

Data on sibling survival in Sub-Saharan Africa: an update on non-sampling errors

Bruno Masquelier

Institut National d'Etudes Démographiques

Pôle Suds Workshop on the quality of demographic data in SSA
March 20th 2012

Motivation

- ▶ Vital registration systems cover a small fraction of deaths in most parts of sub-Saharan Africa (often less than 25%).
- ▶ UNPD and WHO fall back on estimating adult mortality from child survival: the background mortality is obtained by indexing model life tables with ${}_5q_0$, and AIDS-related deaths are then added.
 - ▶ Such model-based estimates are overly sensitive to the choice of a standard age pattern of mortality.
 - ▶ It becomes increasingly difficult to reconstruct the course of the HIV epidemic (scale-up of ART...).
 - ▶ The assumption that trends in ${}_5q_0$ (net of AIDS) reflect trends in mortality in all ages among the uninfected population may be violated.

These limitations provide an impetus for developing empirical counterpoints to model-based estimates.

Motivation (2)

In SSA, sibling histories have been collected since 1992 in 65 DHS, in 33 different countries.

- ▶ They provide occurrence/exposure-type mortality rates,
- ▶ A single survey can give a certain sense of past trends in mortality,
- ▶ They are widely collected, standardized, readily available, and similar in shape to birth histories.

However, they have not been as extensively used as birth histories.

Two reasons for this:

- ▶ A suspicion that selection biases are large (Gakidou and King, 2006; Obermeyer et al., 2010) but it should not be a matter of great concern (Masquelier, 2011),
- ▶ A wariness about recall errors. . . but little is known about these errors in DHS sibling histories.

Motivation (3)

The last systematic assessment was made in 1997, by Stanton et al. (1997) (9 DHS in SSA):

- ▶ Data on reported events are remarkably complete in most surveys,
- ▶ Compared with other estimates (including UN), DHS provide generally lower mortality rates, with a greater downward bias for females,
- ▶ Implausible increases in mortality in many countries (underreporting of deaths in the distant past),
- ▶ Evidence of omission of siblings by older respondents.

15 years after Stanton et al. (1997), there is a need to update the assessment.

Standard indicators of data quality

1. Completeness of the data for reported events
2. Mean size of sibships by age of respondents
3. Sex ratios of enumerated siblings

Alternative indicators of data quality

1. Comparison of mortality rates from successive surveys
2. Plausibility of age patterns of mortality
3. Consistency with UN mortality rates

Conclusions

Standard indicators of data quality

Standard indicators of data quality

1. Completeness of the data for reported events

- ▶ Percentage of siblings with unknown/missing **sex** : median = 0.25% & mean = 0.52%.
 - One distinct outlier : Sierra Leone 2008 (9%)
- ▶ Percentage with unknown/missing **survival status** : median = 0.2% & mean = 0.48%.
 - Sierra Leone 2008 (9%)
- ▶ Percentage of surviving siblings with unknown/missing **age at survey** : median = 0.5% & mean = 1.3%. Little differences by sex.
 - > 5% : Lesotho 2009, Madagascar 1992 (9.6%) & 1997, Mozambique 1997, Namibia 2000.

Standard indicators of data quality

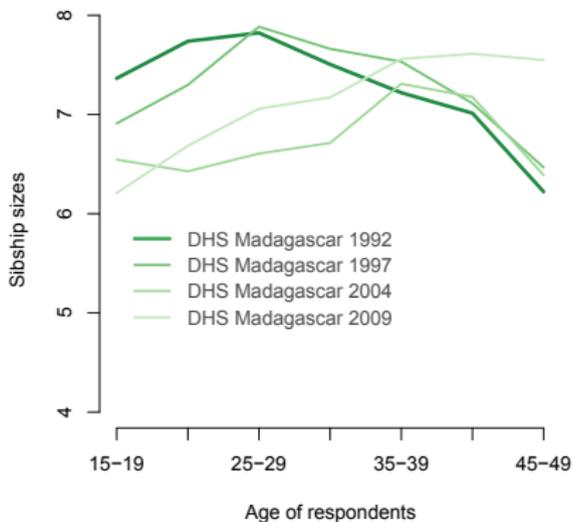
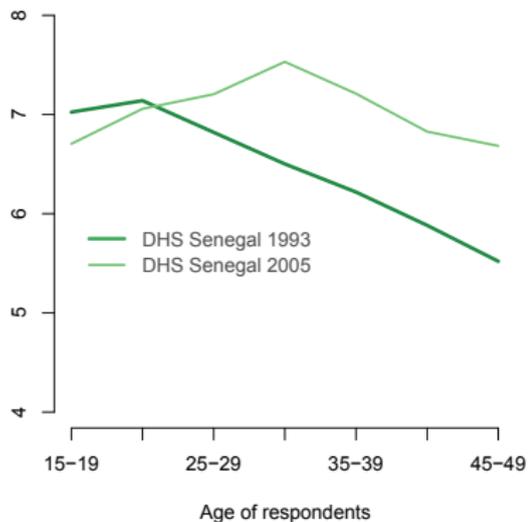
1. Completeness of the data for reported events

- ▶ Percentage of deceased siblings with unknown/missing years since death and year of death: median = 1.98% & mean = 4.7%.
 - > 10%: Lesotho 2009, Madagascar 1992, Mozambique 1997 (5.9%), Namibia 1992 and 2000, Niger 1992, Tanzania 1996, Uganda 1995
- ▶ Percentage of deceased siblings with unknown/missing age at death: median = 2.3% & mean = 4.5%.
 - > 10%: Burkina Faso 1999, Madagascar 1992 and 1997, Namibia 1992 and 2000, Sierra Leone 2008
 - > 20%: Lesotho 2009, Mozambique 1997, South Africa 1998

Standard indicators of data quality

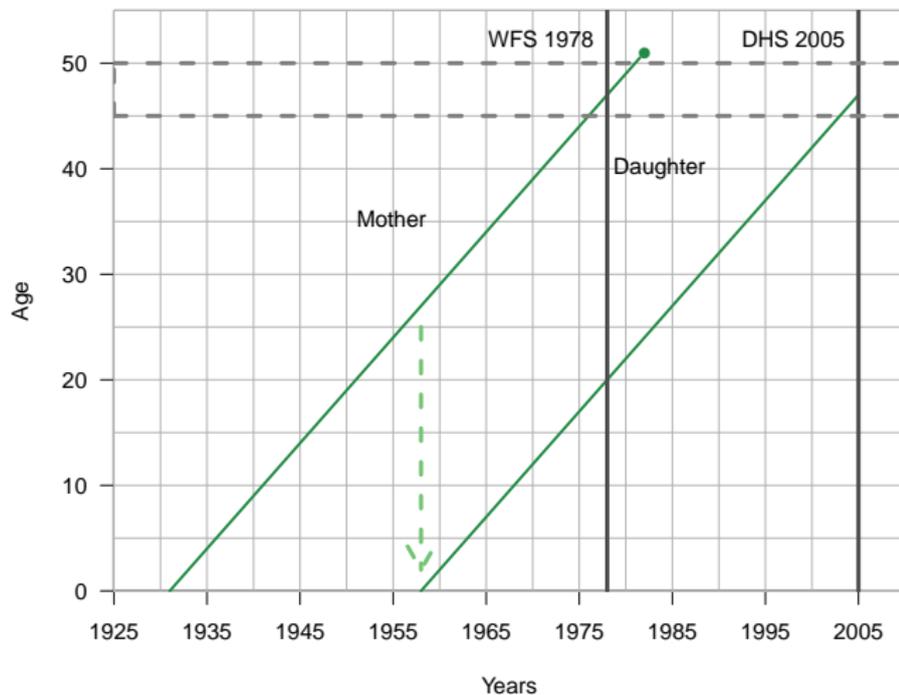
2. Mean size of sibships by age of respondents

In several DHS, the size of sibships is invariant or decreasing with respondents' increasing age. At first sight, this pattern is inconsistent with the fertility declines that occurred in most African countries over the last decades.



Standard indicators of data quality

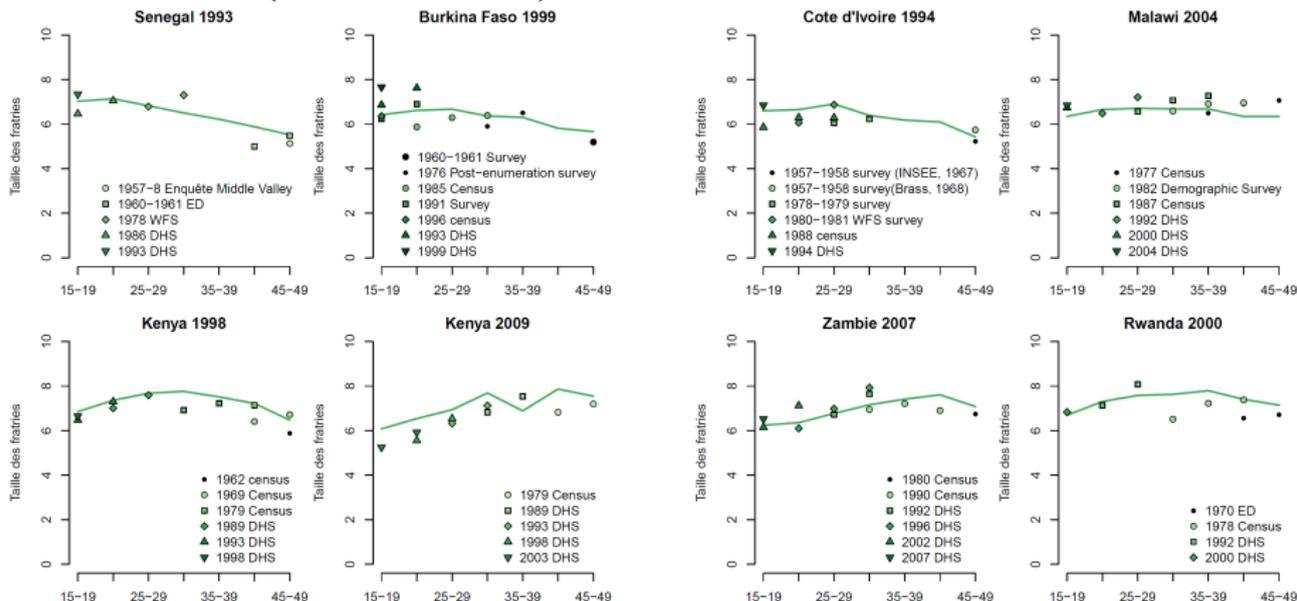
2. Mean size of sibships by age of respondents



Standard indicators of data quality

2. Mean size of sibships by age of respondents

Average parity of respondent's mother by respondent's age (DHS), compared with total number of children ever born of the previous generation (various sources)



Standard indicators of data quality

3. Sex ratios of enumerated siblings

Average of sex ratios = 1.03. Below the world average of 1.055, but consistent with the value in SSA (United Nations, 2011). However, there is an unexpected geographical distribution.

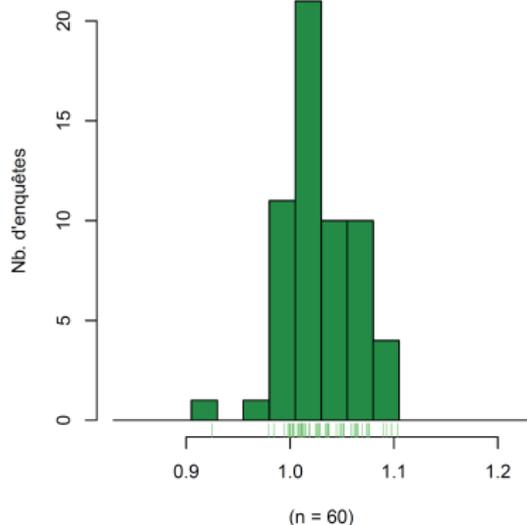


FIGURE 6.6 – *Rapports de masculinité à la naissance des frères et sœurs déclarés - 60 enquêtes EDS*

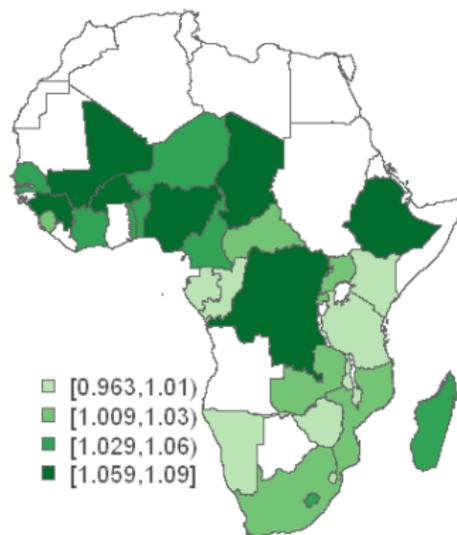


FIGURE 6.7 – *Rapports de masculinité des frères et sœurs déclarés (moyennes des valeurs observées par pays) - Enquêtes EDS*

Can this geographical distribution be explained by recall errors?

- ▶ Higher rates of male migration in Eastern and Southern Africa?
- ▶ Excess female child mortality in Western Africa, and excess male child mortality in southern Africa (Tabutin et al., 2007)?

... or are there other reasons ?

- ▶ Real variation in sex ratios at birth? This is consistent with sex ratios at birth from birth histories. The correlation coefficient between our estimates and Garenne (2002)'s is 0.67.
- ▶ Does it simply reflect the frequency of coresidence with sisters ? Sibships where sisters are more frequent are more likely to be repeatedly mentioned than sibships where brothers are more frequent. This cohabitation is the highest in Southern and East Africa, because of later ages at marriage.

Alternative indicators of data quality

Alternative indicators of data quality

1. Comparison of mortality rates from successive surveys

Data sets are reshaped in person-period files and pooled together. A Poisson regression model is used for all periods for which at least 2 surveys overlap.

- ▶ Dummies for the age groups and sex (interacted with the country),
- ▶ Dummies for 5-year periods (also interacted with the country),
- ▶ Dummies for the number of years prior to the survey.

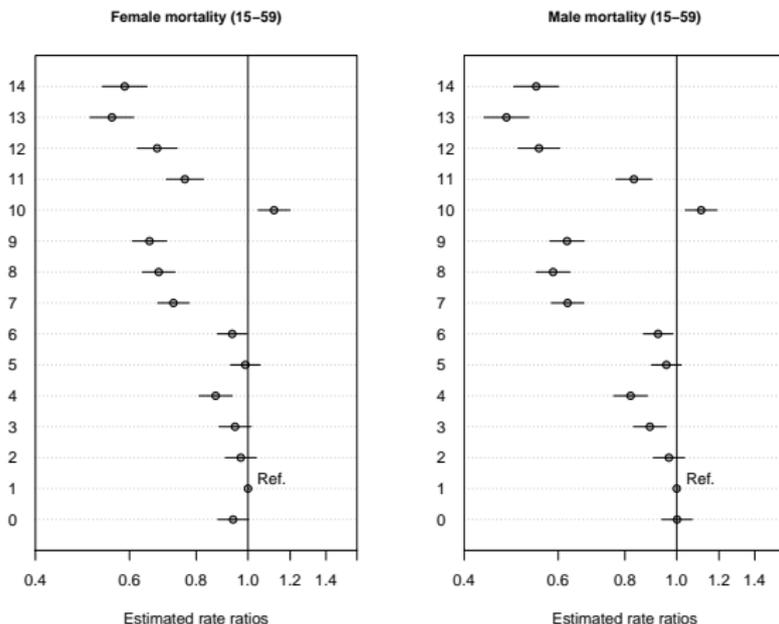
Results (adult mortality):

- ▶ Deaths are progressively underreported for reference periods that are located further back in time,
- ▶ Underreporting larger for borthers,
- ▶ Distinct heaping on 10 years prior to the survey.

- Alternative indicators of data quality
- 1. Comparison of mortality rates from successive surveys

Adult mortality

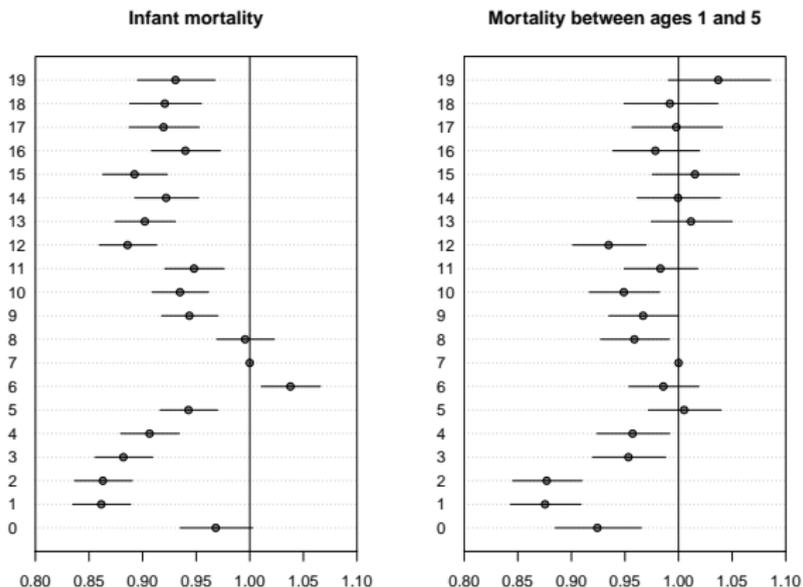
Rate ratios associated with the number of completed years prior to the survey, estimated by pooling together all overlapping periods in 53 DHS conducted in 21 countries in SSA



- Alternative indicators of data quality
- 1. Comparison of mortality rates from successive surveys

Child mortality

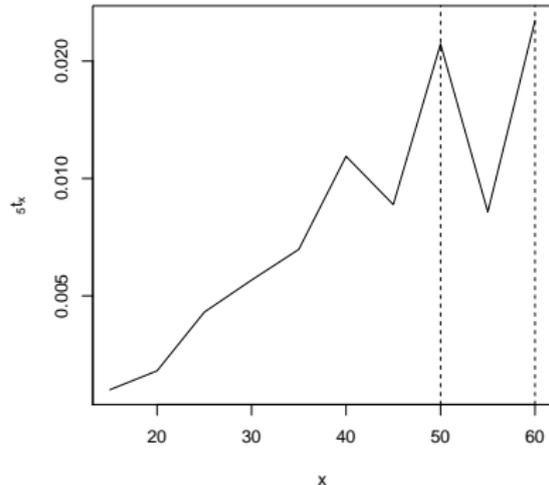
Rate ratios associated with the number of completed years prior to the survey, estimated by pooling together all overlapping periods in 86 DHS conducted in 25 different countries



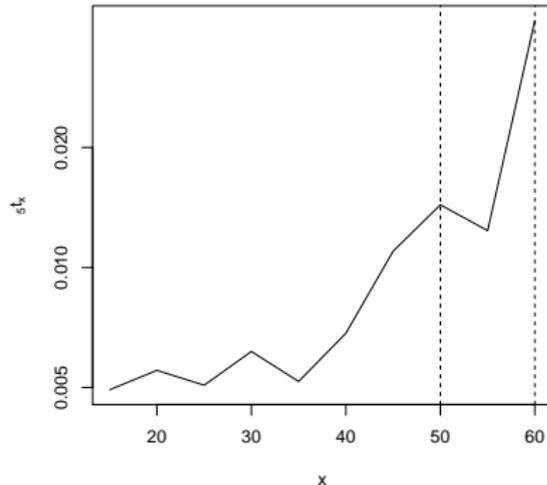
- Alternative indicators of data quality
- 2. Plausibility of age patterns of mortality

Heaping on 50 and 60

Madagascar 1992 (Males)

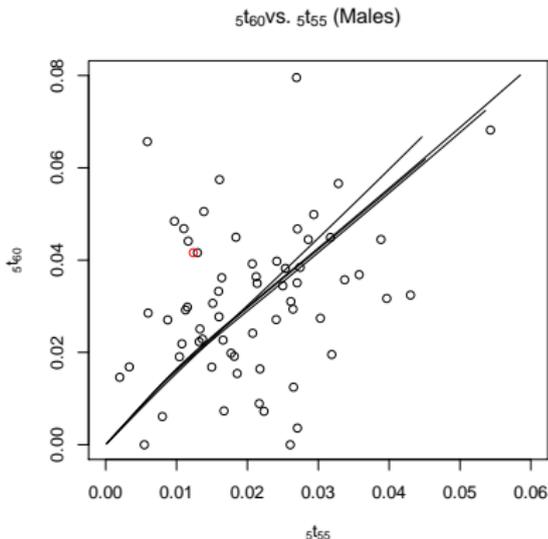
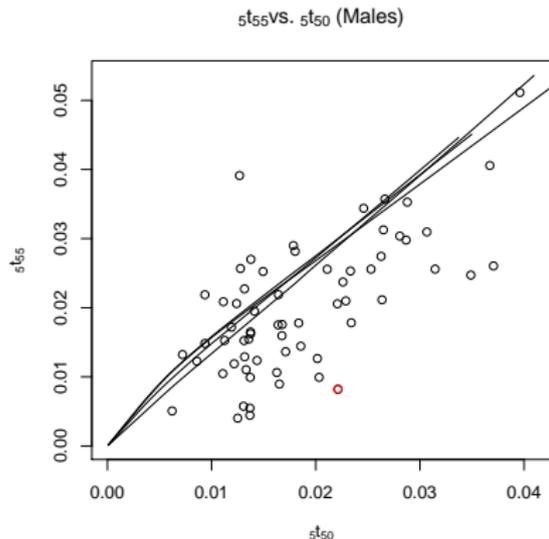


Mali 2006 (Males)



- Alternative indicators of data quality
 - 2. Plausibility of age patterns of mortality

Heaping on 50 and 60

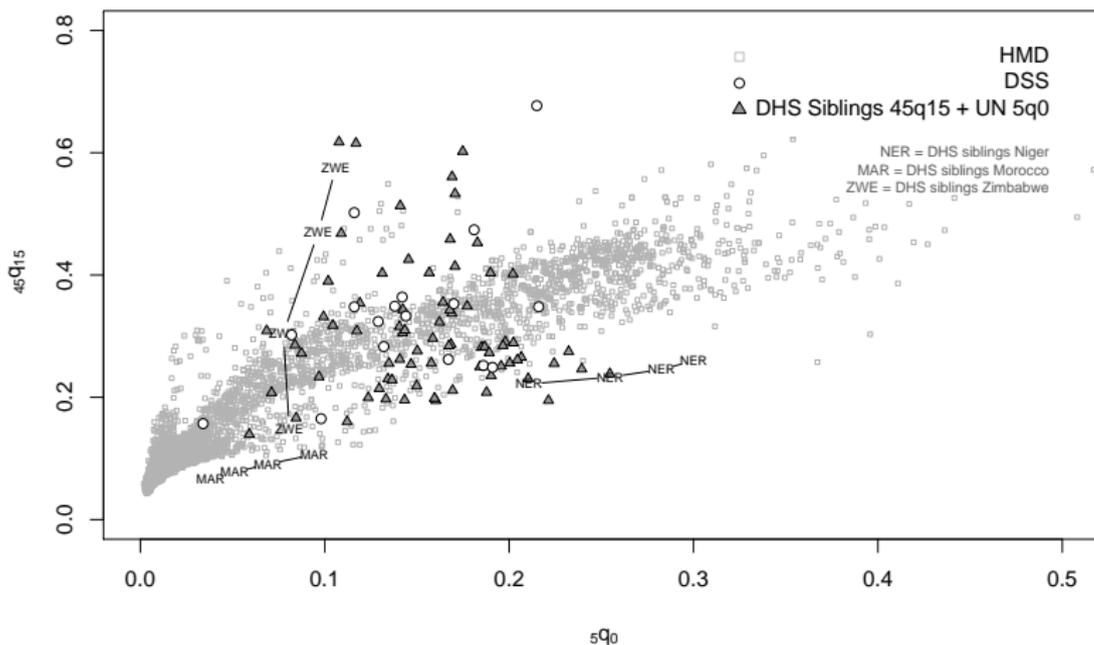


Need to smooth mortality rates : I use the model developed by Timaeus and Jasseh (2004).

Alternative indicators of data quality

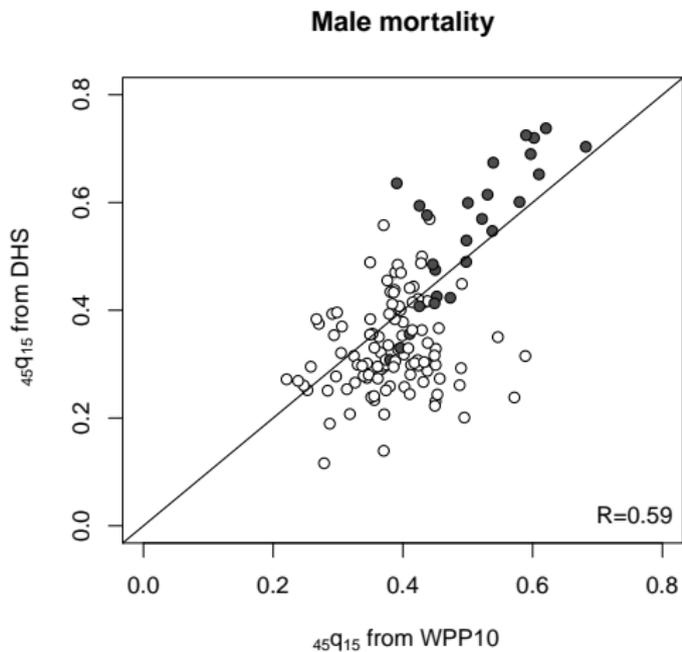
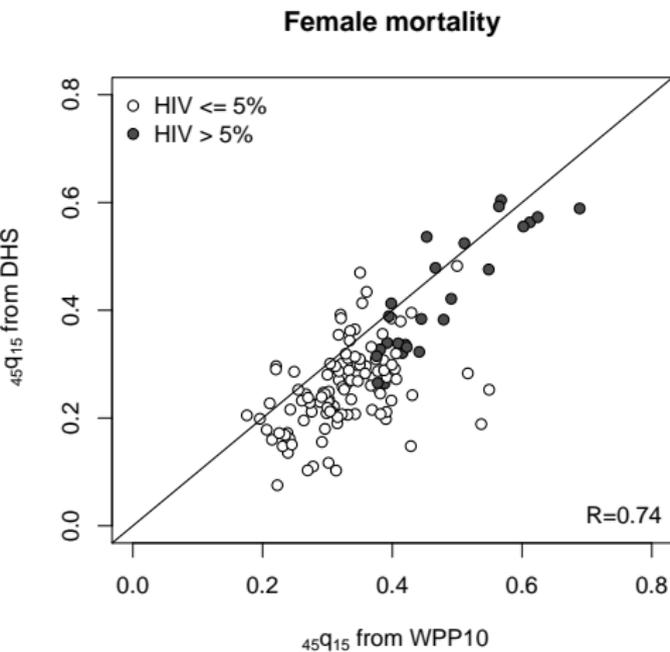
2. Plausibility of age patterns of mortality

Relationship between levels of child and adult mortality (females) in demographic surveillance sites (dots), in the Human Mortality Database (squares) and in DHS (circles)



Alternative indicators of data quality
3. Consistency with UN mortality rates

Comparison between values of ${}_{45}q_{15}$ estimated from sibling histories (y-axis) compared with UNPD estimates (x-axis)

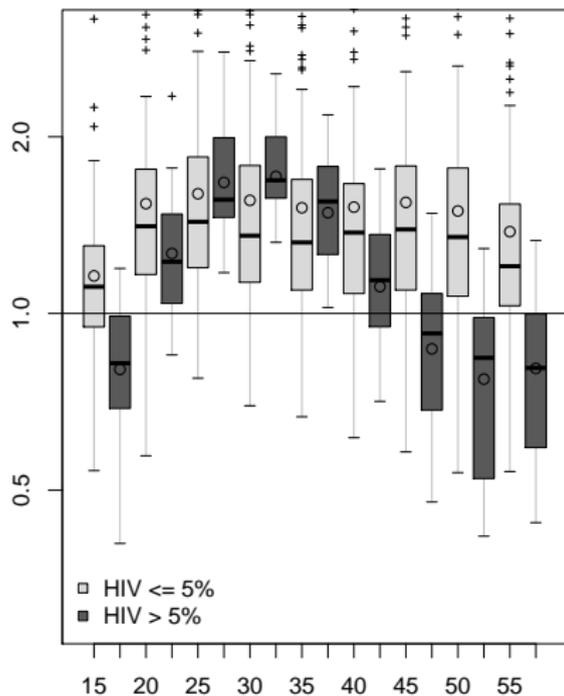


Alternative indicators of data quality

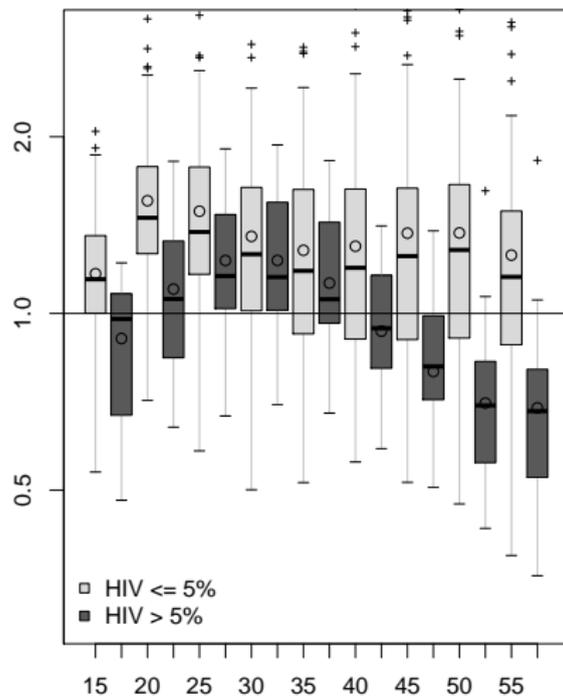
3. Consistency with UN mortality rates

Ratios between probabilities of dying produced for the WPP 2010 and estimates derived from sibling histories, by sex, age group and HIV prev. (1981-2010)

Females



Males

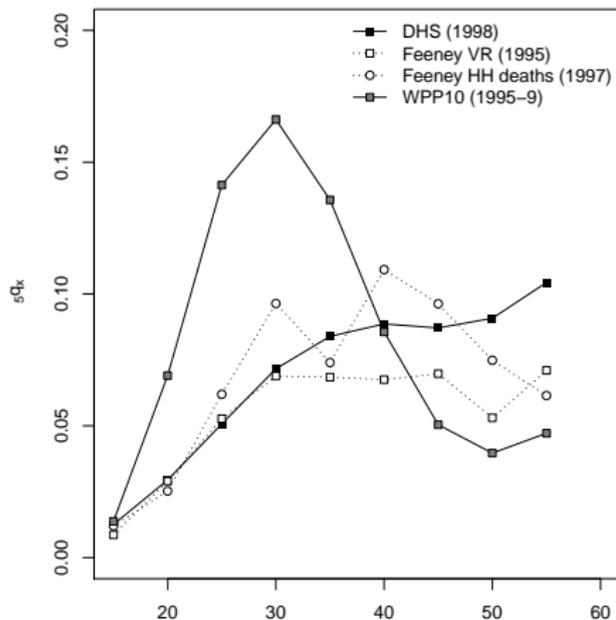


Alternative indicators of data quality

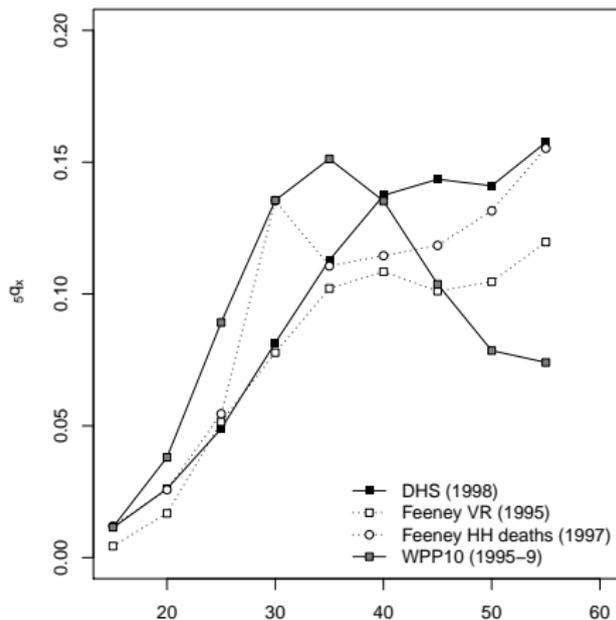
3. Consistency with UN mortality rates

Probabilities of dying produced for the WPP 2010 (for 1998) and estimates derived from sibling histories (for 1998), compared with estimates from civil registration data and the 1997 Population survey of Zimbabwe (Feeney, 2001)

Zimbabwe (Females)



Zimbabwe (Males)



- ▶ Standard indicators of data quality are of little use for detecting problems
- ▶ There is clear evidence of underreporting of deaths
- ▶ Strong heaping on 10 when asked the number of years elapsed since the death
- ▶ Helpful to smooth mortality rates with a model schedule because of the heaping on 50 and 60

Compared with UN mortality rates, generally lower, but:

- ▶ The agreement between model-based and sibling-based estimates varies with the level of HIV prevalence.
- ▶ In a countries severely affected by HIV, adult mortality could be underestimated by UNPD (too low HIV prevalence or too low background mortality).
- ▶ Sex differentials in adult mortality are larger in survey data than in model-based estimates.
- ▶ Age patterns of mortality increases due to AIDS derived from DHS data differ markedly from model outputs.

We should make a more systematic use of sibling histories!

References

- G. Feeney. The impact of HIV/AIDS on adult mortality in Zimbabwe. *Population and Development Review*, 27, 4: 771–780, 2001.
- E. Gakidou and G. King. Death by survey: estimating adult mortality without selection bias from sibling survival data. *Demography*, 43 (3):569–585, 2006.
- M. Garenne. Sex ratios at birth in African populations: a review of survey data. *Human Biology*, 74 (6):889–900, 2002.
- B Masquelier. Adult mortality from sibling survival data : does the corrected method perform better? Paper presented at the 2011 PAA Meeting, March 31-April 2 Washington, DC., 2011.
- Z. Obermeyer, J. Rajaratnam, C. Park, E. Gakidou, M. Hogan, A. Lopez, and Ch. Murray. Measuring Adult Mortality Using Sibling Survival: A New Analytical Method and New Results for 44 Countries, 1974-2006. *PLoS Medicine*, 7(4):e1000260, 04 2010.
- C. Stanton, A. Nouredine, and K. Hill. DHS Maternal Mortality Indicators: an assessment of data quality and implications for Data Use. DHS Analytical Reports No.4, Calverton, Maryland: Macro International Inc., 1997.
- D. Tabutin, C. Gourbin, and G. Beninguisse. Surmortalité et santé des petites filles en Afrique. Tendances des années 1970 aux années 1990. In T. Locoh, editor, *Genre et sociétés en Afrique: implications pour le développement*, chapter 5, pages 137–369. INED, 2007.
- I. Timaeus and M. Jasseh. Adult mortality in Sub-Saharan Africa: evidence from demographic and health survey. *Demography*, 41, 4:757–772, 2004.
- United Nations. World Population Prospects: The 2010 Revision. CD-ROM Edition - Extended Dataset in Excel and ASCII formats. (United Nations publication), 2011.