Evaluation of Child Mortality Data from Population Censuses

United Nations Statistics Division

United Nations Workshop on Census Data Evaluation for English Speaking African Countries
Kampala, Uganda
12 – 16 November 2012

Outline

1. **Life tables**
   a) Constructing life tables
   b) Model life tables
2. **Survival of children ever born**
   a) Information required
   b) Checking data quality
   c) Brass type estimates of child mortality and checking with external sources
   d) A simplified version of Brass for evaluation

Life tables

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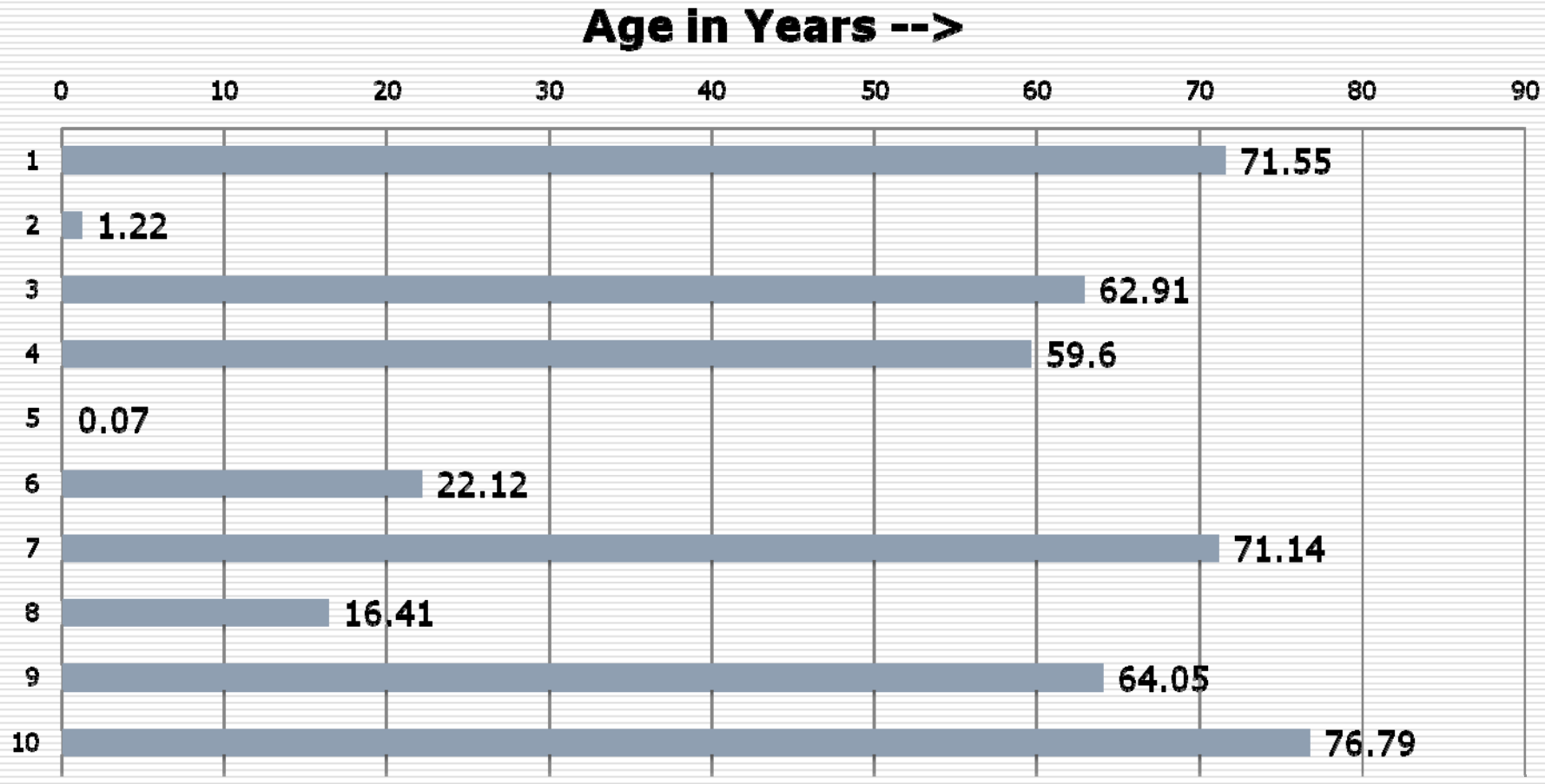
Life tables

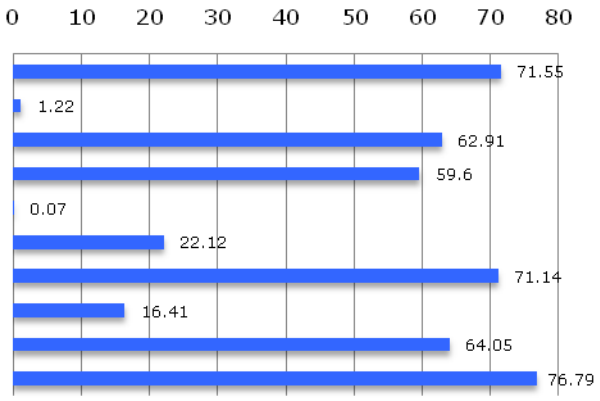
- Contain several functions that represent the effects of mortality on a population
  - Life expectancy, age-specific mortality rates, probability of dying by age x
- Cohort life tables trace the experience of a single birth cohort (e.g. all those born in 1950)
  - Have to wait for entire cohort to die to have full data
- Period life tables use a *synthetic cohort* to represent prevailing mortality conditions at present time
  - As if a cohort lived whole life under current mortality conditions

Constructing a cohort life table



Constructing a cohort life table (2)

Age	Number left alive at age x	Number dying between x and x+n	Probability of dying between ages x and x+n	Person-years lived between ages x and x+n	Persons lived above age x	Expectation of life at age x	Death rate between age x and
x	lx	ndx	nqx	nLx	$Tx = \sum_{a=x}^{\infty} nLa$	$e_x^v = T_x / l_x$	nmx
0	10	1	1/10	9+0.07=9.07	436.79+9.07=445.86	44.586	1/9.07
1	9	1	1/9	8*4+0.22=32.22	404.57+32.22=436.79	48.532	1/32.22
5	8	0	0	8*5=40	364.57+40=404.57	50.571	0
10	8	1	1/8	7*10+6.41=76.41	288.16+76.41=364.57	45.571	1/76.41
20	7	1	1/7	6*10+2.12=62.12	226.04+62.12=288.16	41.166	1/62.12
30	6	0	0	6*10	166.04+60=226.04	37.673	0
40	6	0	0	6*10	106.04+60=166.04	27.673	0
50	6	1	1/6	5*10+9.6=59.6	46.44+59.6=106.04	17.673	1/59.6
60	5	2	2/5	3*10+2.91+4.05=36.96	9.48+36.96=46.44	9.288	2/36.96
70	3	3	3/3	1.55+1.14+6.79=9.48	9.48	3.160	3/9.48
80	0	-	-				



The period life table - example

Age x	${}_nN_x$	${}_nD_x$	${}_nm_x$	${}_na_x$	${}_nq_x$	${}_np_x$	l_x	${}_nd_x$	${}_nL_x$	T_x	e_x^o
0	47,925	419	0.008743	0.068	0.008672	0.991328	100,000	867	99,192	7,288,901	72.889
1	189,127	70	0.000370	1.626	0.001479	0.998521	99,133	147	396,183	7,189,709	72.526
5	234,793	36	0.000153	2.500	0.000766	0.999234	98,986	76	494,741	6,793,526	68.631
10	238,790	46	0.000193	3.143	0.000963	0.999037	98,910	95	494,375	6,298,785	63.682
15	254,996	249	0.000976	2.724	0.004872	0.995128	98,815	481	492,980	5,804,410	58.740
20	326,831	420	0.001285	2.520	0.006405	0.993595	98,334	630	490,106	5,311,431	54.014
25	355,086	403	0.001135	2.481	0.005659	0.994341	97,704	553	487,127	4,821,324	49.346
30	324,222	441	0.001360	2.601	0.006779	0.993221	97,151	659	484,175	4,334,198	44.613
35	269,963	508	0.001882	2.701	0.009368	0.990632	96,492	904	480,384	3,850,023	39.900
40	261,971	769	0.002935	2.663	0.014577	0.985423	95,588	1,393	474,686	3,369,639	35.252
45	238,011	1,154	0.004849	2.698	0.023975	0.976025	94,195	2,258	465,777	2,894,953	30.734
50	261,612	1,866	0.007133	2.676	0.035082	0.964918	91,937	3,225	452,188	2,429,176	26.422
55	181,385	2,043	0.011263	2.645	0.054861	0.945139	88,711	4,867	432,096	1,976,988	22.286
60	187,962	3,496	0.018600	2.624	0.089062	0.910938	83,845	7,467	401,480	1,544,893	18.426
65	153,832	4,366	0.028382	2.619	0.132925	0.867075	76,377	10,152	357,713	1,143,412	14.971
70	105,169	4,337	0.041238	2.593	0.187573	0.812427	66,225	12,422	301,224	785,699	11.864
75	73,694	5,279	0.071634	2.518	0.304102	0.695898	53,803	16,362	228,404	484,475	9.005
80	57,512	6,460	0.112324	2.423	0.435548	0.564452	37,441	16,307	145,182	256,070	6.839
85	32,248	6,146	0.190585	5.247	1.000000	0.000000	21,134	21,134	110,889	110,889	5.247

Source: *Demography*, Preston et. al., 2001

Calculating the period life table

${}_nM_x$ = age-specific period- mortality rate

Box 3.1 *Period Life Table Construction*

A. Observed data:

${}_nN_x$ = *mid-year population in age interval x to x + n*

${}_nD_x$ = *deaths between ages x and x + n during the year*

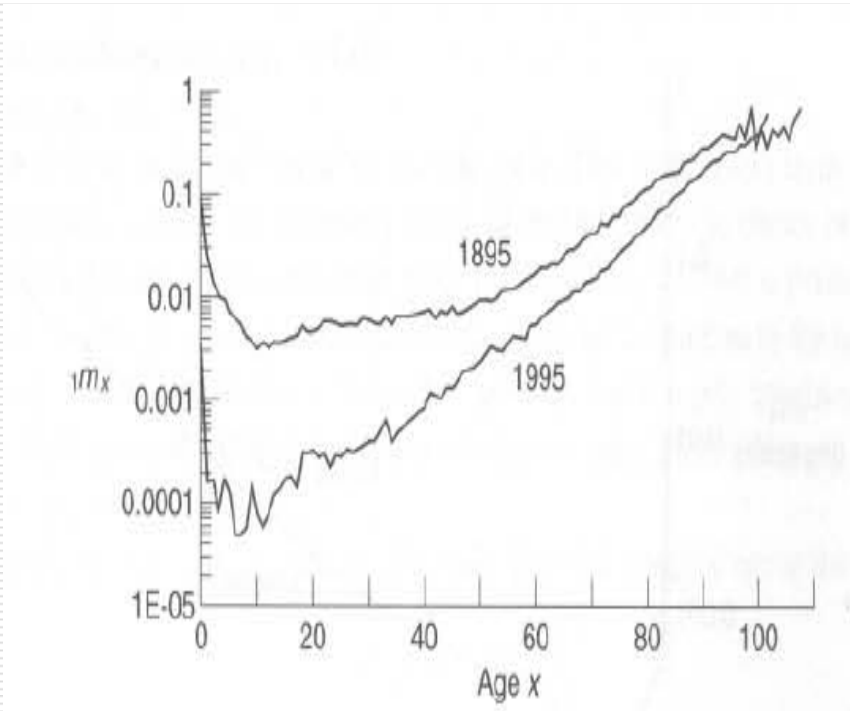
B. Steps for period life table construction:

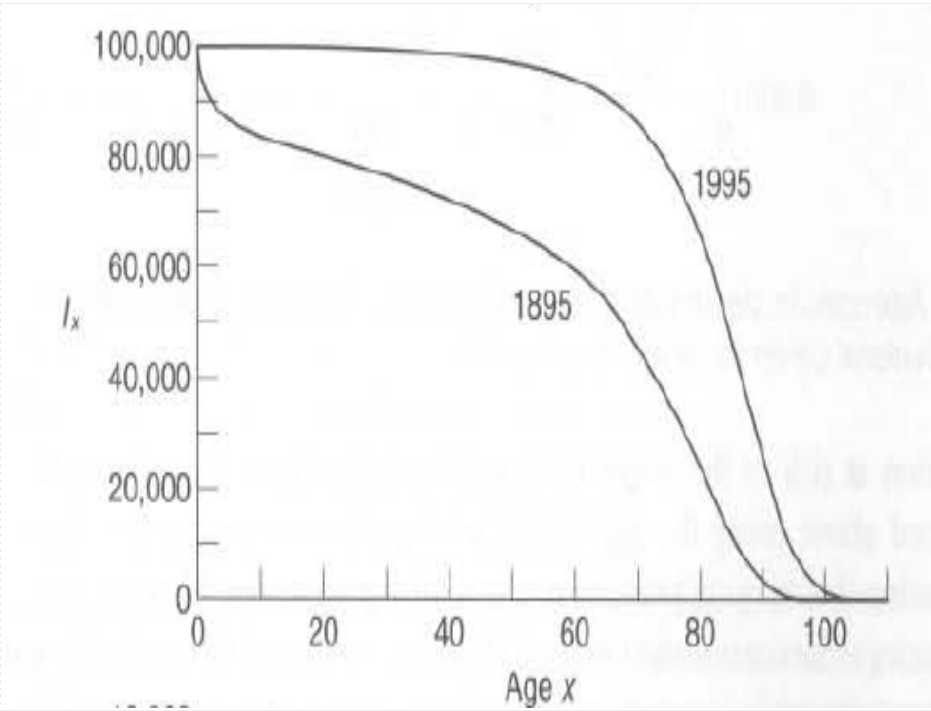
1. ${}_nm_x \simeq {}_nM_x = \frac{{}_nD_x}{{}_nN_x}$
2. ${}_na_x$: *calculated from Coale and Demeny equations shown in table 3.3 under age 5, borrowed from Keyfitz and Flieger above age 5*
3. ${}_nq_x = \frac{n \cdot {}_nm_x}{1 + (n - {}_na_x) \cdot {}_nm_x}$; ${}_\infty q_{85} = 1.00$
4. ${}_np_x = 1 - {}_nq_x$
5. $l_0 = 100,000$; $l_{x+n} = l_x \cdot {}_np_x$
6. ${}_nd_x = l_x - l_{x+n}$
7. ${}_nL_x = n \cdot l_{x+n} + {}_na_x \cdot {}_nd_x$ (*open-ended interval:* ${}_\infty L_x = \frac{l_x}{{}_\infty m_x}$)
8. $T_x = \sum_{a=x}^{\infty} {}_aL_a$
9. $e_x^o = \frac{T_x}{l_x}$

Example: Austria, males, 1992

Source: *Demography*, Preston et al, 2001, P49

Data checks: does the life table make sense?





Source: Swedish females, 1895 vs 1995, *Demography*, Preston et. al. 2001

Example - using MortPak LIFTB

MORTPAK FOR WINDOWS

File Edit View Application Run Chart Window Help

Selected application is LIFTB (Untitled3)

Input File Name: C:\Program Files\MORTPAK4\Untitled.MPL
When last updated: 17 July 2012

Data Entry Help
Show Document Output

Construction of a life table.

TITLE: Botswana Abridged Life Table 2006

Sex: Females
Data Type: m(x,n)
(Output) open age group: 80+

Age Group	m(x,n)
0 - 1	0.03395
1 - 5	0.00542
5 - 10	0.00068
10 - 15	0.00090
15 - 20	0.00144
20 - 25	0.00507
25 - 30	0.01416
30 - 35	0.02780
35 - 40	0.03037
40 - 45	0.01090
45 - 50	0.02212
50 - 55	0.00907
55 - 60	0.00452
60 - 65	0.04668
65 - 70	0.03637
70 - 75	0.39960
75 - 80	0.08739
80 - 85	0.17192
85 - 90	
90 - 95	
95 -100	

Age	m(x,n)	q(x,n)	l(x)	d(x,n)	L(x,n)	S(x,n)	T(x)	e(x)	a(x,n)
0	0.03395	0.03300	100000.	3300.	97192.	0.95752	5147387.	51.474	0.149
1	0.00542	0.02139	96700.	2068.	381570.	0.98662	5050195.	52.225	1.470
5	0.00068	0.00339	94632.	321.	472358.	0.99606	4668625.	49.334	2.500
10	0.00090	0.00449	94311.	423.	470496.	0.99468	4196267.	44.494	2.500
15	0.00144	0.00718	93888.	674.	467994.	0.98572	3725770.	39.683	2.857
20	0.00507	0.02509	93214.	2339.	461310.	0.95554	3257777.	34.950	2.966
25	0.01416	0.06868	90875.	6242.	440799.	0.89998	2796466.	30.773	2.825
30	0.02780	0.13031	84633.	11029.	396709.	0.85598	2355668.	27.834	2.601
35	0.03037	0.14011	73605.	10313.	339577.	0.90635	1958959.	26.615	2.242
40	0.01090	0.05300	63292.	3355.	307774.	0.92106	1619382.	25.586	2.411
45	0.02212	0.10462	59937.	6271.	283479.	0.92272	1311609.	21.883	2.416
50	0.00907	0.04421	53666.	2372.	261571.	0.97098	1028129.	19.158	2.150
55	0.00452	0.02238	51294.	1148.	253981.	0.89667	766558.	14.944	2.832
60	0.04668	0.21200	50146.	10631.	227737.	0.80523	512578.	10.222	2.837
65	0.03637	0.16878	39515.	6670.	183380.	0.39650	284841.	7.208	2.872
70	0.39960	0.88458	32846.	29055.	72710.	0.20859	101461.	3.089	1.850
75	0.08739	0.34963	3791.	1325.	15167.	0.47248	28751.	7.584	2.142
80	0.18149	...	2465.	2465.	13584.	...	13584.	5.510	5.510

First entry of S(x,n) is for survivorship of 5 cohorts of birth to age group 0-4 = L(0,5) / 500000
Second entry of S(x,n) is for S(0,5) = L(5,5) / L(0,5)
Last entry of S(x,n) is S(75+,5) = T(80) / T(75)

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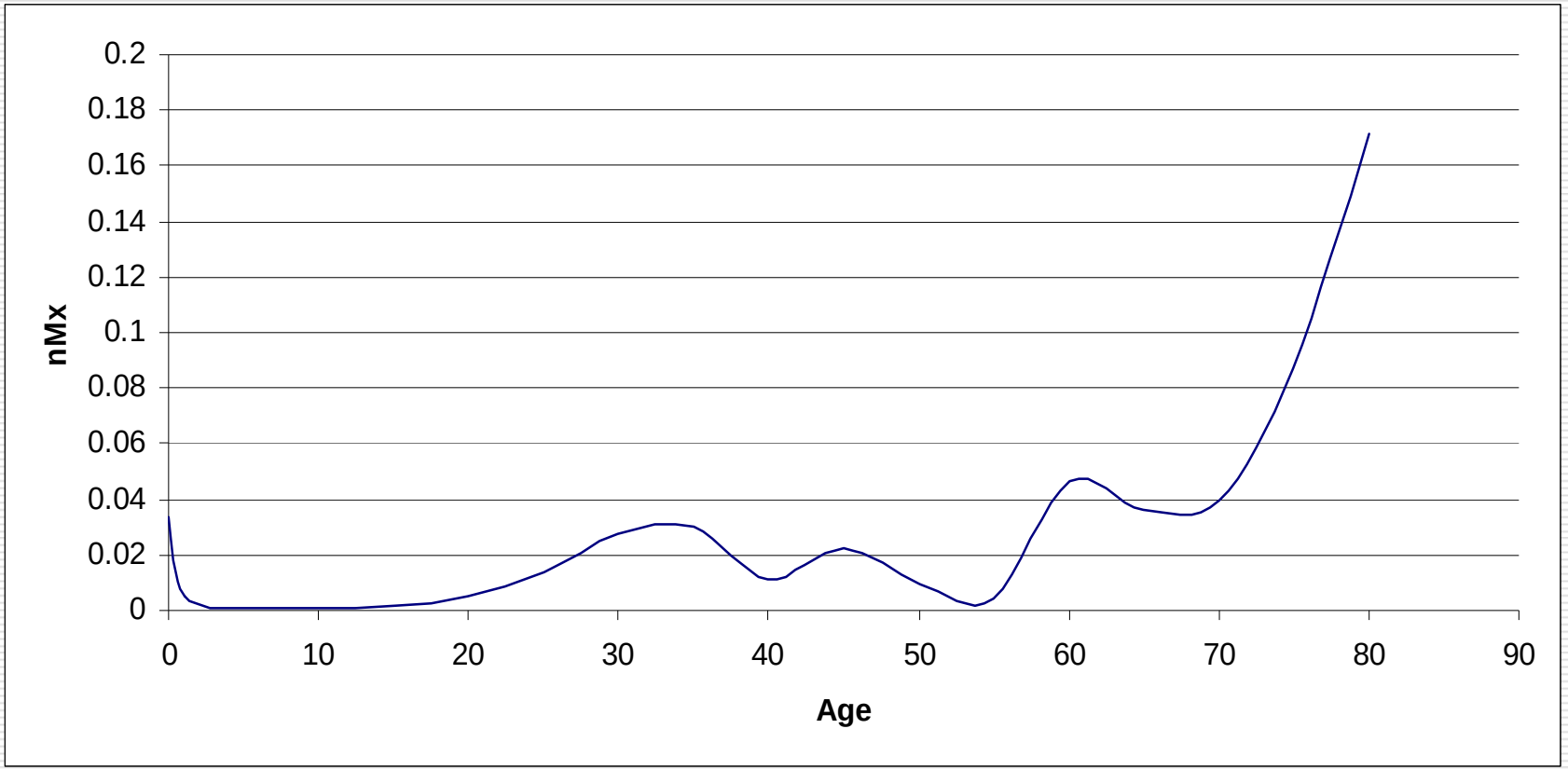
Data Source: Botswana Demographic Survey 2006, available at Human Lifetable Database http://www.lifetable.de

Does it make sense?
Botswana 2006 Demographic Survey



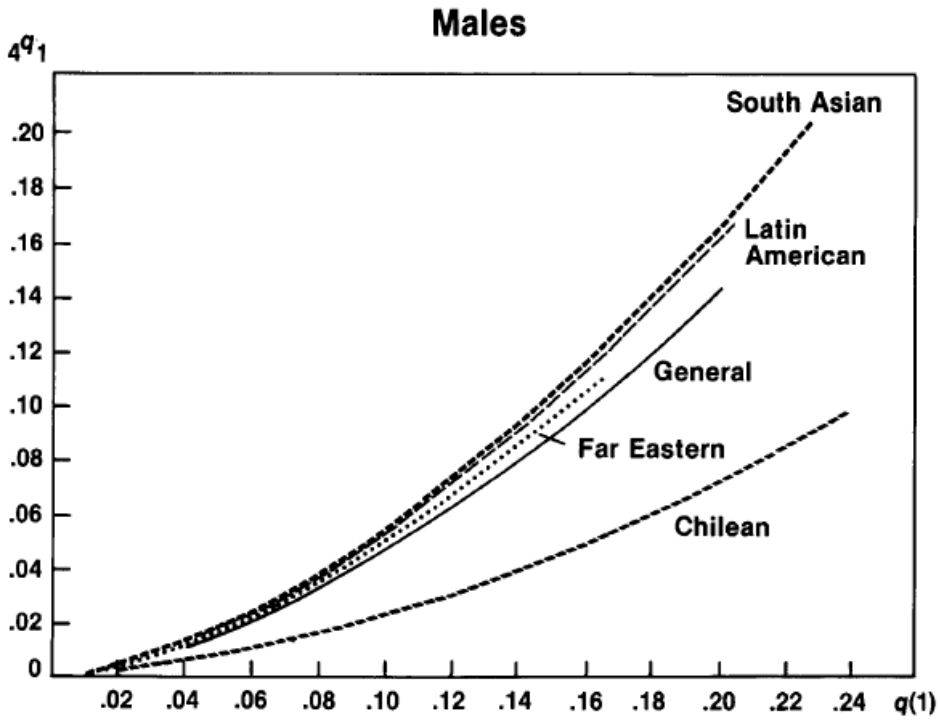
Model life tables

- Represent expected age patterns of mortality – fewer parameters
- Created to estimate demographic parameters for countries with limited data
- Built on empirical studies of age-specific mortality patterns in the past
- Two groups of model life tables:
  - Coale-Demeny (1983): based on European populations, from >600 mortality patterns
    - North, South, East and West European models
    - West only model based on some non-European life tables
  - United Nations (1982): based on developing countries
    - Latin American, Chilean, South Asian, Far Eastern, General

Model life tables (2)

1. Age-specific shape of mortality – relative probabilities of dying at different ages

Figure 4. Relationship between infant mortality, $q(1)$, and child mortality, ${}_4q_1$, in the United Nations mortality models



Source: *Step by step guide to the estimation of child mortality*, 1990, United Nations

Model life tables (3)

2. Level of mortality – each model has several different levels that correspond with a different life expectancies at birth (e0)

Source: *Model Life tables for Developing Countries*, 1982, United Nations

United Nations Model Life Tables — Males

Latin American Pattern

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.23669	.20429	100000	20429	86313	3500000	35.000	0.330
1	.04672	.16631	79571	13234	283241	3413687	42.901	1.352
5	.00982	.04790	66337	3178	323742	3130446	47.190	2.500
10	.00511	.02522	63160	1593	311817	2806704	44.438	2.500
15	.00697	.03427	61567	2110	302841	2494887	40.523	2.633
20	.01036	.05051	59457	3003	290037	2192046	36.868	2.586
25	.01169	.05679	56454	3206	274346	1902009	33.691	2.528
30	.01332	.06449	53248	3434	257753	1627663	30.567	2.528
35	.01528	.07363	49814	3668	239996	1369910	27.500	2.526
40	.01757	.08418	46146	3885	221132	1129914	24.485	2.529
45	.02092	.09948	42262	4204	200930	908782	21.504	2.531
50	.02517	.11849	38058	4509	179185	707852	18.599	2.538
55	.03225	.14939	33548	5012	155420	528667	15.758	2.542
60	.04241	.19205	28537	5480	129217	373247	13.080	2.543
65	.06056	.26327	23056	6070	100230	244030	10.584	2.520
70	.08574	.35208	16986	5980	69747	143800	8.466	2.461
75	.11840	.45210	11006	4976	42023	74053	6.729	2.386
80	.16226	.56382	6030	3400	20953	32030	5.312	2.295
85	.23745	******	2630	2630	11077	11077	4.211	4.211

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.22881	.19840	100000	19840	86707	3599999	36.000	0.330
1	.04434	.15871	80160	12723	286952	3513291	43.828	1.352
5	.00933	.04560	67438	3075	329502	3226339	47.842	2.500
10	.00487	.02408	64363	1550	317940	2896838	45.008	2.500
15	.00667	.03281	62813	2061	309189	2578898	41.057	2.634
20	.00992	.04843	60752	2942	296662	2269709	37.360	2.588
25	.01120	.05451	57810	3151	281263	1973048	34.130	2.529
30	.01277	.06192	54658	3384	264933	1691784	30.952	2.530
35	.01470	.07093	51274	3637	247381	1426852	27.828	2.528
40	.01696	.08140	47637	3878	228615	1179470	24.759	2.532
45	.02029	.09663	43759	4228	208371	950856	21.729	2.535
50	.02452	.11564	39531	4571	186413	742484	18.782	2.541
55	.03156	.14644	34960	5119	162227	556071	15.906	2.545
60	.04164	.18889	29840	5637	135367	393844	13.198	2.546
65	.05958	.25961	24204	6284	105456	258477	10.679	2.523
70	.08453	.34804	17920	6237	73786	153022	8.539	2.464
75	.11698	.44810	11683	5235	44753	79236	6.782	2.390
80	.16076	.56044	6448	3614	22479	34483	5.348	2.299
85	.23611	******	2834	2834	12004	12004	4.235	4.235

Survival of children ever born

Indirect estimation of child mortality

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Quick review - children ever born/surviving data

- Have been used for the past 50 years to collect data on infant and child mortality
- For every woman the following information is collected:
  - the total number of female children she has borne in her lifetime.
  - the total number of male children she has borne in her lifetime.
  - the number of female children who are surviving
  - the number of male children who are surviving

Survival of children ever born

- Ever born – Surviving = Children deceased
- Children deceased / Ever born = Proportion deceased
- Life table measures of infant, child and young adult mortality may be derived from the proportion of deceased
  - In combination with data on age of mother

CEB/CS data

- Possible to get high quality responses in censuses
  - If both CEB and CS understated → some cancellation of errors
  - In practice, reporting of CS is more complete than reporting of CEB → child mortality under-estimated
- More powerful with multiple data sources

CEB/CS data evaluation check list:

- Population by age-sex distribution!
- Any missing data and/or editing?
- Are data on CEB/CS/deceased consistent?
  - By age and over time
- Sex ratio at birth from CEB data for different mother age groups
  - Is it plausible?
  - Under-reporting of female births?
- Is proportion of children surviving/deceased plausible?
  - Comparing with other sources on child mortality
- Is child mortality estimate plausible?
  - Comparing with external sources

CEB/CS – missing data and editing?

Example: missing or implausible values of CEB and CS data

Table 5.1 Percentage of cases where no editing of children ever born and children surviving data was required, by population group and age group

	African		*Coloured*		*Indian/Asian*		*White*	
Age	*CEB*	*CS*	*CEB*	*CS*	*CEB*	*CS*	*CEB*	*CS*
12-14	65.2	34.5	53.5	27.2	61.4	19.7	46.2	22.6
15-19	73.5	44.0	63.7	37.2	68.8	24.6	55.9	28.9
20-24	82.5	62.5	78.5	59.5	79.1	40.9	73.9	44.5
25-29	88.2	75.6	87.6	75.4	88.0	64.3	85.4	63.6
30-34	90.9	81.2	91.2	82.0	92.2	78.3	90.2	76.6
35-39	91.9	83.2	92.6	84.5	93.5	82.9	91.3	81.3
40-44	91.4	83.3	92.5	84.7	93.3	83.6	91.5	82.7
45-49	89.9	82.3	91.3	83.7	91.9	82.6	90.4	82.2

Source: *Estimation of mortality using the South African Census 2001 data*, Dorrington, Moultrie and Timæus, Centre of Actuarial Research, University of Cape Town, 2001

CEB/CS data plausible (by age)?

Average CEB should be realistic given country TFR and typical ages at childbearing

Unless fertility or child mortality are increasing, average CD should increase with age group

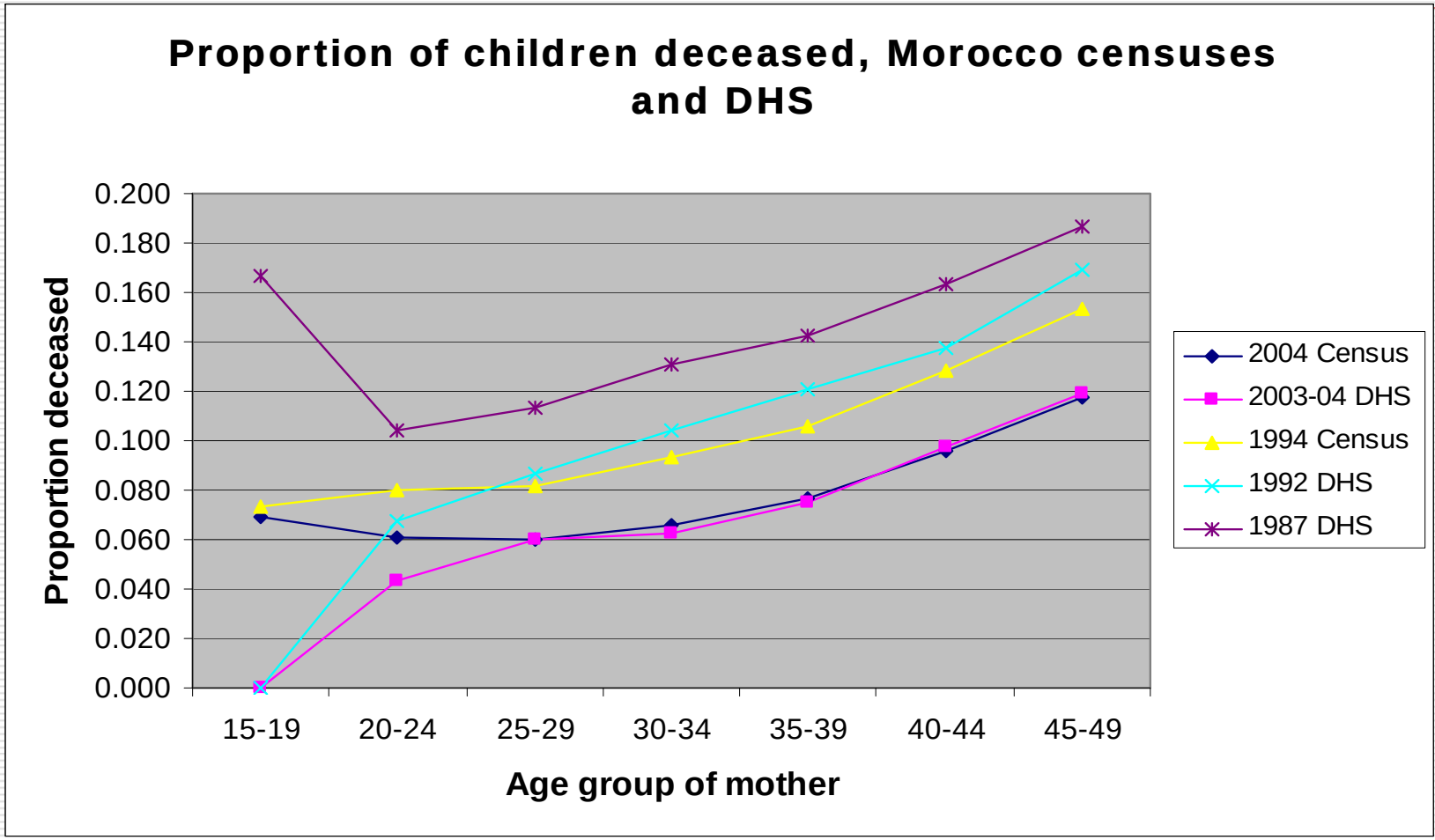
Turkey, 2000

Age group of women	Total women	Total CEB	Average CEB	Total CS	Children deceased (CD=CEB-CS)	Proportion deceased CD/CEB
15 - 19	3518257	294628	0.08	281296	0.003789	0.045
20 - 24	3263432	2078364	0.64	1991445	0.026634	0.042
25 - 29	2918825	4522719	1.55	4312404	0.072055	0.047
30 - 34	2457285	5700038	2.32	5395143	0.124078	0.053
35 - 39	2400808	7036619	2.93	6563946	0.196881	0.067
40 - 44	1985225	6707033	3.38	6131544	0.289886	0.086
45 - 49	1658012	6394157	3.86	5722904	0.404854	0.105

Unless fertility has been rising, average CEB should increase with age group

Source: Tabulated using data from *United Nations Demographic Yearbook*

Proportion deceased with external sources



Data source: United Nations Demographic Yearbook and DHS STATcompiler

Obtaining children mortality estimates – Brass method

- Proportion dead → Life table type mortality measure
  - Brass (1975)
  - Use of model life tables
  - Referring to estimates up to 20 years ago
- Data required:
  - Number of women by
    - 5 year age group OR Duration of marriage (5 year groups)
  - Total number of children born alive and living to women in corresponding 5-year groups

Brass type estimates – tabulation

- Women in the age group should include all women, not only those who respond to CEB/CS questions
  - Important to check in contexts where inappropriate to ask unmarried women about childbearing

BANGLADESH CENSUS 1974 RETROSPECTIVE SURVEY OF FERTILITY AND MORTALITY

	AGE GROUP OF WOMEN	TOTAL WOMEN	TOTAL BIRTHS	CHILDREN AT HOME	CHILDREN AWAY	CHILDREN DEAD
TOTAL						
	0–14	259 104	6 677	4 866	0	1 811
	15–19	2 019 436	1 160 919	921 227	24 327	215 365
	20–24	2 521 318	4 901 382	3 820 649	83 349	997 384
	25–29	2 573 496	9 085 852	6 927 908	219 989	1 937 955
	30–34	2 003 082	9 910 256	7 126 473	522 587	2 261 196
	35–39	1 766 100	10 384 001	6 974 267	919 566	2 490 168
	40–44	1 473 382	9 164 329	5 472 460	1 276 846	2 415 023
	45–49	1 128 791	6 905 673	3 664 328	1 281 801	1 959 544
	50–54	1 040 877	5 963 087	2 601 163	1 441 061	1 920 863
	55–59	601 625	3 257 428	1 206 148	913 559	1 137 721
	60+	1 631 217	8 136 608	2 102 978	2 800 615	3 233 015
	N.S.	204	0	0	0	0
	TOTAL	17 018 632	68 876 212	40 822 467	9 483 700	18 570 045

Note small number of women in 0-14 age group – unmarried were not included

Source: *Step by step guide to the estimation of child mortality*, 1990, United Nations

Brass type estimates -basic idea

Age group of mother in years	Age group index	Proportion of children dead approximates
15-19	1	q(1)
20-24	2	q(2)
25-29	3	q(3)
30-34	4	q(5)
35-39	5	q(10)
40-44	6	q(15)
45-49	7	q(20)
50-54	8	q(25)
55-59	9	q(30)

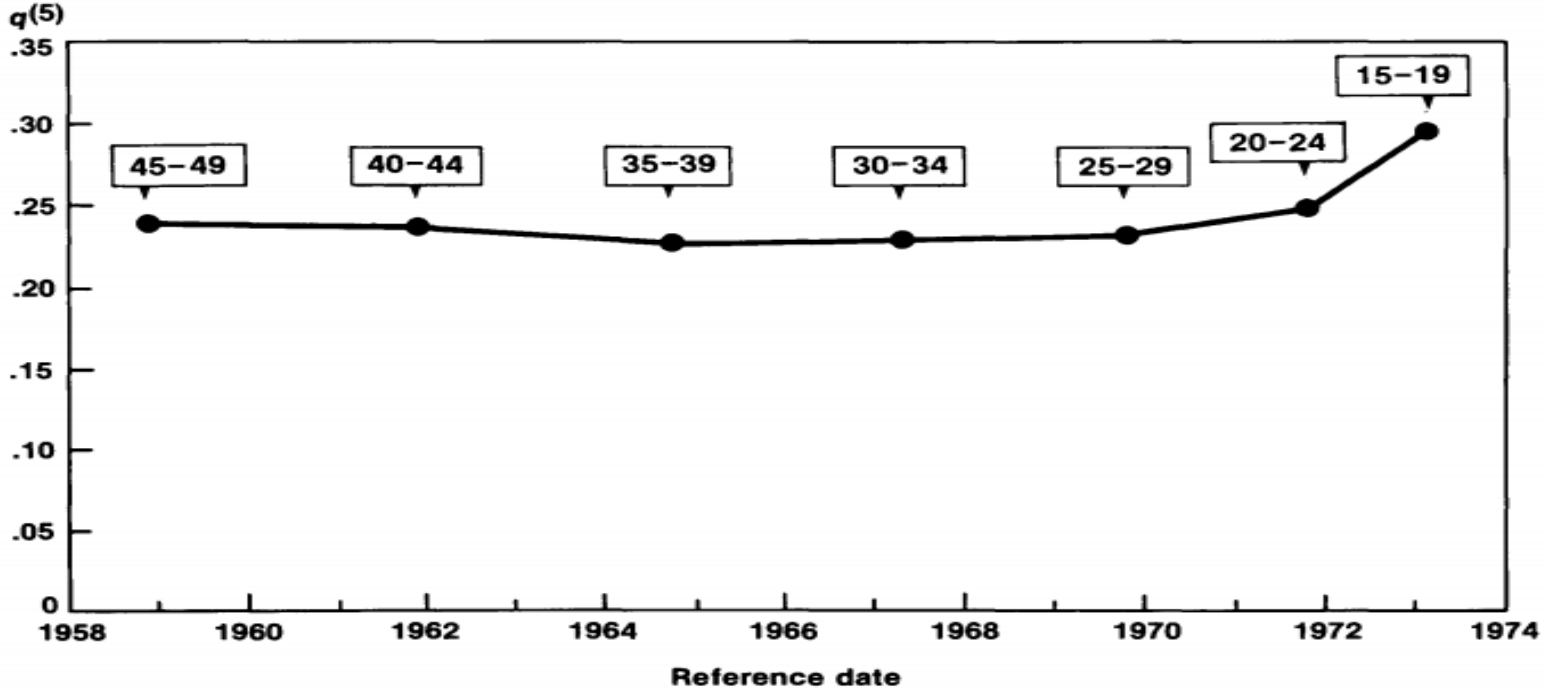
Brass type method – basic idea (2)

- Proportion dead → corresponds to one life table element
  - e.g., proportion dead for 25-29 women → q(3)
- Look for appropriate model life table – from external sources/existing experiences
- Obtain child mortality estimates, q(1), q(5), 4q1 etc
- Find the date associated with the estimates

Brass type estimates – typical results

Bangladesh, 1974 Retrospective Survey of Fertility and Mortality

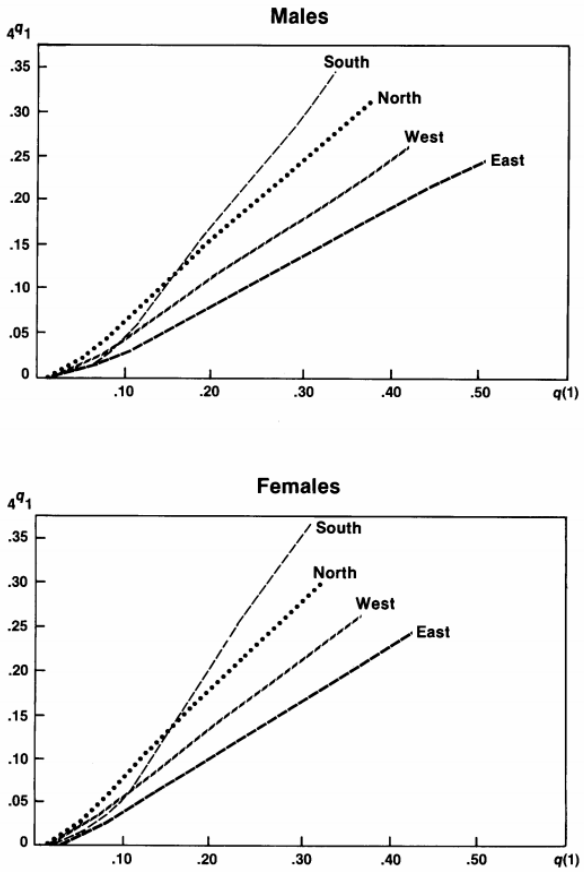
Figure 7. Under-five mortality, $q(5)$, for both sexes in Bangladesh, estimated using model South and the Trussell version of the Brass method



Source: *Step by step guide to the estimation of child mortality*, 1990, United Nations

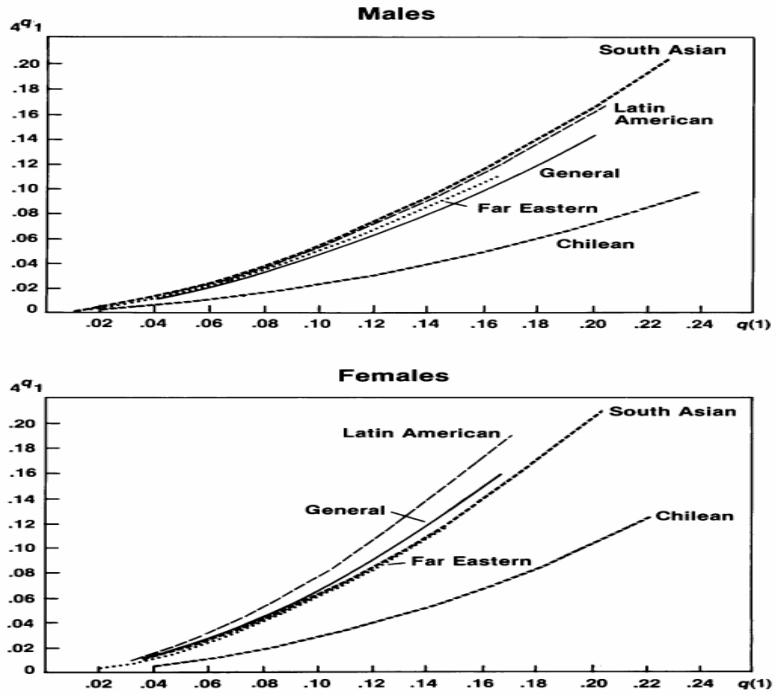
How to identify the right model life table (1)

Figure 3. Relationship between infant mortality, $q(1)$, and child mortality, ${}_4q_1$, in the Coale-Demeny mortality models



Most of the model life tables represent a different relationship between mortality risk during the first year of life and between ages 1 - 4

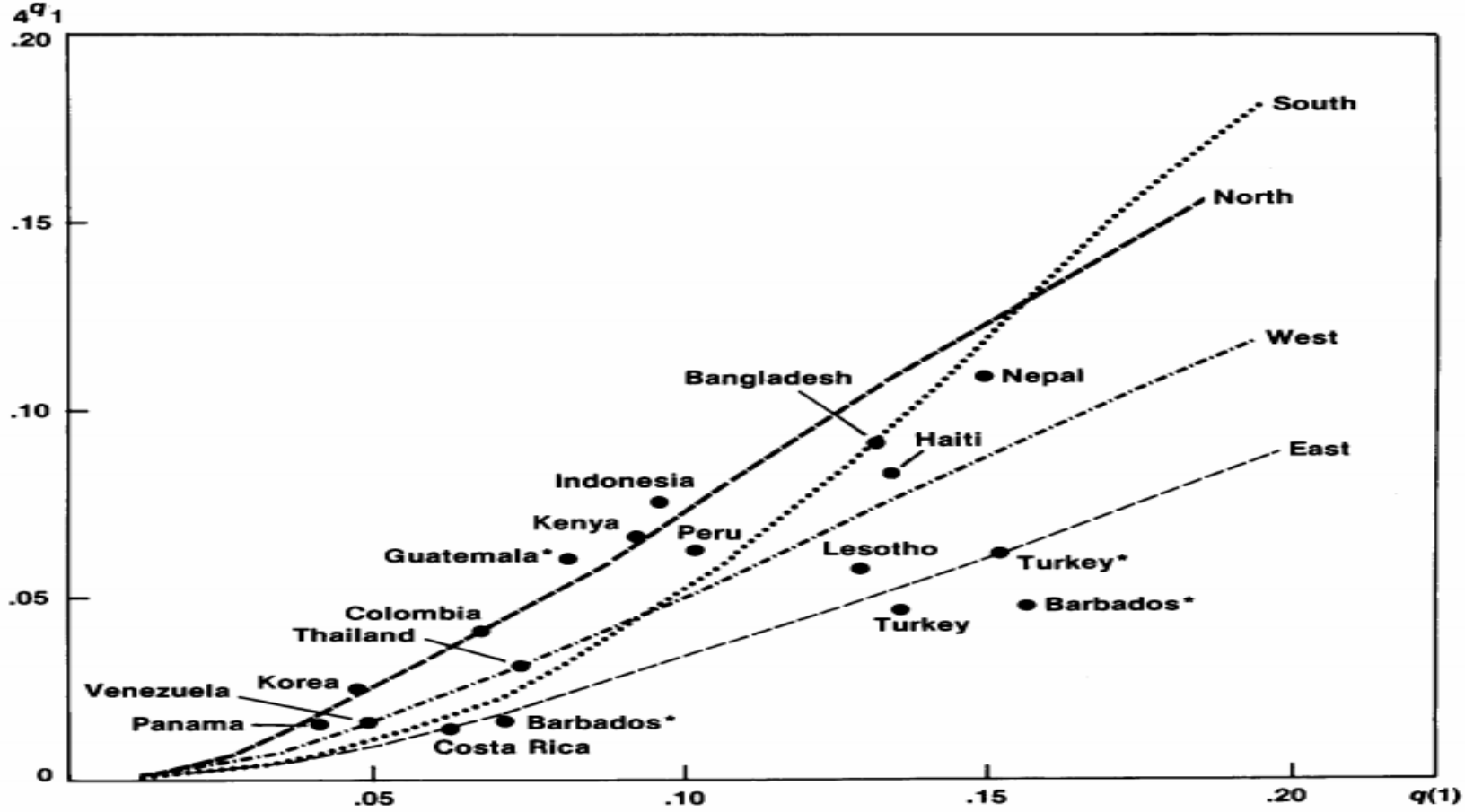
Figure 4. Relationship between infant mortality, $q(1)$, and child mortality, ${}_4q_1$, in the United Nations mortality models



Source: *Step by step guide to the estimation of child mortality*, 1990, United Nations

How to identify the right model life table (2)

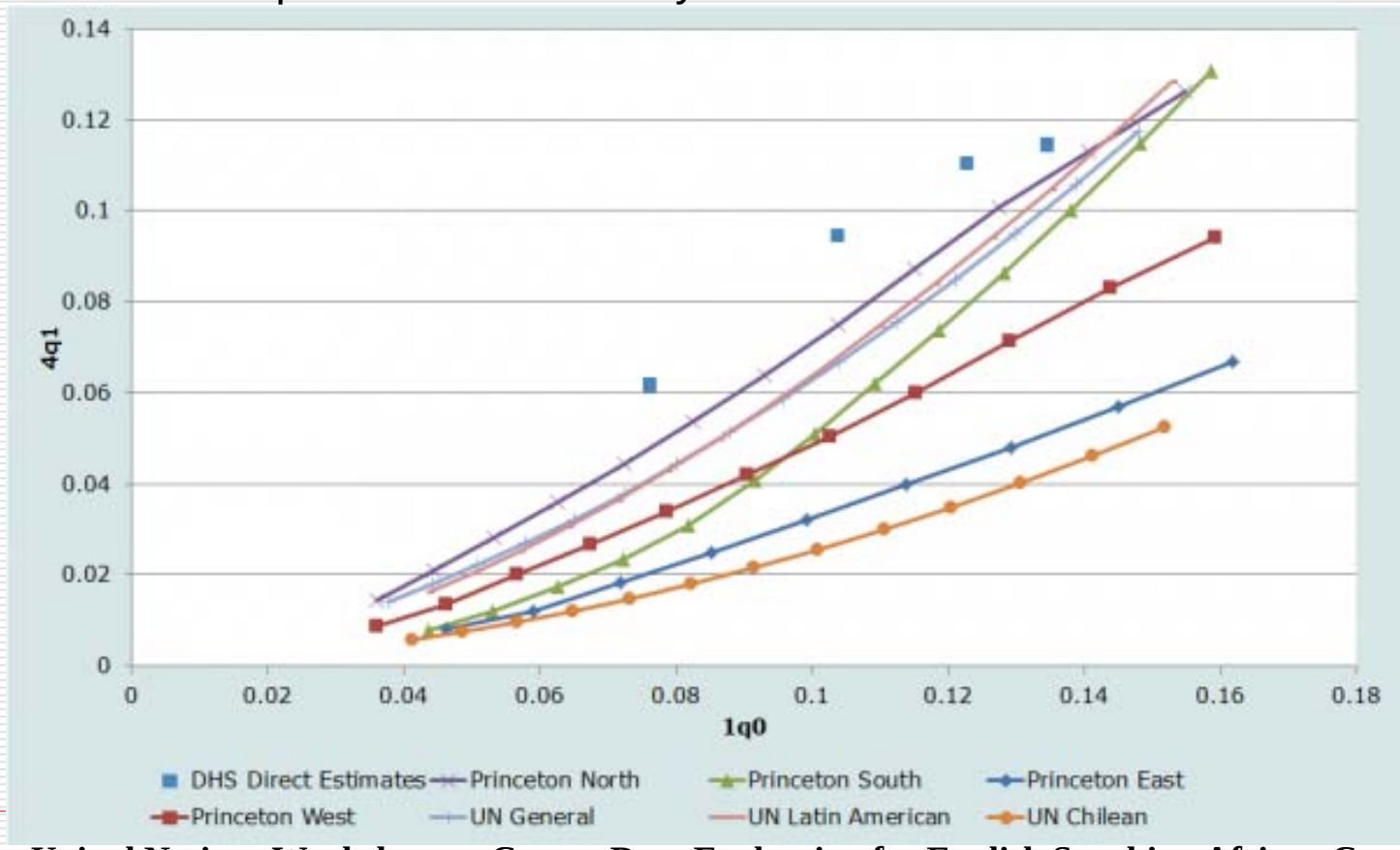
Figure 5. Comparison of country-specific estimates of infant and child mortality with the Coale-Demeny mortality models



Source: *Step by step guide to the estimation of child mortality*, 1990, United Nations

How to identify the right model life table (3)

Example: Direct estimates of 4q1 and 1q0 from Malawi DHS, and the relationships to Coale-Demeny and UN model life tables

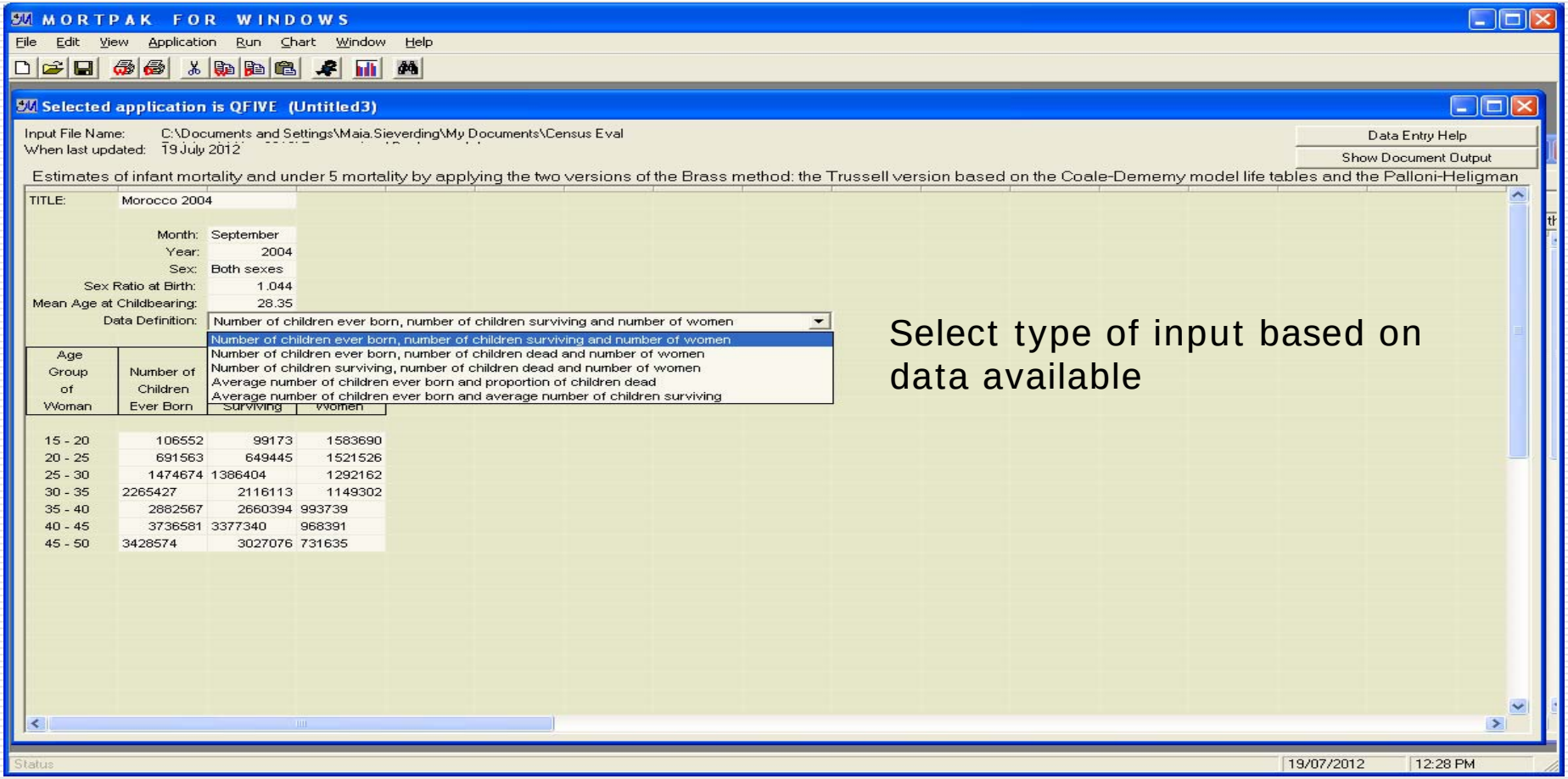


Source: *IUSSP Tools for Demographic Estimation* http://demographicestimation.iussp.org/

Brass type estimates - MortPak QFIVE (1)

- Calculate the sex ratio at birth
  - If not available, can use standard 1.05
- Calculate the mean age of childbearing (only for UN model life tables)
  - M=(17.5*B(15-20) + 22.5*B(20-25) + . . . + 47.5*B(45-50))
    / (B(15-20)+B(20-25)+ . . . + B(45-50))
  - Where B(X-X+N) = Births in past year to women age X to X+N
    - Multiply by mid-point of respective age group and divide by sum of births to all women

Brass type estimates – QFIVE (2)



Select type of input based on data available

Brass type estimates – QFIVE (3) output using Coale-Demeny life tables

MORTPAK FOR WINDOWS

File Edit View Application Run Chart Window Help

Selected application is QFIVE (Untitled3)

Input File Name: C:\Documents and Settings\Maia.Sieverding\My Documents\Census Eval
When last updated: 19 July 2012

Data Entry Help
Show Data Entry/Worksheet Output

Estimates of infant mortality and under 5 mortality by applying the two versions of the Brass method: the Trussell version based on the Coale-Demeny model life tables and the Palloni-Heligman

1

INDIRECT ESTIMATION OF EARLY AGE MORTALITY FOR Morocco 2004
BOTH SEXES
ENUMERATION DATE: SEP 2004

AGE OF WOMAN	AVERAGE NO. CHILDREN BORN	SURVIVING	PROPORTION DEAD	AGE x	COALE-DEMENY MODELS (TRUSSELL EQUATIONS) WEST q(x)	t(x)	NORTH q(x)	t(x)	EAST q(x)	t(x)	SOUTH q(x)	t(x)
15-20	0.067	0.063	.069	1	0.072	(1.1)	0.070	(1.1)	0.074	(1.1)	0.068	(1.1)
20-25	0.455	0.427	.061	2	0.065	(2.2)	0.063	(2.2)	0.065	(2.3)	0.065	(2.2)
25-30	1.141	1.073	.060	3	0.062	(3.9)	0.059	(3.7)	0.062	(3.9)	0.063	(3.8)
30-35	1.971	1.841	.066	5	0.068	(5.8)	0.068	(5.6)	0.068	(5.9)	0.069	(5.7)
35-40	2.901	2.677	.077	10	0.081	(8.0)	0.084	(7.6)	0.081	(8.1)	0.082	(7.9)
40-45	3.859	3.488	.096	15	0.100	(10.4)	0.103	(10.0)	0.099	(10.7)	0.100	(10.5)
45-50	4.686	4.137	.117	20	0.121	(13.4)	0.122	(12.9)	0.120	(13.9)	0.120	(13.6)

COALE-DEMENY:	WEST		NORTH		EAST		SOUTH	
AGE OF WOMAN	REFERENCE DATE	q	REFERENCE DATE	q	REFERENCE DATE	q	REFERENCE DATE	q
INFANT MORTALITY RATE: q(1)								
15-20	2003.6	.072	2003.6	.070	2003.6	.074	2003.6	.068
20-25	2002.5	.057	2002.5	.052	2002.4	.060	2002.5	.058
25-30	2000.8	.051	2001.0	.045	2000.8	.054	2000.9	.054
30-35	1998.9	.052	1999.1	.046	1998.8	.057	1999.0	.056
35-40	1996.7	.056	1997.1	.049	1996.6	.063	1996.8	.063
40-45	1994.3	.063	1994.7	.055	1994.0	.072	1994.2	.071
45-50	1991.3	.069	1991.9	.059	1990.8	.080	1991.1	.079
PROBABILITY OF DYING BETWEEN AGES 1 AND 5: $_4q_1$								
15-20	2003.6	.030	2003.6	.043	2003.6	.020	2003.6	.021
20-25	2002.5	.020	2002.5	.027	2002.4	.013	2002.5	.015
25-30	2000.8	.017	2001.0	.022	2000.8	.011	2000.9	.013
30-35	1998.9	.017	1999.1	.022	1998.8	.012	1999.0	.014
35-40	1996.7	.020	1997.1	.025	1996.6	.014	1996.8	.017
40-45	1994.3	.024	1994.7	.030	1994.0	.019	1994.2	.023
45-50	1991.3	.028	1991.9	.033	1990.8	.023	1991.1	.029
PROBABILITY OF DYING BY AGE 5: q(5)								
15-20	2003.6	.101	2003.6	.110	2003.6	.092	2003.6	.088

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Brass types estimates - QFIVE: (4) output using UN model life tables

United Nations Statistics Division

MORTPAK FOR WINDOWS

File Edit View Application Run Chart Window Help

Selected application is QFIVE (Untitled3)

Input File Name: C:\Documents and Settings\Maia.Sieverding\My Documents\Census Eval
When last updated: 19 July 2012

Data Entry Help
Show Data Entry/Worksheet Output

Estimates of infant mortality and under 5 mortality by applying the two versions of the Brass method: the Trussell version based on the Coale-Demeny model life tables and the Palloni-Heligman

1

INDIRECT ESTIMATION OF EARLY AGE MORTALITY FOR Morocco 2004
BOTH SEXES
ENUMERATION DATE: SEP 2004

AGE OF WOMAN	AVERAGE NO. CHILDREN BORN	SURVIVING	PROPORTION DEAD	AGE x	UNITED NATIONS MODELS (PALLONI-HELIGMAN EQUATIONS) LATIN AM q(x)	t(x)	CHILEAN q(x)	t(x)	SO ASIAN q(x)	t(x)	FAR EAST q(x)	t(x)	GENERAL q(x)	t(x)
15-20	0.067	0.063	.069	1	0.069	(1.1)	0.076	(1.3)	0.069	(1.1)	0.070	(1.2)	0.069	(1.1)
20-25	0.455	0.427	.061	2	0.065	(2.2)	0.067	(2.4)	0.066	(2.3)	0.064	(2.3)	0.065	(2.3)
25-30	1.141	1.073	.060	3	0.062	(3.6)	0.063	(3.8)	0.063	(3.7)	0.061	(3.7)	0.062	(3.7)
30-35	1.971	1.841	.066	5	0.069	(5.4)	0.068	(5.7)	0.069	(5.5)	0.067	(5.5)	0.068	(5.4)
35-40	2.901	2.677	.077	10	0.081	(7.5)	0.079	(7.8)	0.081	(7.6)	0.080	(7.6)	0.081	(7.5)
40-45	3.859	3.488	.096	15	0.098	(10.1)	0.098	(10.4)	0.099	(10.2)	0.098	(10.1)	0.098	(10.1)
45-50	4.686	4.137	.117	20	0.119	(13.4)	0.119	(13.8)	0.119	(13.8)	0.120	(13.2)	0.120	(13.4)

MEAN AGE AT MATERNITY = 28.35

UNITED NATIONS: AGE OF WOMAN	LATIN AM REFERENCE DATE	q	CHILEAN REFERENCE DATE	q	SO ASIAN REFERENCE DATE	q	FAR EAST REFERENCE DATE	q	GENERAL REFERENCE DATE	q
INFANT MORTALITY RATE: q(1)										
15-20	2003.6	.069	2003.4	.076	2003.6	.069	2003.5	.070	2003.6	.069
20-25	2002.5	.055	2002.3	.062	2002.4	.056	2002.4	.056	2002.4	.056
25-30	2001.1	.049	2000.9	.056	2001.0	.050	2001.0	.050	2001.0	.050
30-35	1999.3	.050	1999.0	.059	1999.2	.051	1999.2	.051	1999.3	.051
35-40	1997.2	.054	1996.9	.065	1997.1	.056	1997.1	.055	1997.2	.056
40-45	1994.7	.061	1994.3	.076	1994.5	.065	1994.6	.062	1994.6	.063
45-50	1991.3	.068	1990.9	.086	1991.0	.074	1991.5	.067	1991.3	.070
PROBABILITY OF DYING BETWEEN AGES 1 AND 5: $_4q_1$										
15-20	2003.6	.034	2003.4	.016	2003.6	.031	2003.5	.029	2003.6	.030
20-25	2002.5	.023	2002.3	.011	2002.4	.021	2002.4	.020	2002.4	.020
25-30	2001.1	.019	2000.9	.009	2001.0	.018	2001.0	.017	2001.0	.017
30-35	1999.3	.020	1999.0	.010	1999.2	.019	1999.2	.017	1999.3	.018
35-40	1997.2	.023	1996.9	.012	1997.1	.022	1997.1	.020	1997.2	.020
40-45	1994.7	.028	1994.3	.015	1994.5	.028	1994.6	.024	1994.6	.025
45-50	1991.3	.034	1990.9	.019	1991.0	.034	1991.5	.027	1991.3	.030
PROBABILITY OF DYING BY AGE 5: q(5)										

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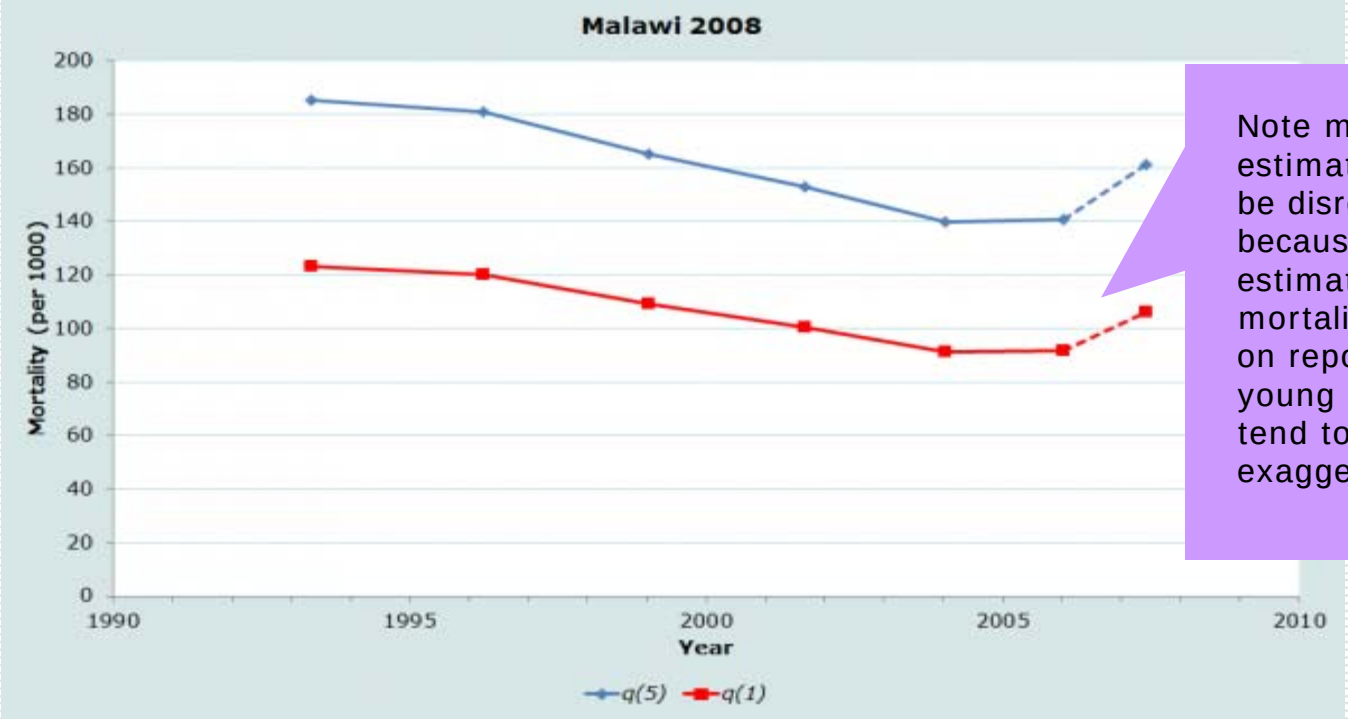
Figure 2: Estimated under five and under one mortality over time, Malawi 2008 census



Source: *IUSSP Tools for Demographic Estimation*
http://demographicestimation.iussp.org/

Brass: q(5) more robust to model life table choice than q(1)

Figure 12. Infant and under-five mortality for both sexes in Bangladesh, estimated using the four Coale-Demeny mortality models

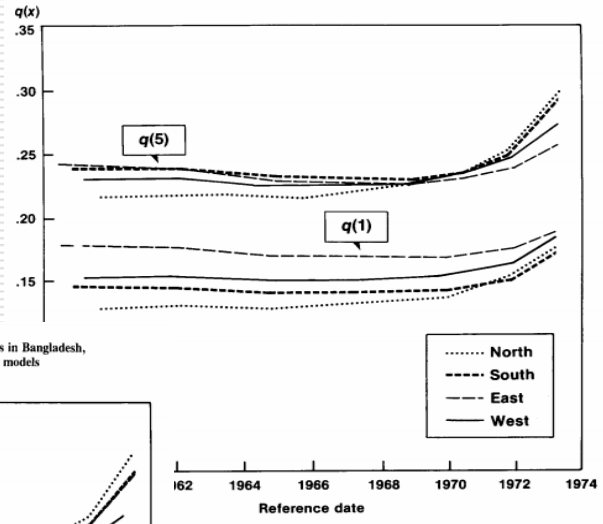
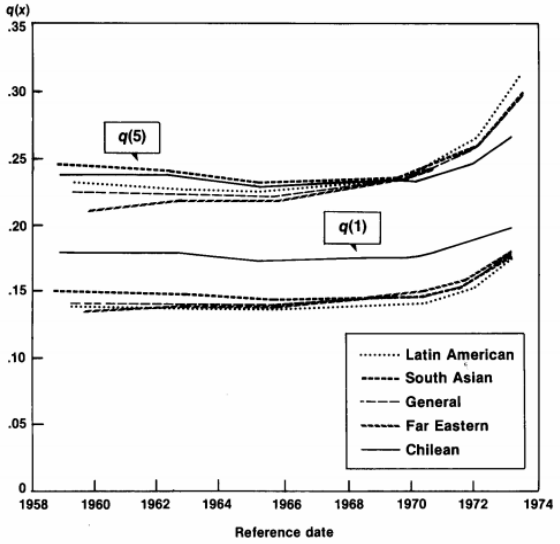
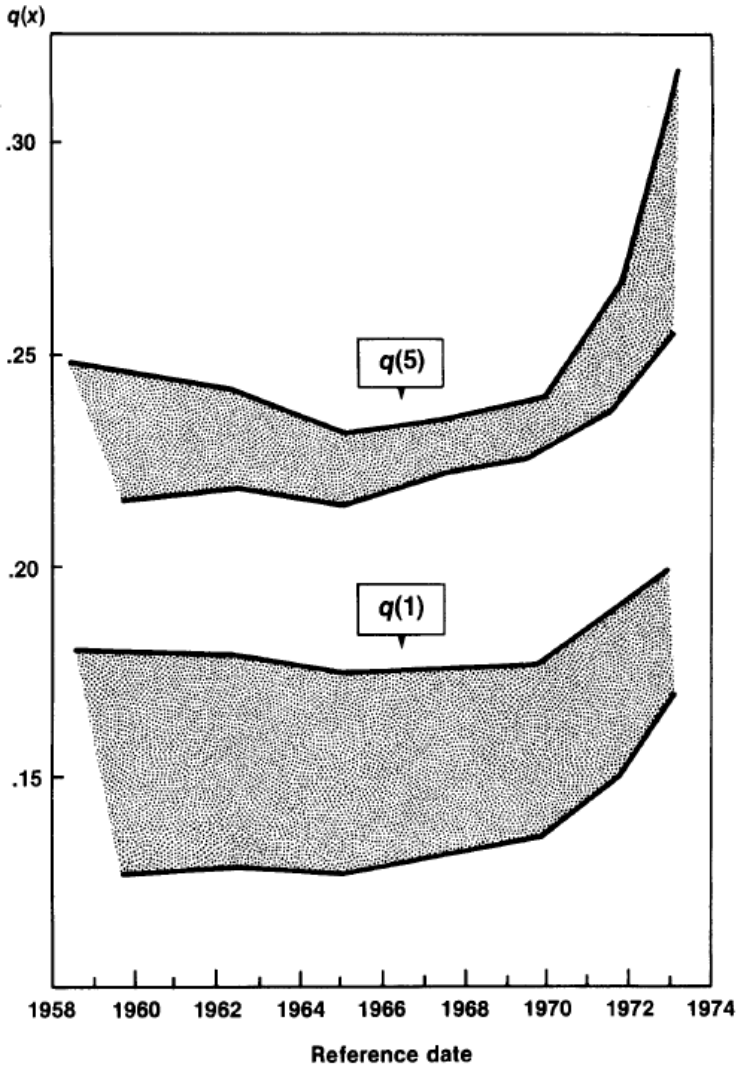


Figure 13. Infant and under-five mortality for both sexes in Bangladesh, estimated using the five United Nations mortality models



Source: Table 17.

Figure 14. Range of variation of the possible estimates of infant and under-five mortality for both sexes in Bangladesh



Source: Tables 16 and 17.

on Census Data Evaluation
Kampala, Ugand
12 – 16 November 2012

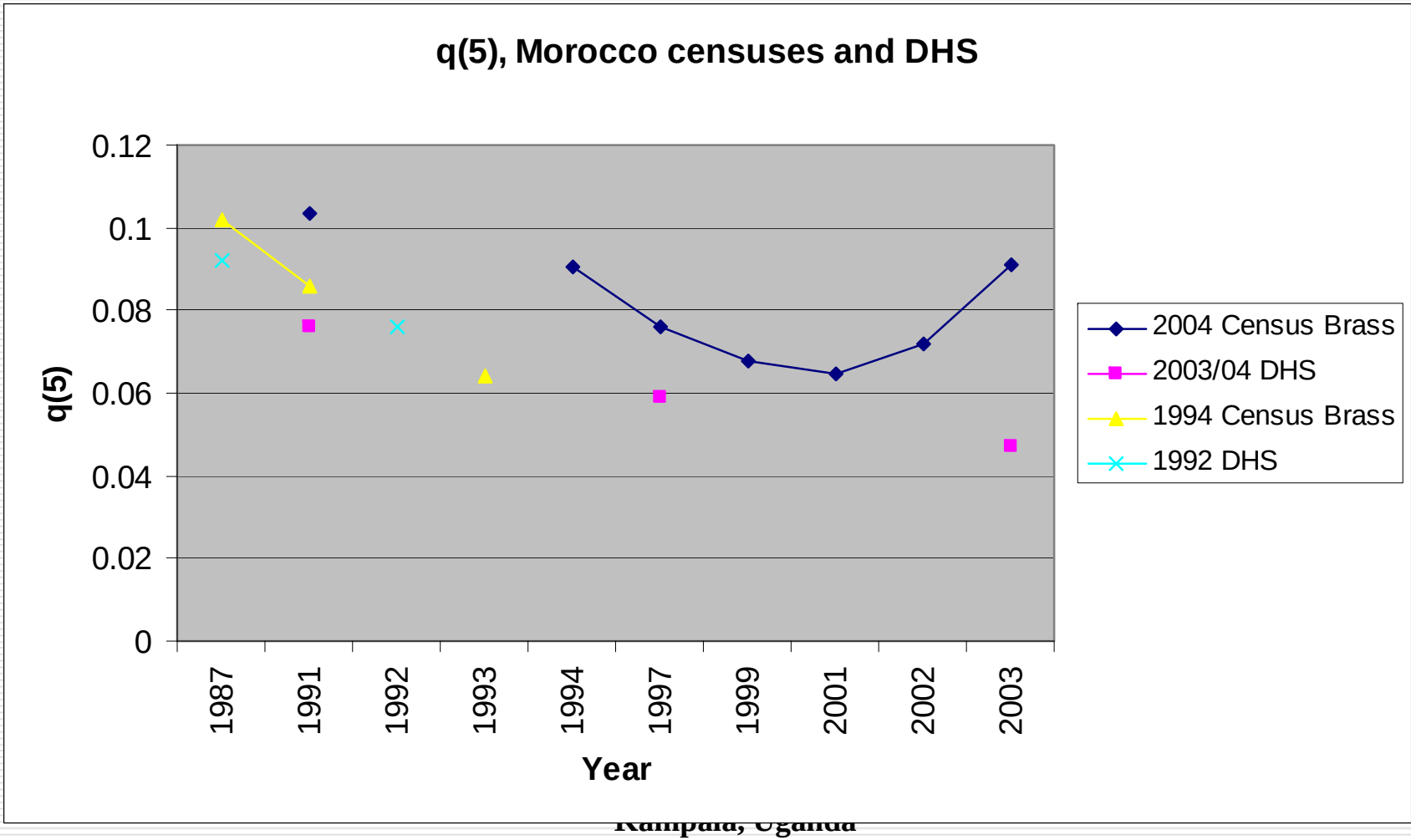
Source: *Step by step guide to the estimation of child mortality*, 1990, United Nations

Brass: take-home messages

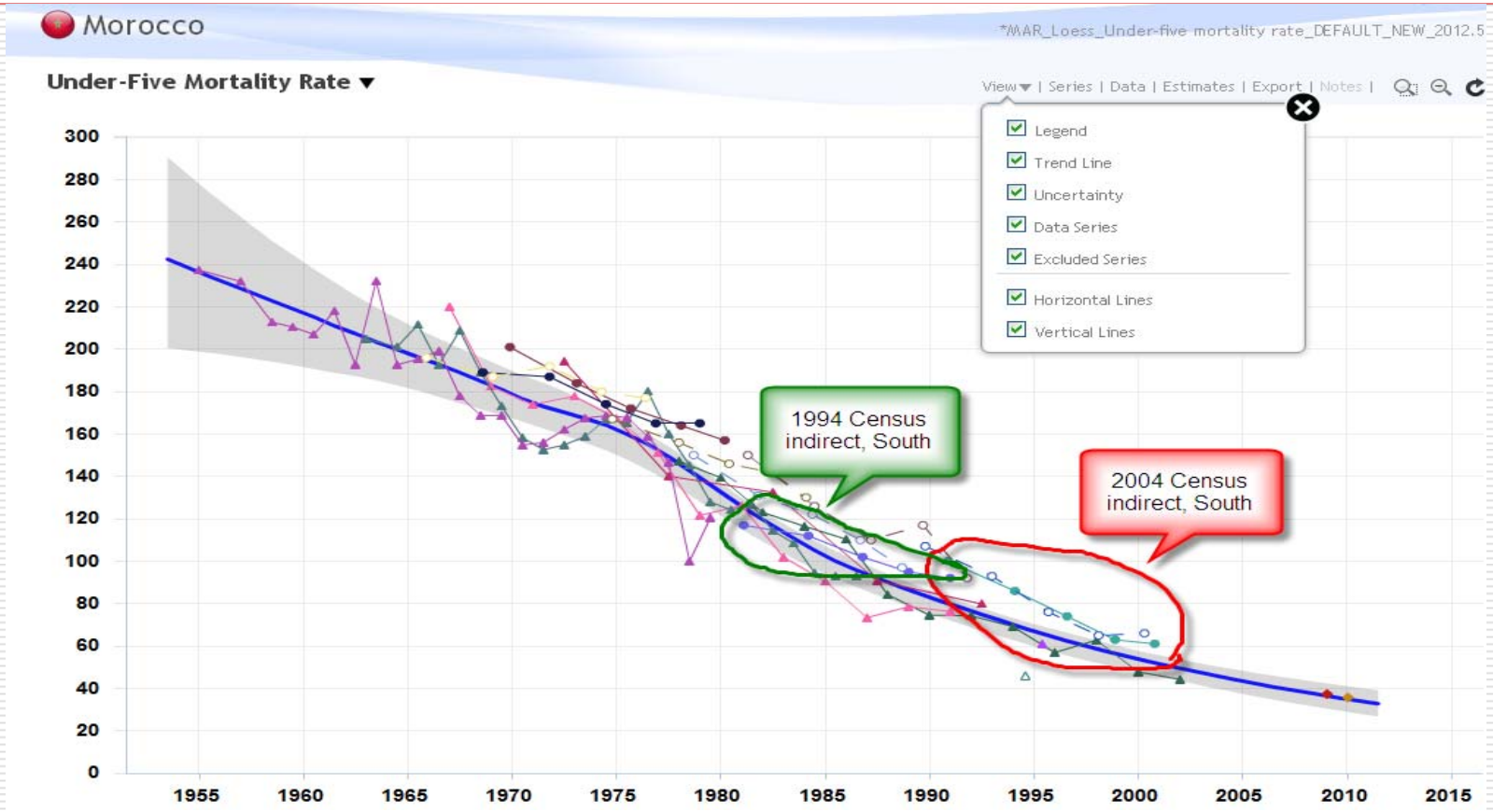
1. Date the estimates!
2. Do not use estimates from 15-19 age group
   - First birth associated with higher mortality level
   - Selection by socioeconomic status
   - Can't represent the population
3. Select the appropriate model life table
4. q(5) more robust than q(1)
5. Consider the assumptions:
   - Fertility decline: over-estimate mortality level
   - Selection bias
     - Mother died and can't report child mortality
     - Mortality level differs between alive and dead mother? If yes, there is a selection bias
     - Typically small unless there is a high HIV prevalence

Source: *IUSSP Tools for Demographic Estimation*, http://demographicestimation.iussp.org/

Quality of estimates: Checking multiple sources



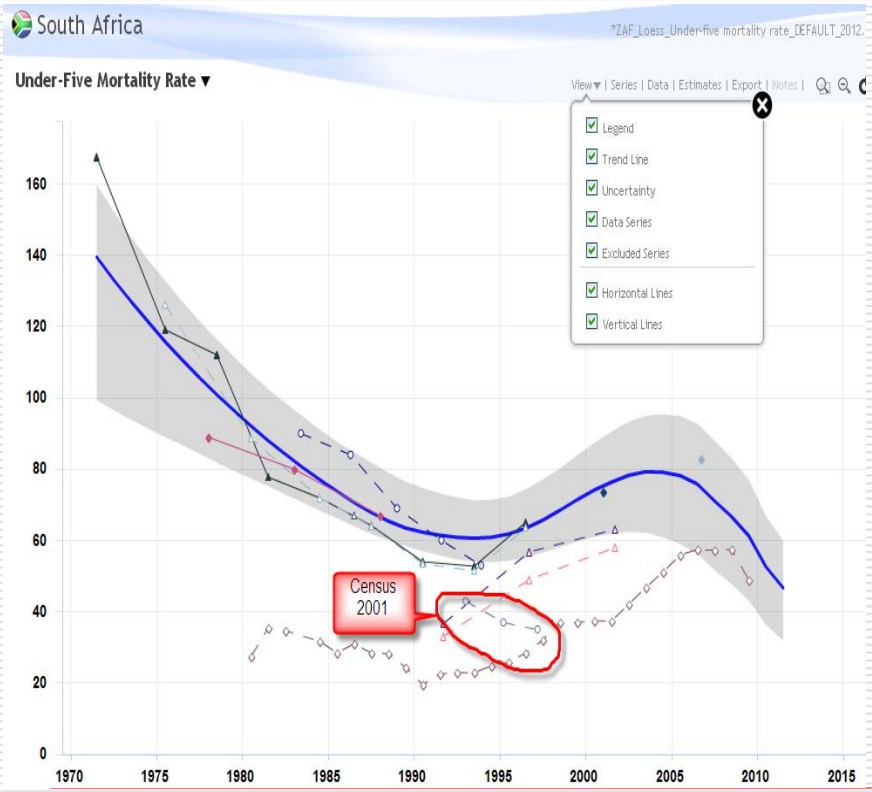
Morocco, under 5 mortality rate from other sources (UNICEF)

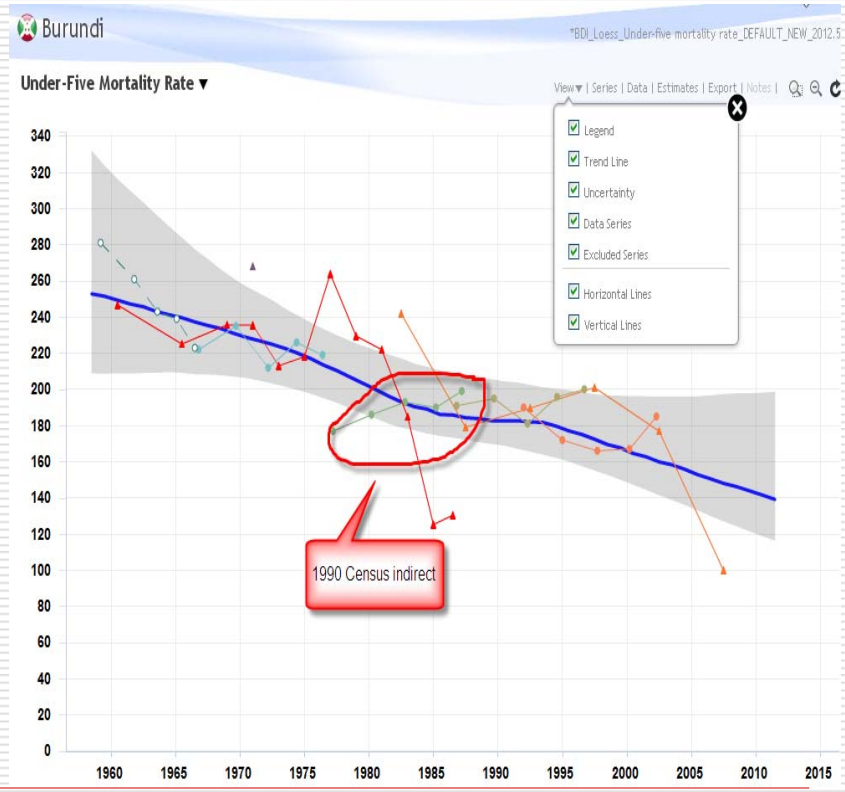


Source: www.childmortality.org

Quality assessment: Comparison with existing external sources

- UN Population Division (World Population Prospects)
- UNICEF child mortality website (www.childmortality.org)





A rapid assessment of CEB/CS data: Ethiopia, 2007 census (1)

Age group	Total women	CEB	CS	CS/CEB
15 - 19	4293380	922350	864962	0.938
20 - 24	3303702	4446644	4141375	0.931
25 - 29	3039655	8577951	7819158	0.912
30 - 34	2131905	8728591	7747622	0.888
35 - 39	1949929	9709603	8391978	0.864
40 - 44	1409245	7775789	6474546	0.833
45 - 49	1097840	6329979	5147848	0.813

Source: Table produced based on data from the United Nations *Demographic Yearbook*

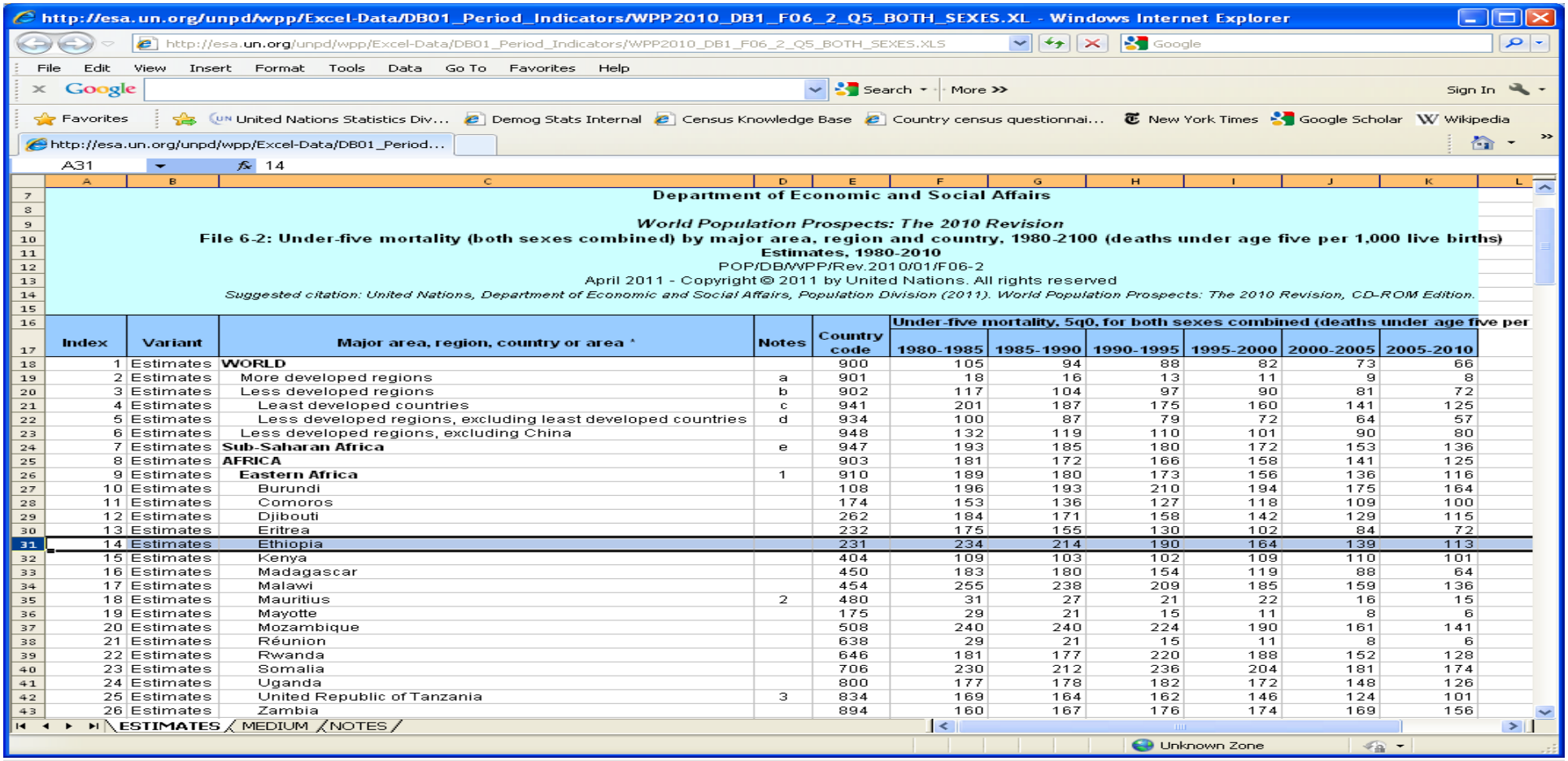
A rapid assessment of CEB/CS data: Ethiopia 2007 census (2)

- Proportion deceased for the 30-34 age group = (1-0.888)=0.112
  - Proportion of children deceased born to mothers of 30-34 years of age approximates q(5), the proportion of children born who die before their 5th birthday, about 7 years before data collection
- Compare with other estimates, e.g., UN Population Division estimates of under-5 mortality
  - 2007 census estimates of under-5 child mortality = *112* per 1000 for 2000
  - UN Pop Division estimates for the period 2000-2005: *139* per 1000
  - Fairly significant underestimate in census data

Method: *Rapid Assessment of Census Data on Children Born and Surviving*, Griffith Feeney, 2009.
http://www.demographer.com/rapid-assessment-of-ceb-and-cs-data/

A rapid assessment of CEB/CS data: Ethiopia 2007 census (3)

United Nations Statistics Division



http://esa.un.org/unpd/wpp/Excel-Data/DB01_Period_Indicators/WPP2010_DB1_F06_2_Q5_BOTH_SEXES.XL - Windows Internet Explorer

Department of Economic and Social Affairs

World Population Prospects: The 2010 Revision

File 6-2: Under-five mortality (both sexes combined) by major area, region and country, 1980-2100 (deaths under age five per 1,000 live births)

Estimates, 1980-2010

POP/DB/WPP/Rev.2010/01/F06-2

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Suggested citation: United Nations, Department of Economic and Social Affairs, Population Division (2011). World Population Prospects: The 2010 Revision, CD-ROM Edition.

Index	Variant	Major area, region, country or area *	Notes	Country code	Under-five mortality, 5q0, for both sexes combined (deaths under age five per					
					1980-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010
1	Estimates	**WORLD**		900	105	94	88	82	73	66
2	Estimates	More developed regions	a	901	18	16	13	11	9	8
3	Estimates	Less developed regions	b	902	117	104	97	90	81	72
4	Estimates	Least developed countries	c	941	201	187	175	160	141	125
5	Estimates	Less developed regions, excluding least developed countries	d	934	100	87	79	72	64	57
6	Estimates	Less developed regions, excluding China		948	132	119	110	101	90	80
7	Estimates	**Sub-Saharan Africa**	e	947	193	185	180	172	153	136
8	Estimates	**AFRICA**		903	181	172	166	158	141	125
9	Estimates	**Eastern Africa**	1	910	189	180	173	156	136	116
10	Estimates	Burundi		108	196	193	210	194	175	164
11	Estimates	Comoros		174	153	136	127	118	109	100
12	Estimates	Djibouti		262	184	171	158	142	129	115
13	Estimates	Eritrea		232	175	155	130	102	84	72
14	Estimates	Ethiopia		231	234	214	190	164	139	113
15	Estimates	Kenya		404	109	103	102	109	110	101
16	Estimates	Madagascar		450	183	180	154	119	88	64
17	Estimates	Malawi		454	255	238	209	185	159	136
18	Estimates	Mauritius	2	480	31	27	21	22	16	15
19	Estimates	Mayotte		175	29	21	15	11	8	6
20	Estimates	Mozambique		508	240	240	224	190	161	141
21	Estimates	Réunion		638	29	21	15	11	8	6
22	Estimates	Rwanda		646	181	177	220	188	152	128
23	Estimates	Somalia		706	230	212	236	204	181	174
24	Estimates	Uganda		800	177	178	182	172	148	126
25	Estimates	United Republic of Tanzania	3	834	169	164	162	146	124	101
26	Estimates	Zambia		894	160	167	176	174	169	156

United Nations Workshop on Census Data Evaluation for English Speaking African Countries
Kampala, Uganda
12 – 16 November 2012

Source: World Population Prospects: The 2010 Revision

References

- IUSSP Tools for Demographic Estimation (in progress) http://demographicestimation.iussp.org/
- Step-by-step Guide to the Estimation of Child Mortality, 1990, United Nations http://www.un.org/esa/population/techcoop/DemEst/stepguide_childmort/stepguide_childmort.html
- Model Life Tables for Developing Countries, 1982, United Nations http://www.un.org/esa/population/publications/Model_Life_Tables/Model_Life_Tables.htm
- Updated UN model life tables: http://esa.un.org/unpd/wpp/Model-Life-Tables/download-page.html
- Manual X: Indirect Techniques for Demographic Estimation, 1983, United Nations http://www.un.org/esa/population/publications/Manual_X/Manual_X.htm