Appendix 1

In this appendix, we describe the estimations process using the Trussell indirect method.

Step 1: Calculating CEB for all age groups (i)

This ratio could be calculated by division of CEB in each age group (i) by number of women in the same age group (i)

$P_i = CEB_i / FP_i$, where FP_i is fertility proportion

Step 2: Calculating proportion of children deceased (CD) to CEB for each age group, D_i

This ratio shows what proportion of CEB have died for each age group of women

$D_i = CD_i / CEB_i$

If during census CS have been questioned instead of CD, then the ratio is calculated as

$D_i = 1 - CS_i / CEB_i$

Step 3: Estimation of K_i coefficients

To estimating q_i (death probability up to age x) it should be modified calculating of D_i. Therefore, we used a coefficient called K

$$K_i = a(i) + b(i)\left(\frac{P(19-15)}{P(20-24)}\right) + c(i)\left(\frac{P(20-24)}{P(25-29)}\right)$$

The coefficients of $a(i)$, $b(i)$ and $c(i)$ were estimated by a simulated regression analysis. These coefficients were estimated for all age groups and for 4 regions of Coale–Demeny life tables.

Step 4: Estimation of death probability up to age x

q_i is estimated for each age group i using D_i and K_i

$$q_i = K_i D_i$$

Step 5: Defining reference time to death occurrence

If death rate is changing at same rate, estimated q based on census was linked to a definite time in the past. This reference time has a gap of few years from census year

$$t_i = e(i) + f(i)\left(\frac{P(19-15)}{P(20-24)}\right) + g(i)\left(\frac{P(20-24)}{P(25-29)}\right)$$

The coefficients $e(i)$, $f(i)$ and $g(i)$ were calculated using the Trussell method for each group of women and based on death pattern of Coale–Demeny.