Adult mortality estimates from censuses and surveys: ongoing work on youth mortality and possible extensions

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Mortality among adolescents and young people aged 15-24 ($_{10}q_{15}$): data sources

More than 6500 country-year data points from:

1. Vital registration data (covering 27% of the population aged 15-24),
2. Estimates from sample vital registration systems (e.g. India) and Rapid Mortality Surveillance in South Africa.
3. Nationally-representative sample surveys (DHS, MICS, WHS) providing sibling histories
   - Direct estimation based on ages at survey/at death and the timing of deaths
   - Stratified jackknife approach used for variance estimation, with reference periods optimized based on the coe□cient of variation of the estimates (< 20%).
4. Rates from reports on recent household deaths in censuses and large-scale surveys (e.g. in China, Pakistan).

A database similar to UN IGME databases for U5MR and $_{10}q_5$, except that we use sibling histories from surveys (instead of birth histories).

Completeness assessment

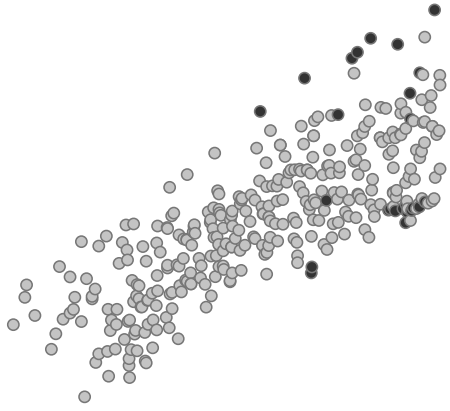
VR data available for 145 countries from WHO, including 38 HMD countries. For other countries, death distribution methods (DDMs) are used to estimate completeness when possible (73 countries, 116 intercensal periods).

- Estimates are based on the hybrid method (GGBSEG), which consists in using first the GGB to obtain the coverage of census 1 relative to census 2 and adjusting populations accordingly prior to using the SEG method.
- No consensus on age trimming (Murray et al., 2010; Hill et al., 2009): range selected automatically here, as implemented in the DDM package in R (Ri□e et al., 2017).
- VR data excluded when completeness is below 80%, adjusted if between 80% and 95%, included without adjustment if higher than 95%. Estimates truncted at 100%.

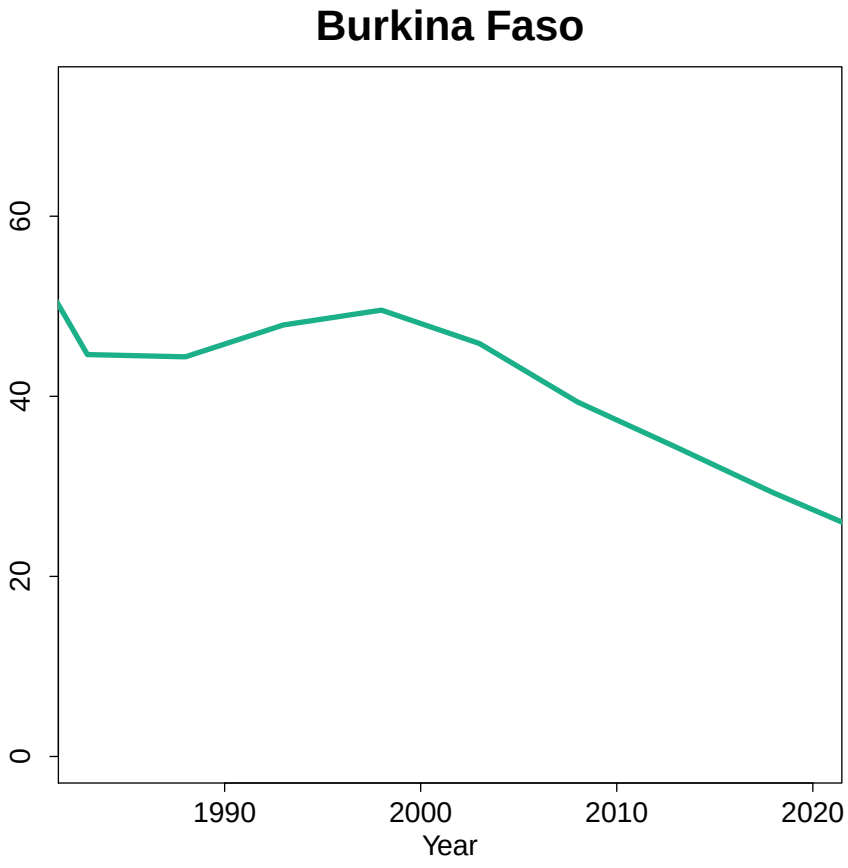
Evaluation of survey and census data based on age patterns

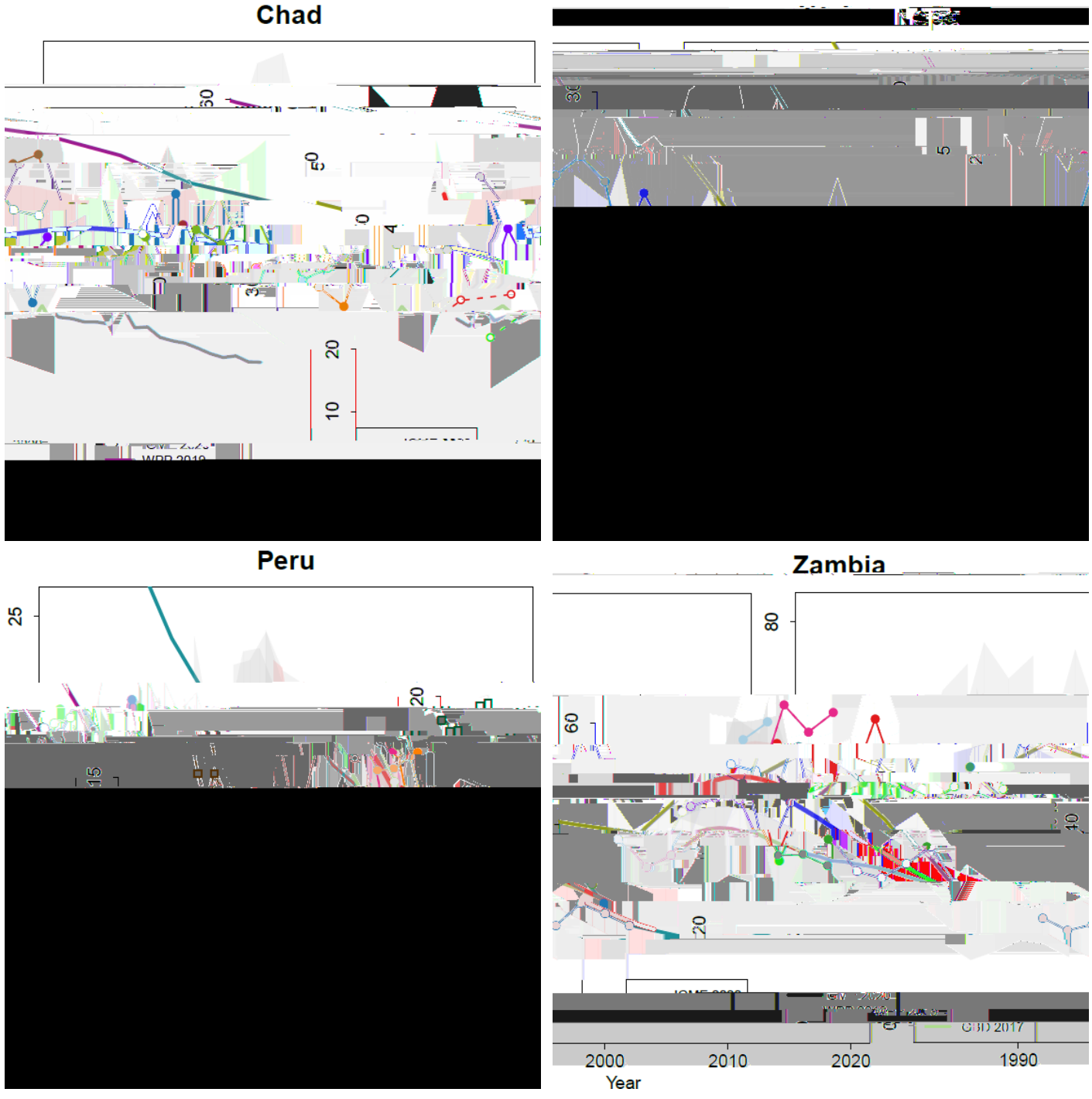
1. HMD 5x5 life tables
2. HDSS life tables (50 sites)
3. Indian SRS
4. Mauritius VR

$$log^{1}{}_{10}q_{15}{}^{o} = {}_{0} + {}_{1}\log(\text{U5MR}) + {}_{2}\log(\text{U5MR})^{2}$$



This automated approach results in the exclusion of 13 DHS (out of 151), 3 MICS (out of 9), 17 WHS out of 42. It also helps in assessing the plausibility of the estimates for some countries with deviations from WPP.

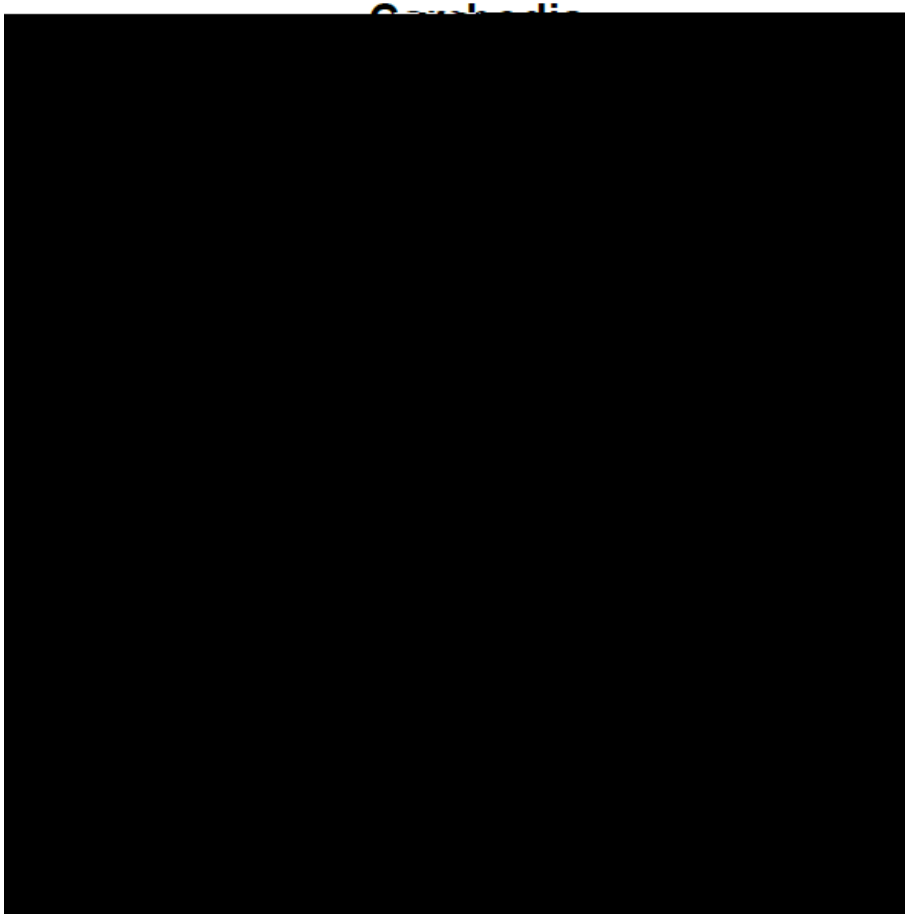



Chad
Peru
Zambia
Year
2000
2010
2020
1990

In 38 countries, there are not enough data inputs to estimate the probability ${}_{10}q_{15}$ from VR, surveys or censuses.

- This represents about 5% of the population aged 15-24.
- A linear model with random intercept and slope for each region is used to regress $\log({}_{10}q_{15})$ against log(U5MR).
- There is room for improvement here. Ex: modelling the ${}_{10}q_{15}$-to-${}_{5}q_{0}$ relationship based on data in a structured model would allow including the limited data available for some countries.

Out-of-sample validation for ${}_{10}q_{15}$



A training set is constructed by removing all data collected in or after 2009 (i.e. about 20% of observations are left out).

- Validation results are based on left-out observations and on the comparison between estimates obtained from the training and full data set.
- The validation suggests that the B3 model performs reasonably well for estimating mortality in youth (comparable to when applied to children aged 5-14), but there is still room for improvement.

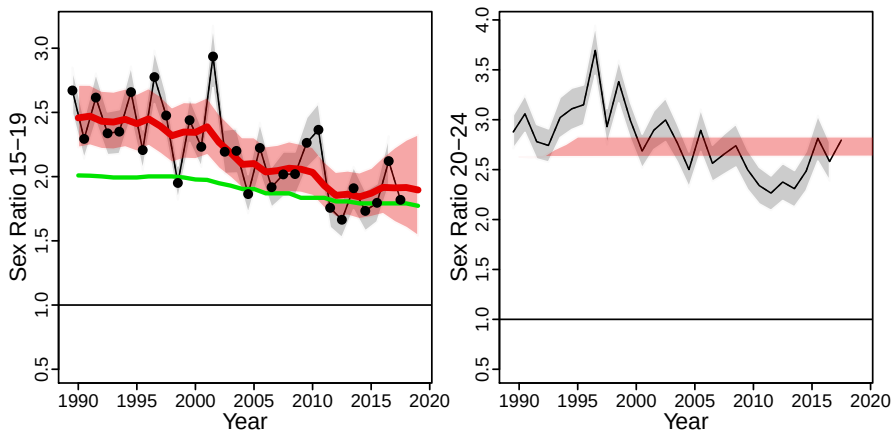
2019 estimates: adolescents and young adults (15-24)

Globally, the probability of dying between the ages 15 and 25 was 10.9 deaths per 1000 adolescents aged 15 (90% confidence interval 10.4-12.7) in 2019.

This is higher than the global estimate of child (1-4) mortality in 2018 (10.0 per 1000 (9.4-11.3))

Quantifying the excess male mortality

Fengqing Chao is currently exploring the use of the Bayesian Hierarchical linear model developed by Alkema et al. (2014) to capture the relation between the total mortality levels and the sex ratios of mortality in the age groups 5-14 and 15-24.



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