# Age patterns and sex ratios of adult mortality in countries with high HIV prevalence: Supplementary Material

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# Appendix A List of countries and methodology used by the UN Population Division to estimate adult mortality

Table S1 lists all countries included in the analysis, their region (according to the United Nations), and indicates which approach was used by the UN Population Division to estimate adult mortality.

Mayotte, Seychelles, Saint Helena and Sao Tome and Principe were not considered because UNAIDS does not create files for countries with populations lower than 250,000. UNAIDS did not produce estimates for Comoros in 2016 either. We also excluded Eritrea because we did not have access to survey or census data to estimate adult mortality, and Mauritius because this country now has a complete system of death registration with accurate cause-of-death data.

| Country | Group | Region | Max HIV prev (%) | HIV modelling | Estimation method | Model age pattern |
|---|---|---|---|---|---|---|
| Angola | 1 | Middle Africa | 0-7 | Yes | Model life tables | CD North |
| Benin | 1 | Western Africa | 0-7 | No | Relational model | CD North |
| Burkina Faso | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Burundi | 1 | Eastern Africa | 0-7 | Yes | Model life tables | CD North |
| Cameroon | 1 | Middle Africa | 0-7 | Yes | Model life tables | CD North |
| Cape Verde | 1 | Western Africa | 0-7 | No | Model life tables | CD West |
| Chad | 1 | Middle Africa | 0-7 | No | Model life tables | CD North |
| Congo | 1 | Middle Africa | 0-7 | Yes | Model life tables | CD West |
| Côte d'Ivoire | 1 | Western Africa | 0-7 | No | Relational model | CD North |
| DRC | 1 | Middle Africa | 0-7 | No | Model life tables | CD North |
| Djibouti | 1 | Eastern Africa | 0-7 | No | Model life tables | CD North |
| Equatorial Guinea | 1 | Middle Africa | 0-7 | Yes | Relational model | CD North |
| Ethiopia | 1 | Eastern Africa | 0-7 | Yes | Model life tables | CD North |
| Gabon | 1 | Middle Africa | 0-7 | Yes | Model life tables | CD North |
| Gambia | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Ghana | 1 | Western Africa | 0-7 | No | Relational model | CD North |
| Guinea | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Guinea-Bissau | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Liberia | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Madagascar | 1 | Eastern Africa | 0-7 | No | Relational model | CD North |
| Mali | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Mauritania | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Niger | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Nigeria | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Rwanda | 1 | Eastern Africa | 0-7 | Yes | Model life tables | CD North |
| Senegal | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Sierra Leone | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| Somalia | 1 | Eastern Africa | 0-7 | No | Model life tables | CD North |
| South Sudan | 1 | Eastern Africa | 0-7 | No | Model life tables | CD North |
| Togo | 1 | Western Africa | 0-7 | No | Relational model | CD South |
| CAR | 2 | Middle Africa | 7-17 | Yes | Relational model | CD North |
| Kenya | 2 | Eastern Africa | 7-17 | Yes | Relational model | CD North |
| Malawi | 2 | Eastern Africa | 7-17 | Yes | Model life tables | CD South |
| Mozambique | 2 | Eastern Africa | 7-17 | Yes | Model life tables | CD North |
| Uganda | 2 | Eastern Africa | 7-17 | Yes | Relational model | CD North |
| UR Tanzania | 2 | Eastern Africa | 7-17 | Yes | Model life tables | CD North |
| Zambia | 2 | Eastern Africa | 7-17 | Yes | Model life tables | CD North |
| Botswana | 3 | Southern Africa | 17+ | Yes | Model life tables | CD West |
| Lesotho | 3 | Southern Africa | 17+ | Yes | Model life tables | CD West |
| Namibia | 3 | Southern Africa | 17+ | Yes | Model life tables | CD West |
| South Africa | 3 | Southern Africa | 17+ | Yes | Model life tables | UN Far Eastern |
| Swaziland | 3 | Southern Africa | 17+ | Yes | Model life tables | CD West |
| Zimbabwe | 3 | Eastern Africa | 17+ | Yes | Model life tables | CD North |

Table S1 – *Classification of countries by region and group and methods used by UNPD to estimate adult mortality*

## Appendix B Data sources for adult mortality

Table S2 lists all data sources on adult mortality included in this analysis.

All DHS conducted in SSA with a maternal mortality module were included, except two surveys: the DHS conducted in Sudan in 1990 because the dataset is not standardized, and the DHS for Nigeria 1999 because of evidence of abnormally large non-sampling errors [1]. Sibling histories from the World Health Surveys were also discarded since they seem to be of lower quality than those collected in DHS, as indicated by the high percentage of missing data on the timing of deaths [2].

For other data sources, the acronyms used in Table S2 are: BDS is Botswana Demographic Survey, DS is Demographic Survey (various countries), DHS is Demographic and Health Surveys, PCS is Malawi 1970-1972 Population Change Survey, FFS is the Malawi 1984 Family Formation Survey, GFFS are the Global Fund Facility Surveys, EDPR is Côte d'Ivoire 1978-1979 Multi-round Demographic Survey, EIS is Côte d'Ivoire 2005 'Enquête sur les indicateurs du sida', DSS is Nigeria 1965-1966 Rural Demographic Sample Survey.

Asterisks in Table S2 identify data on recent household deaths for which it was possible to adjust for under-reporting. About half of point estimates from vital registration, censuses and large-scale surveys were adjusted. The Generalized Growth Balance method was used to estimate the differential coverage between censuses, and the Synthetic Extinct Generations method was applied on the reported deaths and the corrected enumerated populations [3]. Demographers usually drop older and younger age groups to estimate adjustment factors to account for under-reporting in order to reduce biases induced by age exaggeration or varying completeness by age [4, 5]. Here we selected the age ranges based on visual inspection of diagnostic plots for each pair of censuses, and in most cases, we considered all ages groups from 20 to 70 years (Table S3).

Estimates from vital registration in Zimbabwe (adjusted for underreporting) were taken from Feeney (2001) [6]. For South Africa, estimates from vital registration are taken from Dorrington (2013) [3] and obtained from registered deaths for the years 2001 to 2007, the populations enumerated in the 2001 Census and the 2007 Community Survey, and an estimate of the number of net migrants between 2001 and 2007. We also included estimates of the probability ${}_{45}q_{15}$ from the Rapid Mortality Surveillance System for the years 2000, 2005, and 2009 to 2014 [7].

| Country | Group | DHS sibling survival data | Recent household deaths and vital registration |
|---|---|---|---|
| Angola | 1 | | |
| Benin | 1 | 1996, 2006 | |
| Burkina Faso | 1 | 1998-1999, 2003, 2010-MICS | 2006 Census, 2008 GFFS |
| Burundi | 1 | 2010 | |
| Cameroon | 1 | 1998, 2004, 2011-MICS | 1976 Census*, 1987 Census |
| Cape Verde | 1 | | |
| Chad | 1 | 1996-1997, 2004 | |
| Congo | 1 | 2005, 2011-2012 | |
| Côte d'Ivoire | 1 | 1994, 2005 EIS, 2011-2012-MICS | 1978-1979 EDPR, 1998 Census, 2005 EIS |
| DRC | 1 | 2007, 2013-2014 | |
| Djibouti | 1 | | |
| Equatorial Guinea | 1 | | |
| Ethiopia | 1 | 2000, 2005, 2011 | 2007 Census |
| Gabon | 1 | 2000, 2012 | |
| Gambia | 1 | 2013 | |
| Ghana | 1 | 2007 Special | |
| Guinea | 1 | 1999, 2005, 2012 | 1983 Census*, 1996 Census |
| Guinea-Bissau | 1 | | |
| Liberia | 1 | 2007, 2013 | |
| Madagascar | 1 | 1992, 1997, 2003-2004, 2008-2009 | 1993 Census |
| Mali | 1 | 1995-1996, 2001, 2006, 2012-2013 | 1976 Census*, 1987 Census*, 1998 Census*, 2009 Census |
| Mauritania | 1 | | 1988 Census |
| Niger | 1 | 1992, 2006, 2012-MICS | |
| Nigeria | 1 | 1999, 2008, 2013 | 1965-1966 DSS, 2008 DHS, 2013 DHS |
| Rwanda | 1 | 2000, 2005, 2010, 2014-2015 | 2002 Census |
| Senegal | 1 | 1992-1993, 2005, 2010-2011-MICS | 2002 Census |
| Sierra Leone | 1 | 2008, 2013 | 2004 Census |
| Somalia | 1 | | |
| South Sudan | 1 | | |
| Togo | 1 | 1998, 2013-2014-MICS | 1961 ED, 1981 Census, 2010 Census |
| CAR | 2 | 1994-1995 | 1959-1960 Survey, 1988 Census*, 2003 Census |
| Kenya | 2 | 1998, 2003, 2008-2009, 2014 | Vital registration |
| Malawi | 2 | 1992, 2000, 2004, 2010 | 1970-1972 PCS, 1984 FFS, 1987 Census*, 1998 Census*, 2008 Census |
| Mozambique | 2 | 1997, 2003, 2011 | 1997 Census*, 2007 Census |
| Uganda | 2 | 1995, 2000-2001, 2006, 2011 | 2002 Census, 2006 DHS |
| UR Tanzania | 2 | 1996, 2004-2005, 2010 | 1967 Census*, 1988 Census*, 2002 Census |
| Zambia | 2 | 1996, 2001-2002, 2007, 2013-2014 | 2007 DHS, 2008 GFFS, 2010 Census |
| Botswana | 3 | | 1981 Census*, 1991 Census*, 2001 Census, 2006 BDS, 2011 Census |
| Lesotho | 3 | 2004, 2009, 2014 | 1971-1973 DS, 1977 WFS, 1980 Survey, 1986 Census*, 1996 Census*, 2001 DS, 2006 Census |
| Namibia | 3 | 1992, 2000, 2006-2007, 2013 | 2001 Census, 2006-2007 DHS, 2011 Census |
| South Africa | 3 | 1998 | Vital registration* |
| Swaziland | 3 | 2006-2007 | 1997 Census*, 2007 Census |
| Zimbabwe | 3 | 1994, 1999, 2005-2006, 2010-2011 | 1992 Census*, 2002 Census*, 2005-2006 DHS, 2012 Census, Vital registration* |

Table S2 – *Data sources used for adult mortality (data sources adjusted for underreporting are indicated by an asterisk)*

| Country | group | Data.source1 | Data.source2 | agetrim_m | agetrim_f | completeness_m | completeness_f |
|---|---|---|---|---|---|---|---|
| Cameroon | 1 | 1976 Census | 1987 Census | 25-60 | 15-50 | 0.80 | 1.05 |
| Guinea | 1 | 1983 Census | 1996 Census | 15-70 | 15-70 | 0.72 | 0.65 |
| Mali | 1 | 1976 Census | 1987 Census | 15-50 | 15-50 | 0.80 | 0.64 |
| Mali | 1 | 1987 Census | 1998 Census | 25-70 | 25-70 | 0.47 | 0.39 |
| Mali | 1 | 1998 Census | 2009 Census | 25-70 | 25-70 | 0.41 | 0.36 |
| Central African Republic | 2 | 1988 Census | 2003 Census | 15-70 | 15-70 | 0.88 | 0.78 |
| Malawi | 2 | 1977 Census | 1987 Census | 15-60 | 15-60 | 0.41 | 0.24 |
| Malawi | 2 | 1987 Census | 1998 Census | 25-70 | 25-70 | 0.46 | 0.30 |
| Malawi | 2 | 1998 Census | 2008 Census | 25-70 | 25-70 | 0.56 | 0.54 |
| Mozambique | 2 | 1997 Census | 2007 Census | 15-70 | 15-70 | 0.76 | 0.63 |
| United Republic of Tanzania | 2 | 1967 Census | 1988 Census | 25-70 | 25-70 | 0.75 | 0.85 |
| United Republic of Tanzania | 2 | 1988 Census | 2002 Census | 25-70 | 25-70 | 0.72 | 0.88 |
| Botswana | 3 | 1981 Census | 1991 Census | 20-70 | 20-70 | 1.03 | 1.07 |
| Botswana | 3 | 1991 Census | 2001 Census | 20-70 | 20-70 | 0.97 | 1.03 |
| Lesotho | 3 | 1986 Census | 1996 Census | 15-70 | 15-70 | 0.72 | 0.65 |
| Lesotho | 3 | 1996 Census | 2006 Census | 25-70 | 25-70 | 1.56 | 1.22 |
| Swaziland | 3 | 1997 Census | 2007 Census | 25-70 | 25-70 | 0.88 | 0.94 |
| Zimbabwe | 3 | 1992 Census | 2002 Census | 45-70 | 45-70 | 1.09 | 0.84 |
| Zimbabwe | 3 | 2002 Census | 2012 Census | 45-70 | 30-65 | 0.84 | 0.81 |

Table S3 – *Age trims considered for death distribution methods and completeness estimates*

## Appendix C Data sources for the orphanhood prevalence

Table S4 lists all data sources used for the orphan prevalence. Acronyms used in this Table are: DS is Demographic Survey (various countries), WFS is World Fertility Survey (various countries), CS is South Africa 2007 Community Survey, PCS is Malawi 1970-1972 Population Change Survey, ICDS is Zimbabwe 1997 Inter-Censal Demographic Survey, DBS is Kenya 1973 Demographic Baseline Survey, NDS is National Demographic Survey, EPR is Benin 1981-1983 Multi-round Survey, PS is Population Survey, EDPR is Côte d'Ivoire 1978-1979 Multi-round Demographic Survey, SDS is Rwanda 1996 Socio-demographic Survey, FMS is Somalia 1980 Fertility and Mortality Survey.

| Country | Group | DHS | Censuses | Others |
|---|---|---|---|---|
| Angola | 1 | | | |
| Benin | 1 | 1996, 2001, 2006, 2011-2012 | 2002 | 1981-1983 EPR |
| Burkina Faso | 1 | 1993, 2003, 2010-MICS | 2006 | |
| Burundi | 1 | 2010 | 1990 | |
| Cameroon | 1 | 1991, 1998, 2004, 2011-MICS | 1987 | |
| Cape Verde | 1 | 2005-RHS | | |
| Chad | 1 | 1996-1997, 2004 | | 1963-1964 PS |
| Congo | 1 | 2005, 2011-2012 | 1974 | |
| Côte d'Ivoire | 1 | 1994, 2011-2012-MICS | 1988, 1998 | 1978-1979 EDPR |
| DRC | 1 | 2007, 2013-2014 | | |
| Djibouti | 1 | | | |
| Equatorial Guinea | 1 | | | |
| Ethiopia | 1 | 2000, 2005, 2011 | 2007 | |
| Gabon | 1 | 2000, 2012 | | |
| Gambia | 1 | 2013 | 1973, 1983, 2003 | |
| Ghana | 1 | 1993, 1998, 2003, 2008 | | |
| Guinea | 1 | 1999, 2005, 2012 | | |
| Guinea-Bissau | 1 | | | |
| Liberia | 1 | 2007, 2013 | | |
| Madagascar | 1 | 1992, 1997, 2003-2004, 2008-2009 | | |
| Mali | 1 | 1995-1996, 2001, 2006, 2012-2013 | 1987, 1998, 2009 | |
| Mauritania | 1 | | | 1964-1965 PS, 1981 WFS |
| Niger | 1 | 1992, 1998, 2006, 2012-MICS | 1988, 2001 | |
| Nigeria | 1 | 1999, 2003, 2008, 2013 | | |
| Rwanda | 1 | 1992, 2000, 2005, 2010, 2014-2015 | 1991, 2002 | 1996 SDS |
| Senegal | 1 | 1992-1993, 2005, 2010-2011-MICS | 1988 | |
| Sierra Leone | 1 | 2008, 2013 | 1974, 1985, 2004 | 1973 Pilot Census |
| Somalia | 1 | | | |
| South Sudan | 1 | | 1973, 1993, 2008 | |
| Togo | 1 | 1998, 2013-2014-MICS | | |
| CAR | 2 | 1994-1995 | | |
| Kenya | 2 | 1993, 1998, 2003, 2014 | 1969, 1979, 1989, 1999 | 1973 DBS, 1983 NDS |
| Malawi | 2 | 1992, 2000, 2004, 2010 | 1966, 1977, 1998, 2008 | 1970-1972 PCS, 1982 MDS |
| Mozambique | 2 | 1997, 2003, 2011 | 1997, 2007 | |
| Uganda | 2 | 1995, 2000-2001, 2004-2005 AIS, 2006, 2011 AIS, 2011 | 1969, 1991, 2002 | |
| UR Tanzania | 2 | 1991-1992, 1996, 1999 RCHS, 2004-2005, 2010 | 1978, 1988, 2002 | |
| Zambia | 2 | 1992, 1996, 2001-2002, 2007, 2013-2014 | | |
| Botswana | 3 | | 1971, 2001 | |
| Lesotho | 3 | 2004, 2009, 2014 | 1986, 2006 | 1971-1973 DS |
| Namibia | 3 | 1992, 2000, 2006-2007, 2013 | 2001 | |
| South Africa | 3 | 1998 | 1996, 2001 | 2007 CS |
| Swaziland | 3 | 2006-2007 | 1976, 1986, 1997, 2007 | |
| Zimbabwe | 3 | 1994, 1999, 2005-2006, 2010-2011 | 1982, 1992, 2002 | 1997 ICDS |

Table S4 – *Data sources used for orphanhood estimates*

## Appendix D Model life tables

Estimates are sensitive to the choice of the age pattern used to infer background mortality. In the 2015 WPP, the North and South models of Coale-Demeny were predominantly used, except in Southern Africa, where mortality was also modelled based on the West model of Coale-Demeny and UN Far Eastern model [8, 9] (Table S1).

In the North model, the probability of a female surviving to age 5 ($_5p_0$) implied by a life expectancy at birth of 50 years (0.183) corresponds to a probability of dying between ages 15 and 60 ($_{45}q_{15}$) of 0.337. With the South model, the same proportion of females surviving to age 5 corresponds to a life expectancy of 54 years and a probability $_{45}q_{15}$ that is 30% lower (0.243). Differences are smaller between the North and West models (Figure S1). In adulthood, the West model corresponds to slightly higher mortality rates for females when the life expectancy is below 60. The ratio of North to West death rates increases steadily as the mortality decreases. Differences between the West and North models are more pronounced for males. Finally, the Far Eastern pattern, known to reflect high rates of mortality from tuberculosis, exhibits extreme levels of adult mortality for a given level of child survival.

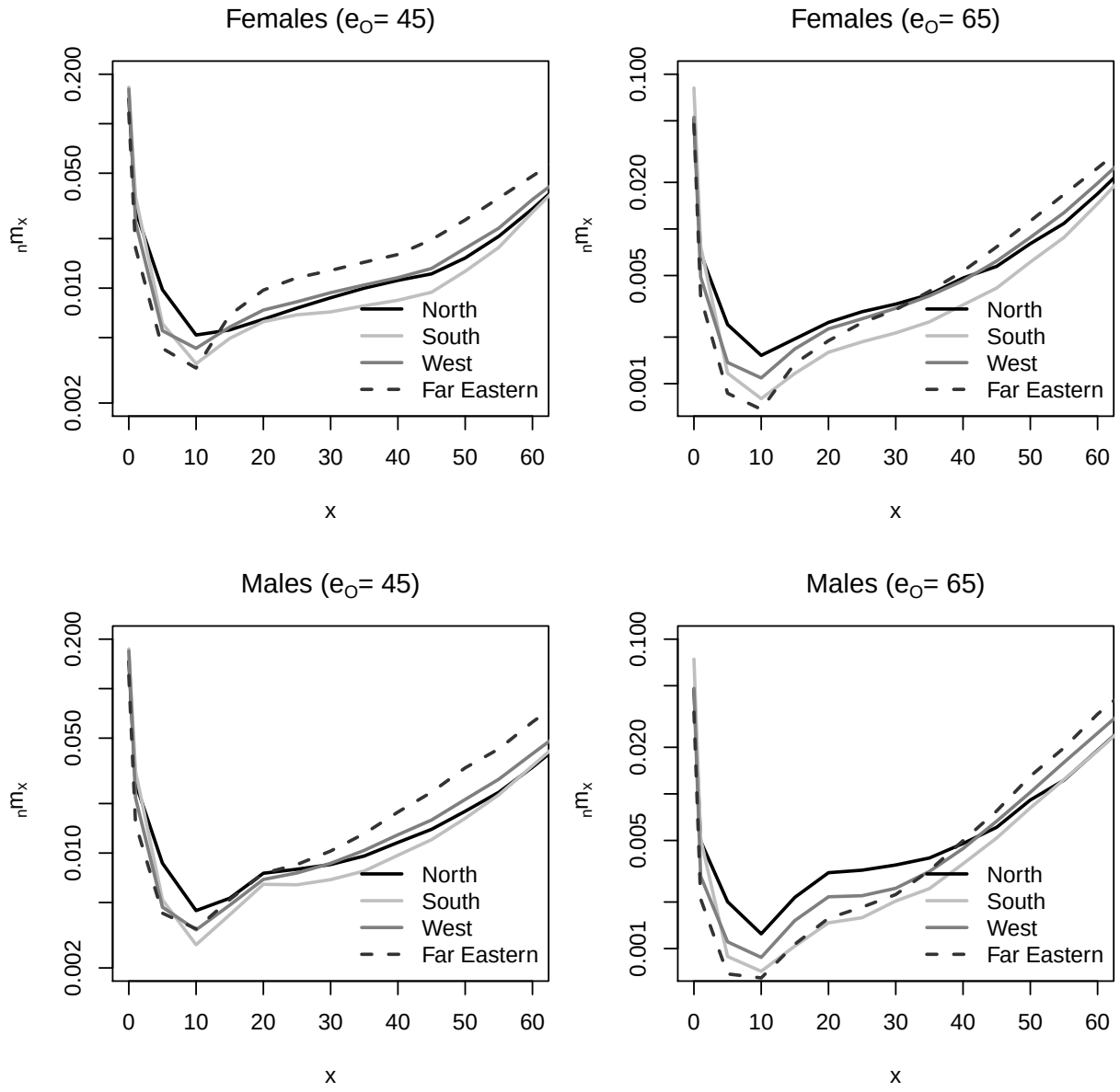


Figure S1 – *Mortality rates (log-scale) implied by different model age patterns for life expectancies at birth of 45 and 65 years*

## Appendix E Country specific plots

Figures S2 to S4 present model-based and survey or census estimates for 9 countries in the three groups considered: Benin, Burkina Faso and Mali for low-HIV countries, Kenya, Uganda and Zambia for countries with intermediate HIV prevalence, and South Africa, Namibia and Zimbabwe for high HIV countries. These countries were selected because numerous data series were available.

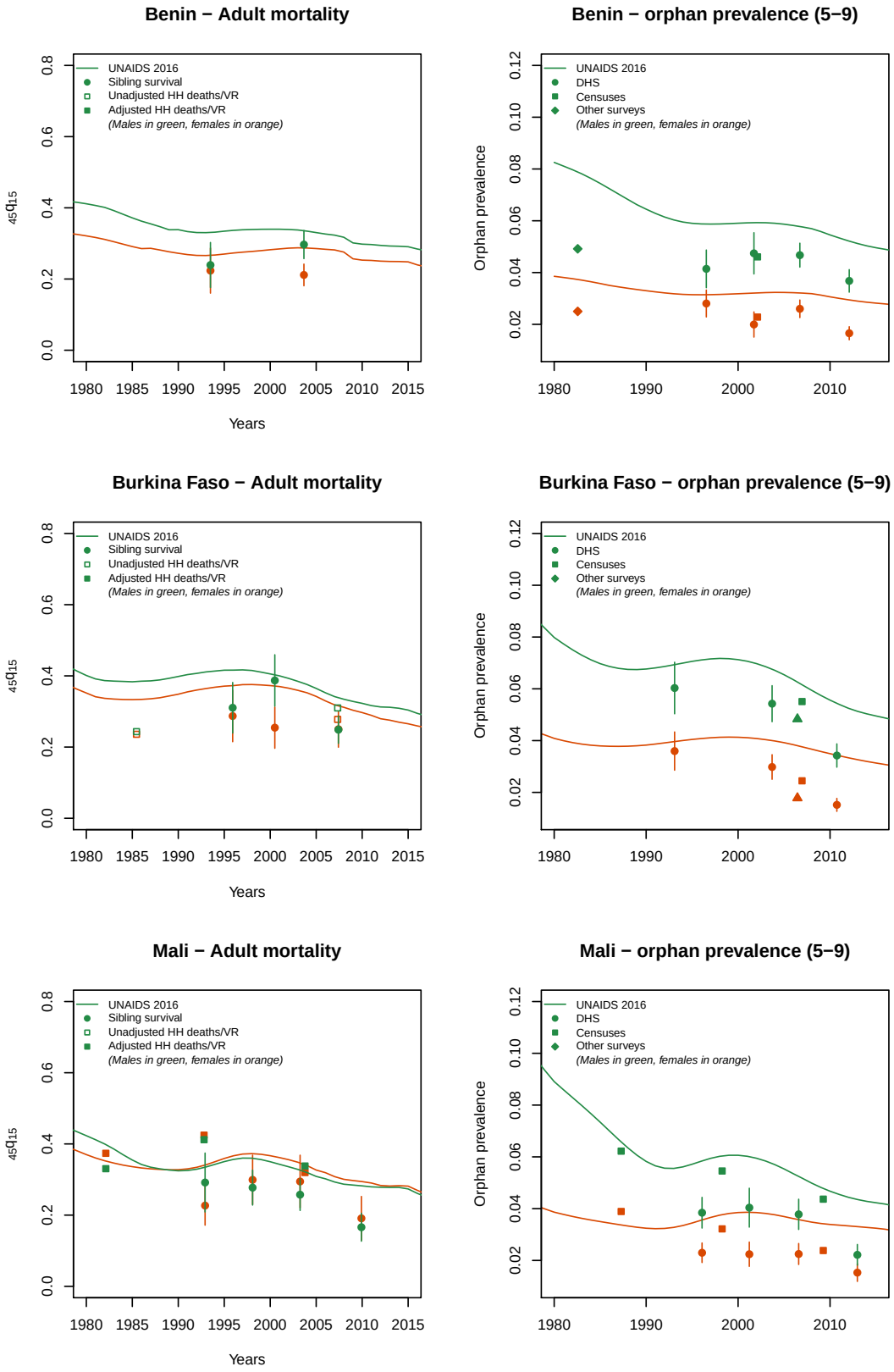


Figure S2 – *Comparison of trends* ${}_{45}q_{15}$ *and prevalence of orphanhood among 5- to 9-year olds observed in surveys and censuses (point estimates) with Spectrum estimates (lines) for Benin, Burkina Faso and Mali. Vertical lines correspond to 95% confidence intervals around the point estimates.*

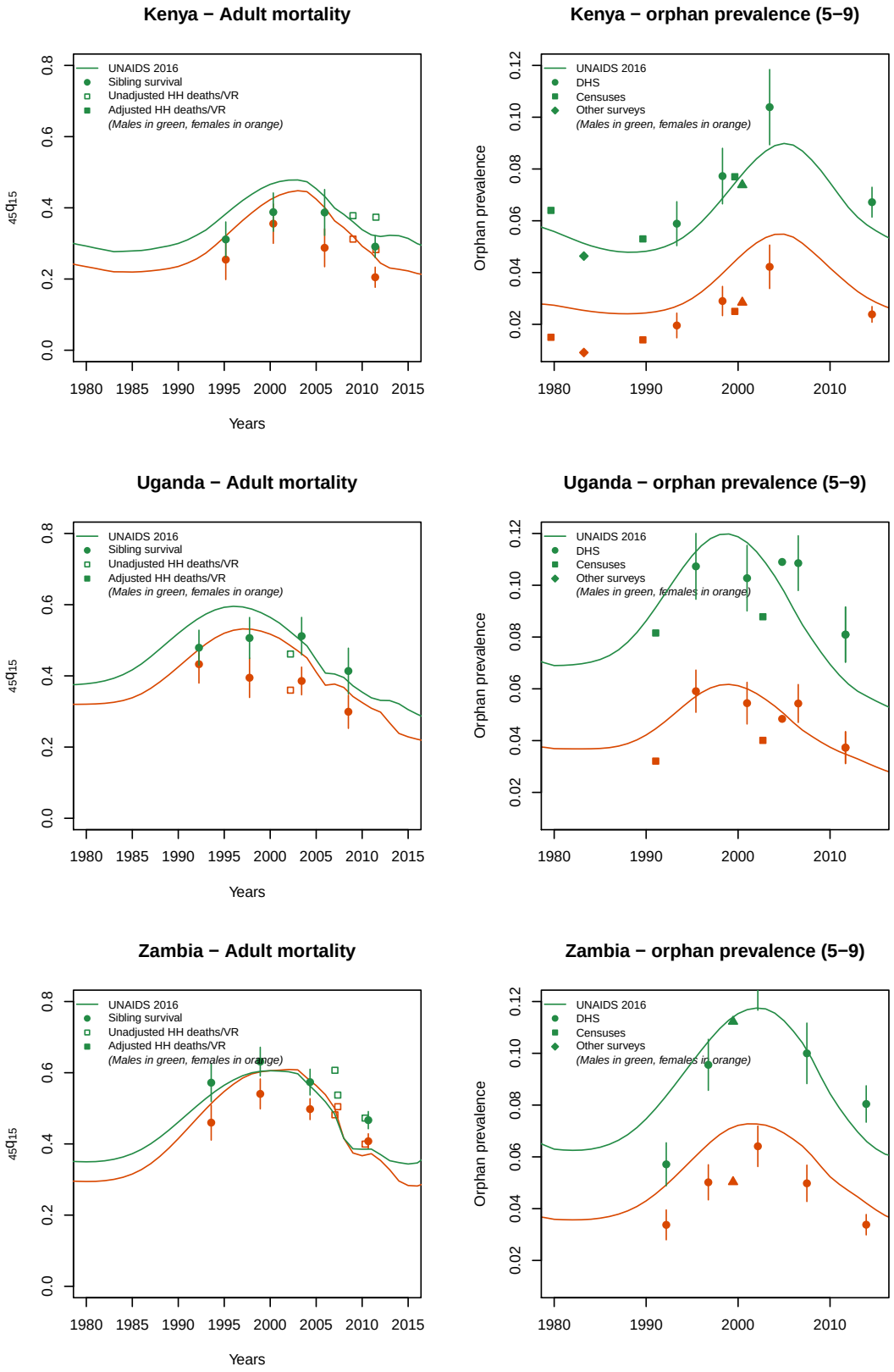


Figure S3 – *Comparison of trends* ${}_{45}q_{15}$ *and prevalence of orphanhood among 5- to 9-year olds observed in surveys and censuses (point estimates) with Spectrum estimates (lines) for Kenya, Uganda and Zambia. Vertical lines correspond to 95% confidence intervals around the point estimates.*

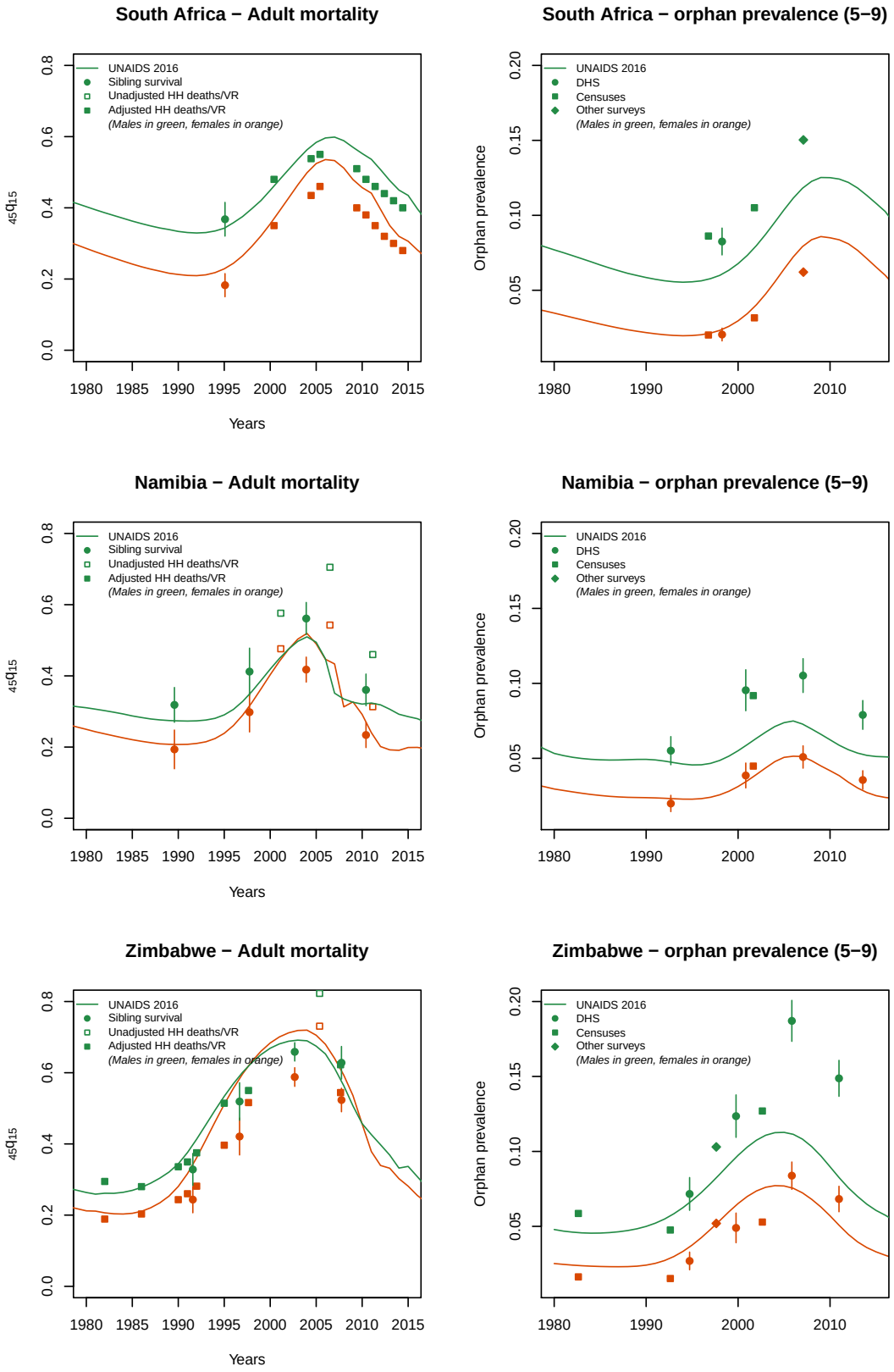


Figure S4 – *Comparison of trends ${}_{45}q_{15}$ and prevalence of orphanhood among 5- to 9-year olds observed in surveys and censuses (point estimates) with Spectrum estimates (lines) for South Africa, Namibia and Zimbabwe. Vertical lines correspond to 95% confidence intervals around the point estimates.*

## Appendix F Regression analysis

Linear mixed-effects models were used to investigate further the patterns of discrepancies between model and empirical estimates. The same model is fitted first on the logged ratios computed from the probability ${}_{45}q_{15}$ and then on orphan prevalence, for each sex. Models include as covariate the source of empirical estimates (sibling histories or recent household deaths for adult mortality; censuses, DHS/MICS or other surveys for orphanhood estimates). The HIV incidence among the population aged 15 to 49 as estimated by UNAIDS is also included as covariate, with a lag of 10 years to allow for a delay between changes in incidence and mortality increases [10]. For adult mortality, estimates from sibling survival, recent household deaths and vital registration were pooled together.

Regression results presented in Table S5 suggest that discrepancies are related to both the modelling of AIDS mortality and the background mortality. First, among males, the ratios of model to empirical estimates of orphanhood decline significantly as the HIV incidence among adults increases. This is not observed when considering maternal orphanhood. This suggests that the ratio of female to male incidence assumed in models could be too high. In Spectrum, this ratio starts at very low values in the beginning of the epidemic, and then increases rapidly to reach 1.38 in most countries. However, there is little evidence on sex ratios of incidence, especially in the more distant past.

Regression results also indicate that the background mortality could be too low in countries with very high HIV prevalence, especially among males.

In addition, there is a large variation in the congruence with UNAIDS estimates according to the data source used to obtain empirical estimates. For adult mortality, DHS sibling histories provide significantly lower mortality rates than reports on recent household deaths, especially among females. By contrast, maternal orphanhood estimates are significantly higher when obtained from DHS and MICS, as compared to census data.

The relationship between the empirical and model-based estimates differs across countries, as shown in Figure S5, which presents the conditional modes and 95% prediction intervals of the country-specific random effects. This Figure can be used to detect deviations from UNAIDS 2016 estimates which would not be sufficiently captured by fixed effects. For example, Tanzania stands out as a case where UNAIDS estimates of adult mortality for both sexes are significantly higher than empirical estimates, even after taking into account fixed effects. The same is true for this country for orphanhood. By contrast, Rwanda, Burundi, South Sudan and Lesotho have ratios of model-based to empirical estimates of orphanhood that are significantly below ratios predicted based solely on fixed effects.

Table S5 – *Linear Mixed-Effects Models*

| | *Dependent variable:* | | | |
|---|---|---|---|---|
| | log($_{45}q_{15}$ UNAIDS/DHS-Censuses) | | log(Orphan rates UNAIDS/DHS-Censuses) | |
| | Females | Males | Maternal | Paternal |
| | (1) | (2) | (3) | (4) |
| Incidence (15-49) | −0.015 | −0.020 | −0.018 | −0.054*** |
| | (0.016) | (0.016) | (0.019) | (0.019) |
| Sibling survival (vs. HH deaths) | 0.143*** | 0.089*** | | |
| | (0.031) | (0.031) | | |
| DHS/MICS (vs. censuses) | | | −0.133*** | −0.067 |
| | | | (0.046) | (0.044) |
| Other survey (vs. censuses) | | | −0.113 | −0.062 |
| | | | (0.100) | (0.096) |
| Group 2: intermediate HIV | −0.044 | −0.047 | −0.040 | −0.003 |
| | (0.053) | (0.060) | (0.095) | (0.105) |
| Group 3: high HIV | −0.058 | −0.144** | −0.178* | −0.418*** |
| | (0.062) | (0.069) | (0.107) | (0.117) |
| Intercept | 0.120*** | 0.069* | 0.401*** | 0.186*** |
| | (0.036) | (0.038) | (0.060) | (0.062) |
| Random effects | | | | |
| # of countries | 36 | 36 | 43 | 43 |
| St. deviation of the random effect | 0.085 | 0.106 | 0.198 | 0.231 |
| Observations | 159 | 159 | 199 | 190 |
| Log Likelihood | 29.244 | 28.127 | -41.649 | -24.310 |
| Akaike Inf. Crit. | -44.487 | -42.254 | 99.299 | 64.620 |
| Bayesian Inf. Crit. | -23.005 | -20.772 | 125.645 | 90.597 |

*Note:* *p<0.1; **p<0.05; ***p<0.01

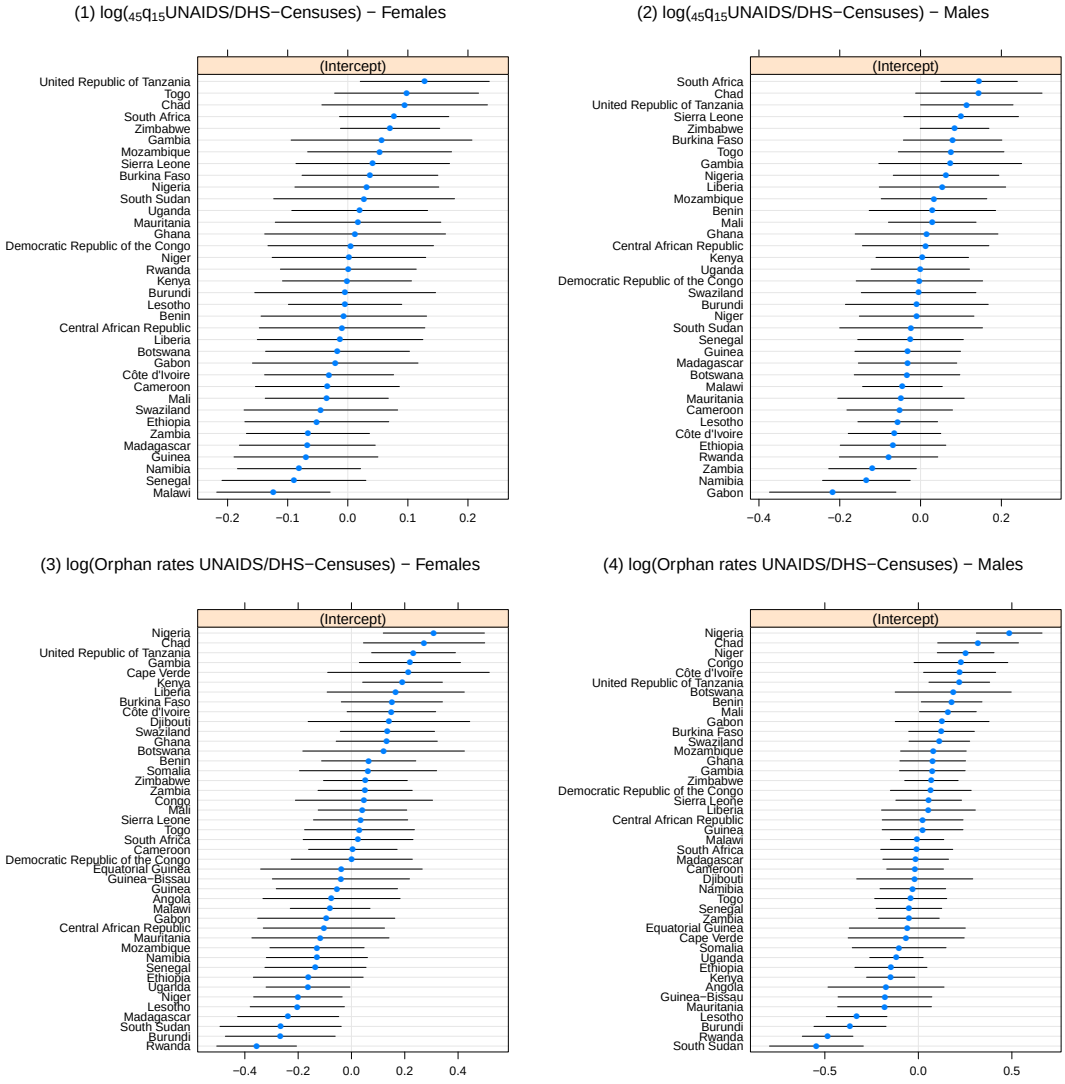


Figure S5 – *Caterpillar plots for conditional modes and 95% prediction intervals of the country-specific random effects*

# Appendix G Age patterns of mortality from recent household deaths

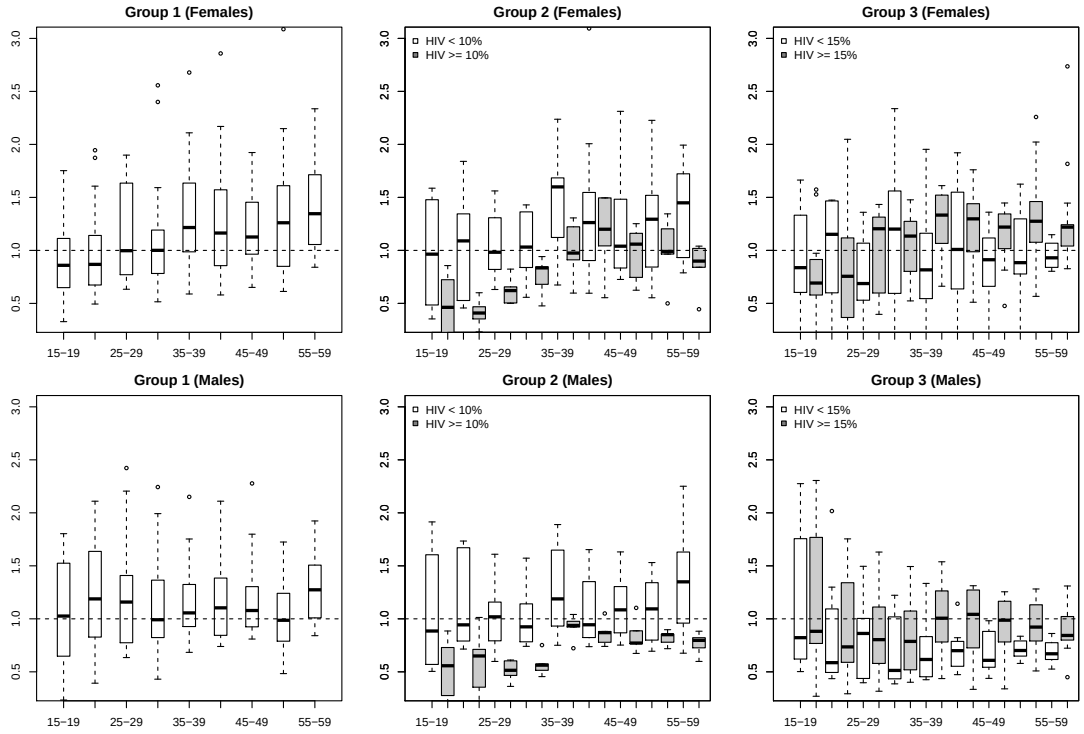


Figure S6 – *Ratios of UNAIDS 2016 age-specific mortality rates to estimates derived from recent household deaths, by sex, group of country, and level of HIV prevalence*

## References


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