Regional model life tables
Regional model stable populations

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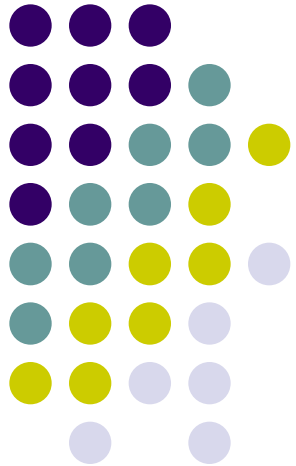
Demography of developing countries ECON 3710

March 2015



Required reading

Rowland, D. (2003). "Stable and Stationary Models". Chapter 9 in

Demographic Methods and Concepts. Oxford University Press, Oxford, pp. 300-306, 312-339 (skip 307-311)

Regional model life tables

Coale & Demeny 1960s

UN 1950s

Empirical regularity in life tables

192 life tables of good quality

Four groups (standard = average of the 192 tables)

1. East (31) 1878-1958

Relatively high mortality for infants and for ages > 50

2. North (9) 1851-1955

Low infant mortality, mortality over 50 increasingly below standard

3. South (22) 1876-1957

High mortality under 5, low ages 40-60, high ages > 65

4. West (130) residual

No systematic deviation from standard

Rowland Table 9.4

A series of regressions for each regional group

e_{10} independent variable,

dependent variables q_0 , ${}_4q_1$, ${}_5q_5$, ${}_5q_{10}$, …, ${}_5q_{80}$

Use e_{10} to predict a complete life table, incl. e_0 .

Select 24 life tables (women) with e_0 = 20(2.5)77.5 y (later 85 y)

e_0 = 20 is level 1; e_0 = 77.5 is level 24 (e_0 = 85 is level 27)

Repeat for each of the four regional groups («family»)

Which family to select in empirical analyses?

Use extra information (e.g. breast feeding → North)

No information: → West

Important: Each life table represents a stationary population

Example of a Regional Model Life Table
West, level 9

24 levels
$e_0 = 20 (2.5) 77.5$ women
↑ lev 1 ↑ lev 24

TABLE I.1. "WEST" MODEL LIFE TABLES ARRANGED BY LEVEL OF MORTALITY (*continued*)

LEVEL 9 $e_0 = 40$ (women)

Age x	l_x	$_nm_x$	$_nq_x$	$_nL_x$	$\frac{_5L_{x+5}}{_5L_x}$	T_x	^0e_x
			Females				
0	100,000	.2010	.1777	88,447	.7835[a]	4,000,000	40.00
1	82,226	.0320	.1179	303,316	.9100[b]	3,911,553	47.57
5	72,530	.0069	.0338	356,520	.9698	3,608,237	49.75
10	70,078	.0054	.0264	345,762	.9694	3,251,718	46.40
15	68,227	.0071	.0350	335,172	.9606	2,905,956	42.59
20	65,842	.0090	.0440	321,964	.9533	2,570,784	39.05
25	62,944	.0102	.0495	306,933	.9474	2,248,820	35.73
30	59,829	.0115	.0559	290,781	.9412	1,941,886	32.46
35	56,483	.0128	.0618	273,690	.9355	1,651,105	29.23
40	52,993	.0139	.0673	256,043	.9291	1,377,415	25.99
45	49,424	.0155	.0747	237,894	.9144	1,121,372	22.69
50	45,733	.0205	.0975	217,525	.8891	883,478	19.32
55	41,277	.0268	.1257	193,410	.8481	665,953	16.13
60	36,087	.0400	.1818	164,037	.7895	472,543	13.09
65	29,527	.0560	.2457	129,500	.7100	308,507	10.45
70	22,272	.0845	.3488	91,943	.6006	179,007	8.04
75	14,505	.1253	.4772	55,221	.3657[c]	87,064	6.00
80	7,584	.2382	—	31,843	—	31,843	4.20
			Males	$e_0 = 37.3$			
0	100,000	.2408	.2074	86,106	.7567[a]	3,730,053	37.30
1	79,263	.0321	.1183	292,227	.9088[b]	3,643,947	45.97
5	69,888	.0065	.0322	343,818	.9722	3,351,720	47.96
10	67,639	.0047	.0233	334,258	.9722	3,007,902	44.47
15	66,064	.0066	.0324	324,977	.9610	2,673,644	40.47
20	63,926	.0094	.0459	312,305	.9517	2,348,667	36.74
25	60,995	.0104	.0508	297,226	.9454	2,036,363	33.39
30	57,895	.0121	.0585	281,009	.9365	1,739,137	30.04
35	54,509	.0142	.0688	263,172	.9240	1,458,128	26.75
40	50,760	.0175	.0837	243,182	.9088	1,194,955	23.54
45	46,512	.0209	.0994	220,999	.8872	951,774	20.46
50	41,887	.0273	.1277	196,068	.8572	730,775	17.45
55	36,540	.0348	.1602	168,066	.8136	534,706	14.63
60	30,686	.0489	.2177	136,730	.7510	366,640	11.95
65	24,006	.0676	.2891	102,678	.6693	229,910	9.58
70	17,066	.0967	.3893	68,718	.5598	127,231	7.46
75	10,421	.1418	.5234	38,471	.3425[c]	58,514	5.62
80	4,967	.2478	—	20,043	—	20,043	4.04

[a] Proportion surviving from birth to 0–4.
[b] $_5L_5/_5L_0$.
[c] T_{80}/T_{75}.

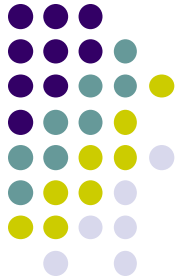
$\frac{88447}{4 \text{ mln}} = 0{,}022$ = share age 0

$\frac{303316}{4 \text{ mln}} = 0{,}076$ = share aged 1–4

$\frac{164000}{4 \text{ mln}} = 0{,}041$

Stationary →
CDR = $\frac{1}{40} = 0{,}025$
= CBR

Fra: UN Manual IV: Methods of Estimating Basic Demographic Measures from Incomplete Data 1967



See also Rowland Table 9.5: West level 25

Each life table represents a stationary population: i.e. a stable population with r = 0.

Next: simulate stable populations for different values of r

Example of a Regional Model Stable Population based on West, level 9 (women)

Regional Model Stable Population

TABLE II. "WEST" MODEL STABLE POPULATIONS ARRANGED BY LEVEL OF MORTALITY (*continued*)

LEVEL 9
Females ($^0e_0$ = 40.00 years)

	Annual rate of increase												
	−.010	−.005	.000	.005	.010	.015	.020	.025	.030	.035	.040	.045	.050
Age interval				*Proportion in age interval*									
Under 1	.0158	.0188	.0221	.0257	.0295	.0336	.0379	.0424	.0471	.0518	.0567	.0617	.0667
1-4	.0557	.0653	.0758	.0870	.0988	.1111	.1238	.1367	.1498	.1629	.1760	.1890	.2018
5-9	.0684	.0786	.0891	.1000	.1111	.1221	.1330	.1436	.1538	.1636	.1728	.1814	.1894
10-14	.0698	.0781	.0864	.0946	.1024	.1098	.1167	.1229	.1284	.1332	.1372	.1405	.1431
15-19	.0711	.0776	.0838	.0894	.0945	.0988	.1024	.1051	.1071	.1084	.1089	.1087	.1080
20-24	.0718	.0765	.0805	.0838	.0863	.0880	.0890	.0891	.0886	.0874	.0856	.0834	.0808
25-29	.0720	.0747	.0767	.0779	.0783	.0779	.0767	.0750	.0727	.0699	.0668	.0635	.0600
30-34	.0717	.0726	.0727	.0720	.0705	.0684	.0658	.0627	.0593	.0556	.0518	.0480	.0443
35-39	.0709	.0701	.0684	.0661	.0632	.0598	.0560	.0521	.0480	.0439	.0400	.0361	.0324
40-44	.0698	.0672	.0640	.0603	.0562	.0519	.0474	.0430	.0387	.0345	.0306	.0270	.0236
45-49	.0681	.0640	.0595	.0546	.0497	.0447	.0399	.0352	.0309	.0269	.0233	.0200	.0171
50-54	.0655	.0600	.0544	.0487	.0432	.0379	.0330	.0284	.0243	.0207	.0174	.0146	.0122
55-59	.0612	.0547	.0484	.0423	.0365	.0313	.0265	.0223	.0186	.0154	.0127	.0104	.0084
60-64	.0546	.0476	.0410	.0350	.0295	.0246	.0204	.0167	.0136	.0110	.0088	.0070	.0056
65-69	.0453	.0385	.0324	.0269	.0221	.0180	.0145	.0116	.0092	.0073	.0057	.0044	.0034
70-74	.0338	.0280	.0230	.0186	.0150	.0119	.0093	.0073	.0056	.0043	.0033	.0025	.0019
75-79	.0213	.0173	.0138	.0109	.0085	.0066	.0051	.0039	.0029	.0022	.0016	.0012	.0009
80+	.0131	.0103	.0080	.0061	.0046	.0035	.0026	.0019	.0014	.0010	.0007	.0005	.0004
Age				*Proportion under given age*									
1	.0158	.0188	.0221	.0257	.0295	.0336	.0379	.0424	.0471	.0518	.0567	.0617	.0667
5	.0715	.0842	.0979	.1127	.1284	.1484	.1617	.1791	.1968	.2147	.2327	.2506	.2685
10	.1400	.1627	.1871	.2127	.2394	.2668	.2947	.3227	.3507	.3783	.4055	.4321	.4579
15	.2097	.2408	.2735	.3073	.3419	.3767	.4114	.4456	.4791	.5115	.5427	.5725	.6010
20	.2809	.3185	.3573	.3968	.4363	.4755	.5137	.5507	.5862	.6198	.6516	.6813	.7090
25	.3527	.3949	.4378	.4806	.5227	.5635	.6027	.6399	.6747	.7072	.7372	.7647	.7898
30	.4247	.4697	.5145	.5585	.6009	.6414	.6794	.7148	.7474	.7771	.8040	.8282	.8498
35	.4963	.5423	.5872	.6305	.6715	.7098	.7452	.7775	.8067	.8328	.8559	.8762	.8940
40	.5673	.6124	.6556	.6966	.7346	.7696	.8012	.8296	.8547	.8767	.8958	.9123	.9265
45	.6370	.6796	.7197	.7568	.7908	.8214	.8487	.8726	.8933	.9112	.9264	.9393	.9501
50	.7052	.7436	.7791	.8115	.8405	.8662	.8885	.9078	.9243	.9381	.9497	.9593	.9672
55	.7707	.8036	.8335	.8602	.8837	.9041	.9215	.9363	.9486	.9588	.9671	.9739	.9794
60	.8319	.8583	.8819	.9025	.9202	.9354	.9481	.9586	.9672	.9742	.9798	.9843	.9878
65	.8865	.9059	.9229	.9374	.9497	.9600	.9684	.9753	.9808	.9852	.9886	.9913	.9934
				Parameter of stable populations									
Birth rate	.0175	.0212	.0250	.0291	.0336	.0383	.0433	.0486	.0540	.0597	.0654	.0713	.0773
Death rate	.0278	.0262	.0250	.0241	.0236	.0233	.0233	.0236	.0240	.0247	.0254	.0263	.0273
GRR (27)	1.24	1.42	1.63	1.86	2.12	2.41	2.75	3.12	3.55	4.02	4.56	5.17	5.85
GRR (29)	1.25	1.44	1.66	1.91	2.20	2.53	2.91	3.34	3.83	4.38	5.01	5.73	6.54
GRR (31)	1.25	1.46	1.70	1.97	2.30	2.67	3.09	3.58	4.15	4.79	5.54	6.39	7.36
GRR (33)	1.25	1.47	1.73	2.04	2.40	2.81	3.30	3.86	4.52	5.28	6.17	7.20	8.39
Average age	36.2	33.9	31.6	29.5	27.4	25.5	23.7	22.0	20.5	19.1	17.8	16.7	15.6
Births/population 15-44	.042	.048	.056	.065	.075	.086	.099	.114	.130	.149	.170	.194	.221

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From: UN Manual IV
Methods of Estimating Basic Demographic Measures from Incomplete Data 1967

27, 29, 31, 33 mean age of underlying maternity schedule (μ)

median age in pop. ~35 ~32 ~27 ~14

One page for each life table («level»)

13 stable populations on each page; cf. also Rowland Table 9.6 (West level 17) and page 3 of Handout (West level 13 men only)

Find characteristics of an actual population, assumed (nearly) stable, by comparing its age structure with that of the 13*96 = 1248 regional model stable populations

Within each family, just two parameters are sufficient

- Growth rate and mortality schedule (Coale & Demeny)
- Proportion under certain age and birth rate
- ….

Robust, provided carefully selected indicators

Example: Appendix 1 of lecture notes – Norway 1801