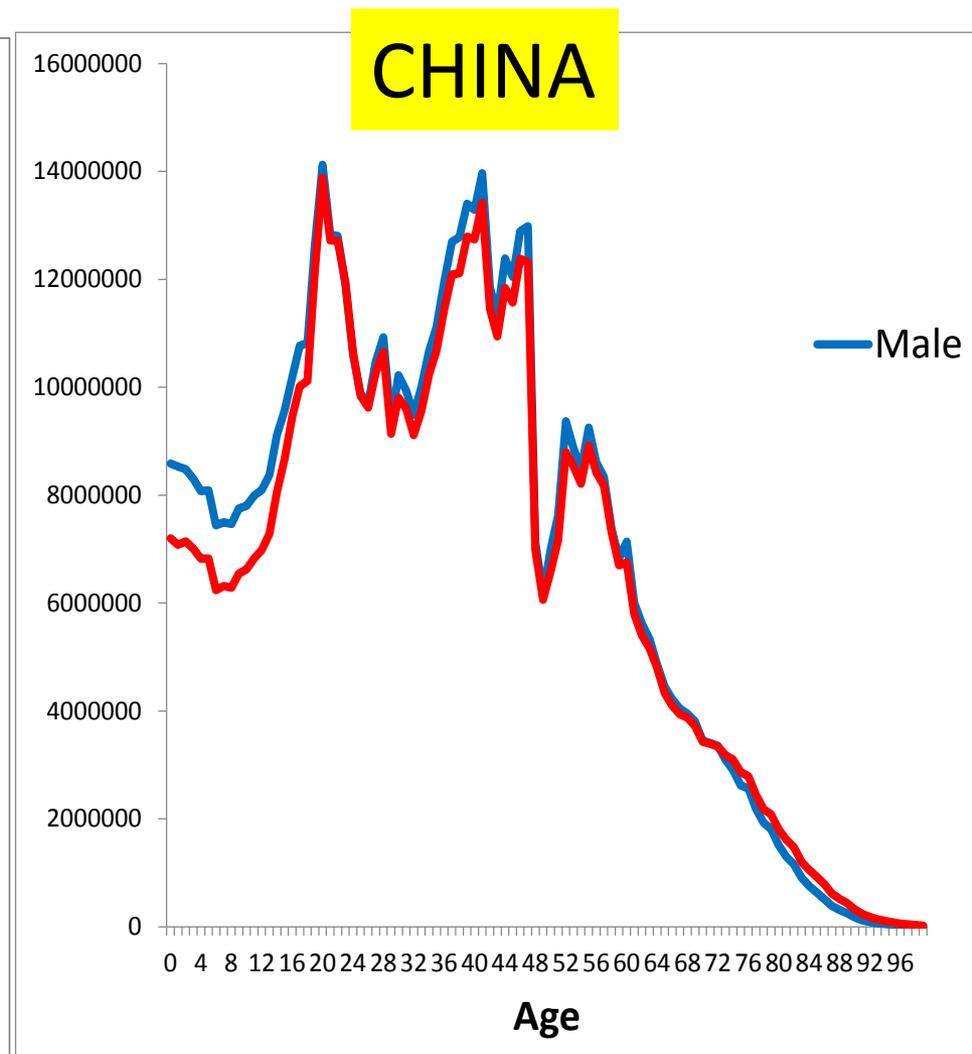
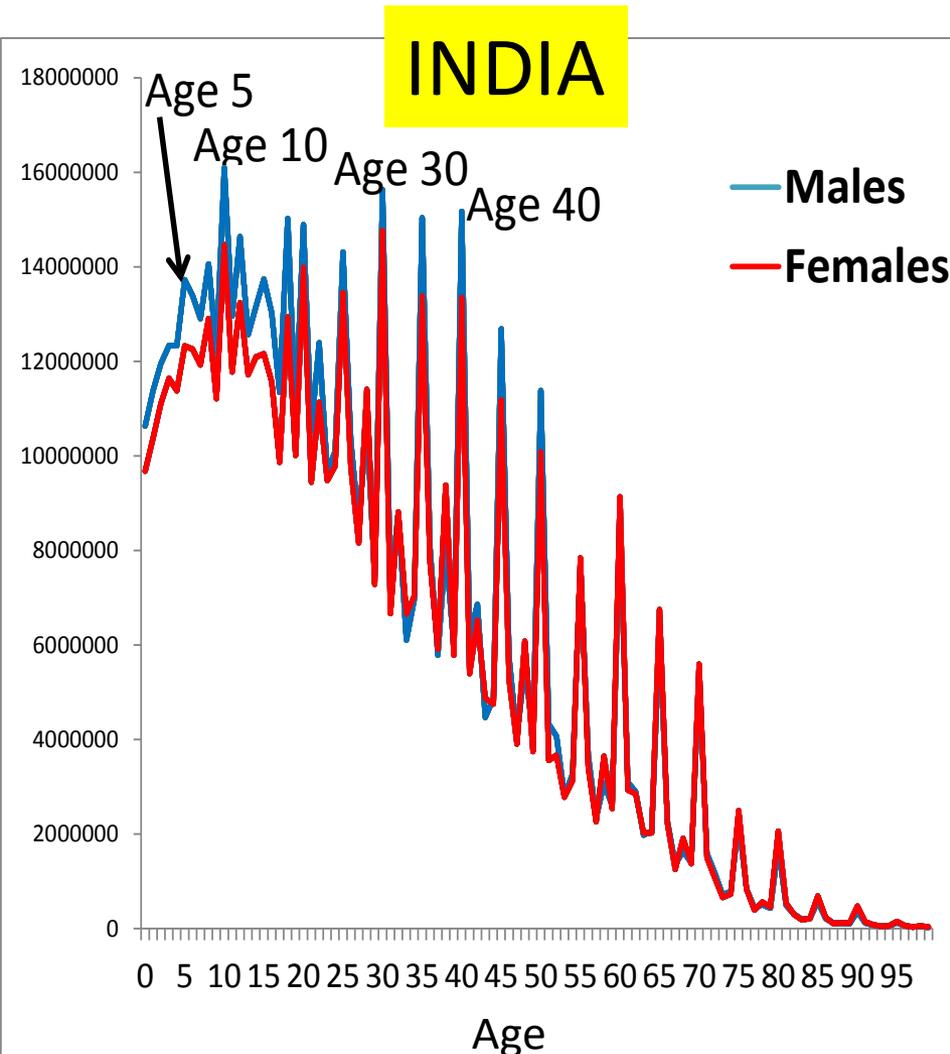
- Indirect evidence about **completeness of death registration**: 1971-1991: 95% for men, 88-91% for women 1970s-80s.
- **Variation in quality of registration** across major states
- **Unequal coverage of population under risk across ages**: substantial undercount at older ages, especially among females → *possibly due to sampling and other errors.*

Sources: Bhat, 1987, 2002.

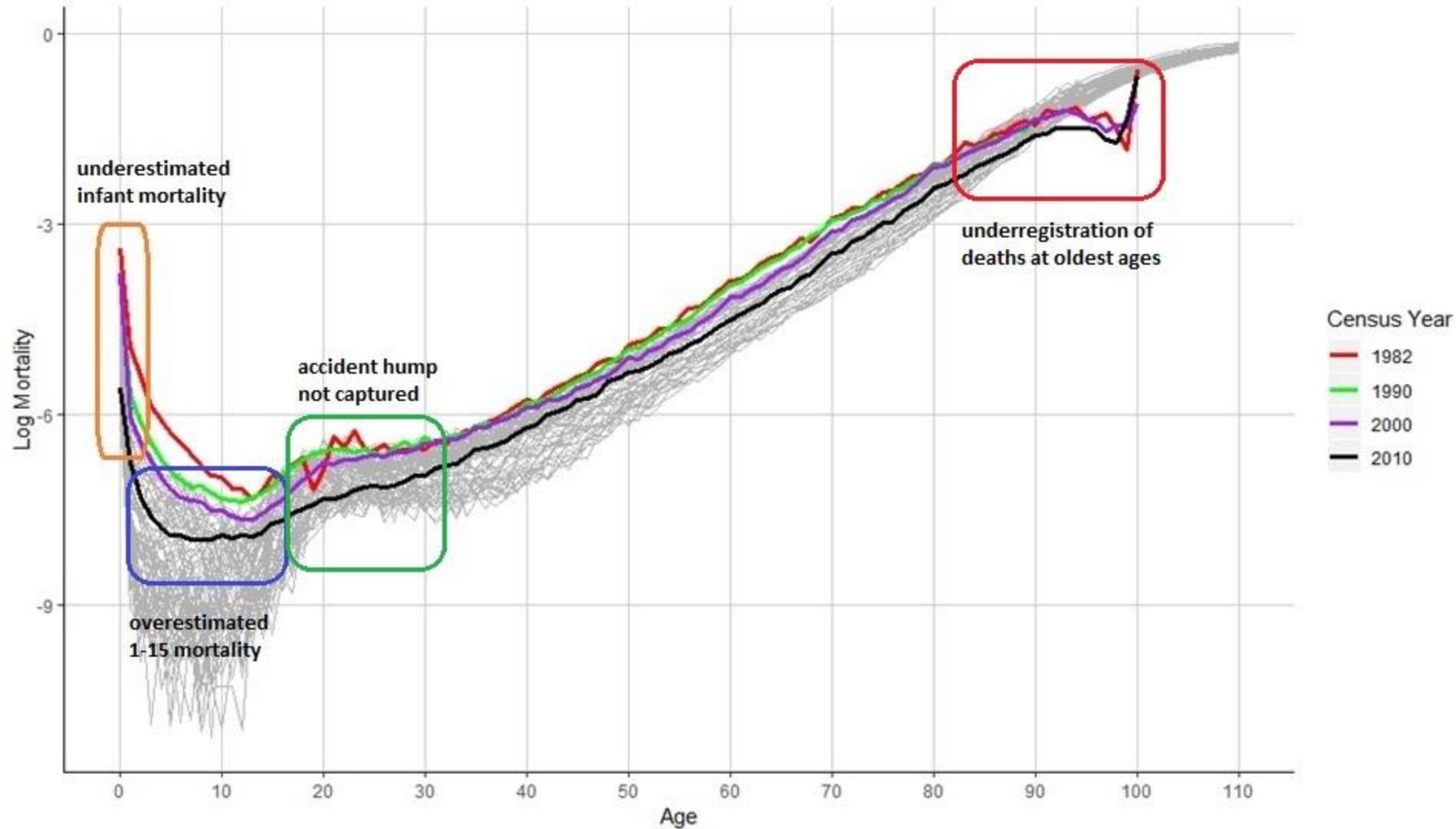
## Age misreporting:

- Age overstatement**: more pronounced among men and more observed in deaths than in population at risk (Saikia et al. 2012).
- Age understatement** among older females (Bhat 1987, 1995).
- Very pronounced **age heaping**: most of evidence from census data, SRS releases only abridged 5-year group data  
→ does such grouping help avoiding distortions?

# Different countries → different problems? Age-specific population counts from the latest pop. censuses (2011 & 2010)



# Age-specific mortality derived from the Chinese censuses and HMD age-specific mortality estimates for Sweden



Source: HMD, 2019; Statistics Bureau of China, 2019.

# PRESENTATIONS OF THE HMD AND COLABORATING TEAMS:

*Mortality estimates for China and its regions: solving data and methodological challenges.*

[MPIDR / Beijing University, China / China Population and Development Research Center, China]

*Reconstructing age-specific mortality in India using data with pronounced age heaping from DLHS and NFHS surveys.*

[MPIDR / International Institute for Population Sciences, India]

*Issues in constructing HMD data series in middle-income countries: The case of Mexico.*

[University of California at Berkeley, USA / Department of Actuarial Mathematics & Statistics Heriot-Watt University, UK]