

Example III

In the case of Yap, 1987, we demonstrate how the estimation of the underlying mortality function can be fine-tuned so as to take the underlying age-pattern of fertility into account. For graduation of the observed fertility rates (see Table 14, column (5)) the graduating polynomial is

$$p_{\phi}(x) = -1.051956 + 0.1109 x - 0.0031026 x^2 + 0.00026111 x^3$$

with approximate roots, $a_1 = 14.9562$, $a_2 = 50.0354$ and $a_3 = 53.8664$. As already noted, the mean age for $p_{\phi}(x)$ is $\hat{\mu} = 29.6$. We use $p_{\phi}(x)$ to model the fertility function f in (4).

To model the mortality function, we use $q(x; a, b)$ with $\hat{a} = -1.5055$ and $\hat{b} = 0.0757$ which gives a continuous representation of the mortality function (both sexes) in West level 20 (see Hartmann, 1980, pp. 36-55).

Starting the numerical integration in (4) at age $x = 14.9562$, the model proportions of deceased children appear as given in Table A5.

To estimate K in (16), we use (17) for the ages 20, 21, 23, 24 and 25 (we drop age 22 because $\hat{H}_{22} = 0$) and obtain

$$\hat{K} = \frac{\sum_x [\hat{H}_x H_x^s]}{\sum_x [H_x^s]^2} = 0.014024 / 0.013593 = 1.0317.$$

As in the previous examples, the estimated mortality function becomes $\hat{q}(x) = 1.0317 q(x; -1.5055, 0.0757)$ with q given by (10).

Table A5.-Model proportions of deceased children corresponding to estimated fertility for Yap 1987

Age x	Cumulated Fertility at age x	Cumulated child deaths at age x	Proportion of deceased children at age x
14.9562	0.00000	0.00000	
15.5	0.00518	0.00018	0.0347
16.5	0.04015	0.00162	0.0403
17.5	0.10498	0.00456	0.0434
18.5	0.19612	0.00896	0.0457
19.5	0.31019	0.01472	0.0475
15-19	0.13132		0.0423
20.5	0.44395	0.02179	0.0491
21.5	0.59434	0.02995	0.0504
22.5	0.75844	0.03916	0.0516
23.5	0.93349	0.04918	0.0527
24.5	1.11690	0.05998	0.0537
20-24	0.76942		0.0515
25.5	1.30621	0.07138	0.0546
26.5	1.49913	0.08330	0.0556
27.5	1.69354	0.09548	0.0564
28.5	1.88746	0.10789	0.0572
29.5	2.07907	0.12040	0.0579
25-29	1.69308		0.0563

2.5 Estimating a life table for Yap around 1987

The estimation of a life table for Yap is necessarily an approximate endeavor. The only practical solution at hand is to take advantage of the estimates of infant and childhood mortality and infer the remaining part of the survival curve from these estimates. With this approach one could select e.g. a West model life table with the corresponding level of infant and childhood mortality. We abandon this approach because, in our view, it would give an estimated life table with a too high life expectancy. Instead, we make use of the Brass logit life table approach (see e.g. Brass, 1971, pp. 69-110). The application of the Brass logit life table method hinges on the selection of a proper standard life table. We have chosen the life table for Western Samoa around 1981-82 as a standard (see Table 2).