Notes for the Extended Model Life Tables (version 1.3)

toleran#e (1$1/2). (2) * simple seven/term moving average "as performed after the appli#ation of the pchip method to smooth the estimated probabilities of death $_1q_x$. The smooth "as performed iteratively to ensure the #onstraint noted in (1). (3) 8e then estimated $_1m_x$ from $_1q_x$ by assigning an initial value of $.4 to the $_1a_x$ for ea#h single year of age (as per the &uman 6ortality Database method proto#ol! see 8ilmoth et al.! 2$$>73(). 8e then estimated $_4m_x^1$ to verify "hether the $_4m_x^1$ "as e-ual to the original $_4m_x$ from the model life table of the version 2. 3f not! iterations for $_1a_x$ "ere performed to ensure $_4m_x^k$ to be as #lose as possible to $_4m_x$ after k^{th} iterations. 3n this step! $_1a_x$ "as also updated. ()) Bn#e $_4m_x^k$ "as estimated (i.e.! $_1m_x^k$ "as estimated)! "e re/#al#ulated the average probability of death for ea#h of five/year age groups and re/implemented the pro#edures (3) and ()) until the #hanges of estimates "ere smaller than the spe#ified toleran#e bet"een adCa#ent iterations (1$1/2).

1.) Ages from # to %$7 8e applied the 9ompertD model to estimate $_1m_x$ for ages bet"een 2$ and >' based on $_4m_x$ for ages 4$/4)! 44/4'! 2$/2)! 24/2'! >$/>)! and >4/>' from the version 1.2. The 9ompertD fun#tion μ_x % ae^{bx} is from the formula presented in ,hapter T"o of the boo EFor#e of 6ortality at *ges ($ to 12$G by That#her! @annisto! and Haupel (1''() (available at http7;;"""".demogr.mpg.de;Papers;+oo s;6onograph4;start.htm)! "here a and b are parameters! and μ_x is the for#e of mortality at exa#t age x. The model "as fitted by the maximum li elihood method using the formula of $L(x) = -D(x)\log(q_x) - (N - D)\log(1 - q_x)$ = "here L(x) is the li elihood fun#tion! D is number of persons "ho survive to age x but die before they rea#h age $x + n$ = N is number of persons "ho rea#h age x = q_x is estimated probability of dying from age x to $x + n$. Bn#e μ_x is fi

1.2 3n a final round! minor adCustments "ere made for $_1m_x$ (and thus also for $_1a_x$) proportionally a##ording to the distribution of dx to ensure that $T_\$$ e-uals to 1$01$$!$$$! "here 1$ is a given level of life expe#tan#y at birth. 8e used 6atlab to implement this pro#ess.

'. Abridged model life tables

*bridged life table "ere #onstru#ted from the #ompleted life table. The main reason "e used the approa#h des#ribed above to re#onstru#t the model life tables (i.e.! generating abridged model life tables using #ompleted model life tables) is that "e have dete#ted noti#eable biases for $_4a_x$ in the abridged life table using 9revilleJs formula : $_na_x = \frac{n}{2} - \frac{n^2}{12}\left({}_nm_x - \frac{\ln({}_nm_{x+n}/{}_nm_{x-n})}{2n}\right)$ < "hen 4

United 5ations (2$13). 6ortPa for "indo"s (version).3). 5e" Mor 7United 5ations Population Division.
http7;;""".un.org;en;development;desa;population;publi#ations;pdf;mortality;mortpa 0manual.pdf

8ilmoth! ?.L.! *ndreev! @.! ?danov! D.! and 9lei! D.*. ("ith the assistan#e of +oe! ,.! +ubenheim! 6.! Philipov! D.! Ah olni ov! H.! and Ha#hon! P.) (2$$>). 6ethods proto#ol for the human mortality database.
http7;;""".mortality.org;Publi#;Do#s;6ethodsProto#ol.pdf

Notes for the Extended Model Life Tables (version 1.')

T"o sets of standard model life table families (,oale/Demeny 1'22 and 1'('! and United 5ations! 1'(2) are #ommonly used to derive a variety of mortality indi#ators! and! as underlying mortality patterns for estimation and proCe#tion by the United 5ations and the demographi# resear#h #ommunity at large. +ut these t"o sets of model life tables / designed primarily to be used in developing #ountries or for histori#al populations #over mortality patterns only for a life span from ages 2$ to >4. * first extension of these model life tables "as produ#ed by Thomas +uettner in 1''(! "hi#h extended the initials sets of model life tables from e($)%>4.$ up to '2.4 using both a limit life table as an asymptoti# pattern and the #lassi# Kee/,arter approa#h to derive intermediate age patterns (+uettner! 2$$2).

8ith the extension of the proCe#tion horiDon for all #ountries up to 21$$! and as part of the 2$12 Levision of the U5 8orld Population Prospe#ts! it "as ne#essary to allo" life expe#tan#y at birth to go beyond '2.4 years. 3n add