ANNEX V

Description of life table construction for the input life tables

Life tables for Chile were calculated for the periods 1951-1953, 1959-1961 and 1969-1971 based on population census age-sex counts of 24 April 1952, 29 November 1960 and 22 April 1970 and registered vital events by age and sex for the indicated three-year periods.

Sources of data

For the 1951-1953 and 1969-1971 life tables, population and vital statistics data were available from official Chilean publications and various issues of the United Nations *Demographic Yearbook*.[1] For the 1959-1961 life table, death rates by age and sex were available from the study of Tacla and Pujol.[2]

Evaluation of death rates at ages 5 and over

Chile's vital registration system has long been known to be of high quality and numerous studies have taken the death registration system to be complete or nearly complete.[3] We evaluated the quality of the death registration system by application of the methods of Brass and Preston. Estimates of completeness for ages 5 and over based on these techniques are presented in the following table:

	(Percentage)		
	1951-1953	*1959-1961*	*1969-1971*
Males			
Brass	94-98	89-97	103-117
Preston	91-93	91	93-97
Females			
Brass	98-103	94-96	102-106
Preston	92-94	84-89	88-90

The estimates show some inconsistencies between the two methods, the Brass method generally showing higher values than the Preston method. It generally appears that death registration is at least 90 per cent complete, relative to the census, for all three periods, but how much more than 90 per cent complete is unclear. We can probably most safely say that, relative to the census count, death registration has been between 90 and 100 per cent complete since the early 1950s. We chose to make no adjustment of the death registration data for ages 5 and over, realizing however that with this choice we may have slightly underestimated mortality in each life table.

Evaluation of death rates at ages under 5

As with deaths at the older ages, deaths of persons under age 5 have generally been assumed to be completely registered. However, birth registration data, the source of the denominator for calculation of early-age mortality rates, have often been adjusted for omission or late registration of events.[4]

We further evaluated death registration data under age 5 by comparison of the registered rates with rates estimated from the 1970 sample tabulations of children ever born and children surviving by age of mother.[5] Proportions of children still alive by age of mother calculated from these tabulations can be converted into conventional life table probabilities of death by Trussell regression equations. By using another series of equations developed by Trussell, the approximate reference dates to which these estimates refer can be calculated.

Values of $q(2)$ and $q(5)$, the probabilities of a live-born child dying before ages 2 and 5, respectively, estimated from the census tabulations were compared with those estimated from vital statistics. For $q(2)$ the comparison was made for 1968 and for $q(5)$ for 1965.

The evaluation of death registration data under age 5 was carried out under two assumptions: that death registration was equally complete between ages 1 and 2, 2 and 3, 3 and 4 and 4 and 5; and that the relation of completeness below age 1 to age-group 1-4 followed a pattern observed by Puffer and Serrano for Chile, in which completeness of death registration for age-group 0-1 is about 98 per cent of that for age-group 1-4.[6]

From the civil registration data, values of the probabilities of dying before age 1 and between ages 1 and 2 or between ages 1 and 5 (depending on whether comparisons are made on the basis of $q(2)$ or $q(5)$) were calculated by following artificial birth cohorts forward through time and reducing them by the deaths reported in those age-groups by the civil registration system.[7]

Estimates of completeness were then obtained by solving for c in the formula

$$p(2) = {}_1p_0^{(1/0.93\,c)} \cdot {}_1p_1^{1/c} \qquad (1)$$

or

$$p(5) = {}_1p_0^{(1/0.93\,c)} \cdot {}_4p_1^{1/c} \qquad (2)$$

where $p(i) = 1 - q(i)$ is the estimate of the probability of surviving up to age i estimated from the children ever born and children surviving tabulations, and ${}_1p_0$ and ${}_jp_1$ are the probabilities of surviving from birth to age 1 and from age 1 to age $1+j$, respectively, calculated from the civil registration system. Solving equation (1), based on $p(2)$, we obtain completeness estimates of 95 per cent for infant death registration and 97 per cent for registration in age-group 1-4. Solving the "$p(5)$ equation", we obtain estimates of 107 per cent completeness for infant death registration and 109 per cent for childhood death registration. These estimates are, of course, relative to completeness of birth registration.

In the following table, we present a comparison of the values of ${}_1q_0$ and ${}_4q_1$ for 1960 and 1970 that "fall out" from these completeness estimates and those obtained by Pujol, and Tacla and Pujol:[8]

	${}_1q_0$		${}_4q_1$	
	Our estimates	*Pujol*	*Our estimates*	*Pujol*
1969-1971				
Total	0.0718-0.0805	0.0824	0.0123-0.0138	0.0145
Male	0.0772-0.0865	0.0892	0.0128-0.0143	0.0153
Female	0.0661-0.0742	0.0754	0.0117-0.0132	0.0137

[1] For population by age and sex, see República de Chile, Oficina de Planificación Nacional, *Proyección de la Población de Chile por Sexo y Grupos Quinquenales de Edad, 1950-2000* (Santiago, CELADE, 1975), p. 16, table 1. For registered deaths by age and sex, see *Demographic Yearbook, 1957* (United Nations publication, Sales No. 58.XIII.1), pp. 244-245, table 10; and *Demographic Yearbook, 1974* (United Nations publication, Sales No. E/F.75.XIII.1), pp. 566 and 567, table 25. For births by sex, see *Demographic Yearbook, 1959* (United Nations publication, Sales No. 60.XIII.1), p. 227, table 10; and *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F. 76.XIII.1), pp. 446-447, table 20.

[2] See O. Tacla and J. Pujol, *Chile: Tablas Abreviadas de Mortalidad, 1952-53 y 1960-61* (Santiago, CELADE, 1965), pp. 32-33, tables 14 and 15.

[3] See, for example, the following publications of CELADE: J. M. Pujol, *Chile: Tablas Abreviadas de Mortalidad a Nivel Nacional y Regional, 1969-70* (Santiago, 1976); J. Somoza and O. Tacla, *La Mortalidad en Chile según las Tablas de Vida de 1920, 1930, 1940, 1952 y 1960* (Santiago, 1973), especially pp. 3-7; O. Tacla and J. Pujol, op. cit.; and E. Taucher, *Chile: Mortalidad desde 1955 a 1975, Tendencios y Causas* (Santiago, 1978), especially pp. 3-5. Also, see United States Bureau of the Census, *Country Demographic Profiles: Chile*, by Sylvia D. Quick (Washington, D.C., 1978), p. 1.

[4] See sources listed in foot-note *3* to this annex.

[5] The tabulations are available in H. Behm and M. Correa, *La Mortalidad en los Primeros Años de Vida en Países de América: Chile 1965-66* (San José, CELADE, 1977), p. 48, table 1A.

[6] As a by-product of Puffer and Serrano's study of mortality in childhood, it was possible to determine the underregistration of births and childhood deaths within the survey areas. In the case of Chile, the study area of the survey was the metropolitan area of Santiago and the four *comunas* of Colina, Lampa, Quilcura and Til-Til. For more information, see R. R. Puffer and C. V. Serrano, *Patterns of Mortality in Childhood* (Washington, D.C., Pan American Health Organization, 1973), pp. 27-40.

[7] For the calculation of $q(5)$, it was necessary to know the distribution of deaths in the age interval 1-4 for 1965. As an estimate, we used the percentage distribution of deaths in age-group 1-4 for 1970, the closest year for which data are available. Small departures from the true distribution cause insignificant changes in the final results.

[8] See Pujol, op. cit., pp. 33-35, tables 5-7; and Tacla and Pujol, op. cit.

	$_1q_0$		$_4q_1$	
	Our estimates	*Pujol*	*Our estimates*	*Pujol*
1959-1961				
Total	0.1072-0.1199	0.1149	0.0285-0.0320	0.0322
Male	0.1142-0.1277	0.1222	0.0280-0.0314	0.0327
Female..	0.0999-0.1118	0.1072	0.0291-0.0327	0.0316

We have assumed that the completeness estimates apply to both years and sexes. Clearly, the estimates provided by Tacla and Pujol and Tacla are closer to the upper bound of the ranges. Furthermore, the agreement is closer for 1960 than for 1970. Many factors could explain the differences: sex difference in completeness, changes of completeness between 1960 and 1970, different data bases (e.g., Tacla used a two-year rather than three-year average in 1970) or unequal reliability of the estimates of $q(2)$ and $q(5)$. Nevertheless, all the estimates are relatively similar and for each three-year period we averaged the various estimates to obtain the following final figures:

	$_1q_0$			$_4q_1$		
	Total	*Male*	*Female*	*Total*	*Male*	*Female*
1969-1971 ..	0.0782	0.0843	0.0719	0.0135	0.0141	0.0129
1959-1961 ..	0.1140	0.1214	0.1063	0.0309	0.0307	0.0311

No indirect procedures could be used to provide independent verification for estimates calculated by Tacla and Pujol for 1951-1953. However, the closeness of our estimates with those obtained by Pujol and Tacla and Pujol for the other periods justifies adopting the Tacla and Pujol estimates for 1951-1953. These values are:

	$_1q_0$			$_4q_1$		
	Total	*Male*	*Female*	*Total*	*Male*	*Female*
1951-1953 ..	0.1204	0.1280	0.1124	0.0394	0.0384	0.0405

Calculation of mortality rates

For the 1951-1953 and 1969-1971 life tables, central death rates for ages 5 and over were calculated from three-year averages of deaths in 5-year age-sex groups and the corresponding census age-sex counts moved to the mid periods. Death rates under age 5 were calculated as described in the previous section. For the 1959-1961 life table, we accepted without alteration the death rates for ages 5 and over calculated by Tacla and Pujol. Under age 5, the death rates were calculated as described earlier.

Further adjustments to the life table

For the 1951-1953 and 1969-1971 life tables, the death rates were smoothed from ages 20 and over by three-term moving averages through their logarithms. No smoothing was done for the 1959-1961 life tables.

Chile Males 1951–1953

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.14001	.12800	100000	12800	91424	5158261	51.583	0.330
1	.00985	.03840	87200	3348	339933	5066837	58.106	1.352
5	.00220	.01094	83851	917	416964	4726905	56.372	2.500
10	.00190	.00946	82934	784	412710	4309941	51.968	2.500
15	.00320	.01588	82150	1305	407714	3897231	47.440	2.673
20	.00450	.02226	80845	1800	399913	3489517	43.163	2.603
25	.00550	.02714	79046	2145	390019	3089604	39.086	2.571
30	.00670	.03296	76901	2535	378335	2699585	35.105	2.567
35	.00810	.03972	74366	2954	364665	2321250	31.214	2.575
40	.01040	.05073	71412	3622	348316	1956585	27.399	2.586
45	.01360	.06584	67789	4463	328188	1608269	23.724	2.589
50	.01830	.08765	63326	5550	303292	1280082	20.214	2.597
55	.02600	.12235	57776	7069	271888	976789	16.907	2.596
60	.03770	.17273	50707	8759	232323	704901	13.902	2.578
65	.05520	.24299	41948	10193	184655	472578	11.266	2.539
70	.07890	.32894	31755	10446	132390	287924	9.067	2.474
75	.10720	.41933	21310	8936	83355	155534	7.299	2.404
80	.14570	.52415	12374	6486	44515	72179	5.833	2.324
85	.21285	******	5888	5888	27663	27663	4.698	4.698

Chile Females 1951–1953

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.12126	.11240	100000	11240	92694	5563153	55.632	0.350
1	.01040	.04049	88760	3594	345556	5470459	61.632	1.361
5	.00191	.00950	85166	809	423807	5124903	60.175	2.500
10	.00175	.00871	84357	735	419946	4701096	55.729	2.500
15	.00296	.01470	83622	1229	415248	4281150	51.197	2.672
20	.00412	.02040	82393	1681	407909	3865902	46.920	2.588
25	.00470	.02323	80712	1875	398960	3457993	42.844	2.547
30	.00540	.02665	78837	2101	389037	3059033	38.802	2.550
35	.00630	.03102	76736	2381	377868	2669996	34.794	2.558
40	.00760	.03731	74356	2774	365042	2292128	30.827	2.572
45	.00960	.04691	71581	3358	349814	1927086	26.922	2.590
50	.01290	.06257	68223	4269	330898	1577273	23.119	2.606
55	.01820	.08721	63954	5577	306441	1246375	19.488	2.610
60	.02620	.12328	58377	7197	274679	939934	16.101	2.609
65	.03990	.18202	51181	9316	233482	665255	12.998	2.593
70	.06110	.26556	41865	11117	181955	431772	10.314	2.538
75	.08830	.36087	30747	11096	125658	249818	8.125	2.469
80	.12760	.47850	19652	9403	73693	124159	6.318	2.388
85	.20307	******	10248	10248	50466	50466	4.924	4.924

Chile Males 1959–1961

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.13215	.12140	100000	12140	91866	5474685	54.747	0.330
1	.00783	.03070	87860	2697	344298	5382819	61.266	1.352
5	.00173	.00861	85163	733	423980	5038521	59.163	2.500
10	.00122	.00608	84429	513	420864	4614541	54.656	2.500
15	.00204	.01015	83916	852	417632	4193677	49.975	2.712
20	.00345	.01711	83064	1421	411976	3776045	45.459	2.646
25	.00425	.02104	81643	1718	404065	3364069	41.205	2.584
30	.00538	.02656	79925	2123	394513	2960004	37.035	2.591
35	.00695	.03418	77803	2659	382620	2565491	32.974	2.596
40	.00915	.04477	75143	3364	367625	2182870	29.049	2.595
45	.01200	.05833	71779	4187	348822	1815246	25.289	2.594
50	.01620	.07797	67592	5270	325297	1466424	21.695	2.597
55	.02250	.10671	62322	6650	295636	1141126	18.310	2.598
60	.03248	.15059	55672	8384	258118	845490	15.187	2.586
65	.04697	.21060	47288	9959	212039	587372	12.421	2.550
70	.06596	.28319	37329	10571	160271	375334	10.055	2.505
75	.09305	.37586	26758	10057	108085	215063	8.037	2.444
80	.12792	.47865	16701	7994	62492	106978	6.406	2.371
85	.19572	******	8707	8707	44486	44486	5.109	5.109

Chile Females 1959–1961

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.11419	.10630	100000	10630	93091	6014198	60.142	0.350
1	.00794	.03110	89370	2779	350145	5921107	66.254	1.361
5	.00138	.00688	86591	596	431464	5570962	64.337	2.500
10	.00100	.00499	85995	429	428901	5139499	59.765	2.500
15	.00159	.00792	85566	678	426259	4710597	55.052	2.683
20	.00245	.01218	84888	1034	421987	4284339	50.470	2.627
25	.00300	.01489	83854	1249	416250	3862352	46.060	2.581
30	.00372	.01844	82606	1523	409350	3446102	41.718	2.586
35	.00470	.02324	81082	1884	400853	3036751	37.453	2.581
40	.00575	.02836	79198	2246	390569	2635898	33.282	2.587
45	.00755	.03708	76952	2853	377910	2245329	29.178	2.600
50	.01000	.04884	74099	3619	361886	1867419	25.202	2.622
55	.01497	.07231	70480	5096	340358	1505533	21.361	2.638
60	.02248	.10672	65383	6978	310336	1165175	17.821	2.624
65	.03397	.15703	58405	9171	269994	854840	14.636	2.598
70	.05046	.22455	49234	11056	219099	584845	11.879	2.551
75	.07199	.30492	38179	11641	161702	365746	9.580	2.492
80	.09998	.39785	26537	10558	105596	204044	7.689	2.434
85	.16231	******	15979	15979	98448	98448	6.161	6.161

Chile Males 1969–1971

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.08971	.08430	100000	8430	93971	5886564	58.866	0.285
1	.00356	.01411	91570	1292	362919	5792593	63.259	1.399
5	.00100	.00499	90278	450	450264	5429674	60.144	2.500
10	.00090	.00449	89828	403	448130	4979411	55.433	2.500
15	.00170	.00847	89424	757	445393	4531281	50.672	2.717
20	.00260	.01292	88667	1146	440637	4085888	46.081	2.645
25	.00350	.01736	87521	1519	433986	3645250	41.650	2.616
30	.00470	.02324	86002	1999	425228	3211264	37.339	2.606
35	.00610	.03006	84004	2525	413974	2786037	33.166	2.606
40	.00830	.04069	81479	3316	399479	2372063	29.113	2.613
45	.01140	.05549	78163	4337	380445	1972584	25.237	2.609
50	.01570	.07566	73826	5585	355764	1592139	21.566	2.607
55	.02230	.10584	68240	7222	323873	1236375	18.118	2.601
60	.03180	.14767	61018	9010	283343	912502	14.955	2.586
65	.04640	.20843	52008	10840	233624	629159	12.097	2.563
70	.06850	.29266	41168	12048	175885	395536	9.608	2.514
75	.09840	.39319	29119	11449	116356	219650	7.543	2.446
80	.14140	.51463	17670	9094	64311	103295	5.846	2.356
85	.22000	******	8577	8577	38984	38984	4.545	4.545

Chile Females 1969–1971

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.07591	.07190	100000	7190	94720	6492472	64.925	0.266
1	.00325	.01289	92810	1196	368137	6397751	68.934	1.407
5	.00080	.00399	91613	366	457152	6029614	65.816	2.500
10	.00060	.00300	91248	273	455555	5572462	61.070	2.500
15	.00100	.00499	90974	454	453816	5116907	56.246	2.674
20	.00140	.00698	90520	632	451106	4663091	51.514	2.631
25	.00190	.00946	89889	850	447419	4211985	46.858	2.617
30	.00250	.01243	89039	1106	442550	3764567	42.280	2.610
35	.00330	.01637	87932	1440	436236	3322017	37.779	2.620
40	.00460	.02275	86493	1968	427797	2885781	33.364	2.628
45	.00640	.03152	84525	2664	416301	2457983	29.080	2.626
50	.00900	.04406	81861	3607	400774	2041682	24.941	2.635
55	.01340	.06495	78254	5082	379287	1640908	20.969	2.643
60	.02040	.09735	73171	7123	349183	1261621	17.242	2.659
65	.03530	.16280	66048	10752	304603	912439	13.815	2.616
70	.05060	.22522	55295	12453	246114	607836	10.993	2.562
75	.07880	.32960	42842	14121	179196	361721	8.443	2.520
80	.12270	.46637	28721	13395	109168	182525	6.355	2.429
85	.20893	******	15327	15327	73357	73357	4.786	4.786

Life tables for Colombia were calculated for the 1963-1965 period based on the population census age-sex count of 15 July 1964 and registered vital events during the 1963-1965 period by age and sex. Registration data were adjusted for incompleteness.

Sources of data

Census and vital registration data are available from the United Nations.[9]

Evaluation and adjustment of mortality data at ages 5 and over

Registered deaths were adjusted separately for ages 5 and over and under age 5. For ages 5 and over, incompleteness of registered death rates for the 1963-1965 period has been estimated by Potter and Ordoñez based on a variant of Brass's method that allows correction for lack of stability.[10] The authors found death registration to be approximately 87 per cent complete for both males and females. Registered deaths above age 5 have thus been adjusted by these completeness estimates.

Evaluation and adjustment of mortality data at ages under 5 years

Unlike other Latin American countries, Colombia's vital registration system seems to have undercounted births more than infant deaths.[11] As a consequence, infant mortality rates calculated from unadjusted vital registration data are too high when compared with figures obtained by more accurate (indirect) procedures. Mortality data under age 5 were evaluated by comparison of the registered mortality rates with indirect estimates of early-age mortality from tabulations of the female population by age-group, number of children ever born and number of children still living. Proportions of children still alive by age of mother calculated from these tabulations can be converted into conventional life table probabilities of death by Trussell regression equations. By using another series of equations developed by Trussell, the approximate reference dates to which these estimates refer can be calculated.

We had available the requisite tabulations of children ever born and children surviving by age of woman from the 1973 census and from the 1976 Colombian World Fertility Survey (WFS).[12] From each of these sources we estimated values of $q(2)$ and $q(5)$, the probability of a child dying before ages 2 and 5, respectively. In order to obtain estimates of $q(2)$ and $q(5)$ for 1963-1965 (the reference period of the life tables) we fitted a trend line between the two $q(2)$ estimates and between the two $q(5)$ estimates and extrapolated (with appropriate consideration to the reference dates to which these figures applied) back in time to 1964. In the following table the resulting values are displayed and compared with estimates obtained independently from birth histories:[13]

Indirect estimates		*Birth histories*	
$q(2)$	$q(5)$	$q(2)$	$q(5)$
0.0946	0.1164	0.0966	0.1172

The evaluation of death registration data under age 5 was carried out under two assumptions: that death registration was equally complete between ages 1 and 2, 2 and 3, 3 and 4 and 4 and 5; and that the relation of completeness below 1 and between 1 and 4 followed a pattern observed by Puffer and Serrano for Colombia, in which completeness of death registration for age-group 0-1 is about 95 per cent of that for age-group 1-4.[14]

From the vital registration data, values of the probabilities of dying before age 1 and between ages 1 and 2 or between ages 1 and 5 (depending on whether comparisons are made on the basis of $q(2)$ or $q(5)$) were calculated by following artificial birth cohorts forward through time, reducing them by the deaths reported in those age-groups by the vital registration system.[15]

Estimates of completeness were then obtained by solving for c in the formula

$$p(2) = {}_1\overset{*}{p}_0^{(1/0.95\,c)} \cdot {}_1\overset{*}{p}_1^{1/c} \qquad (1)$$

or

$$p(5) = {}_1\overset{*}{p}_0^{(1/0.95\,c)} \cdot {}_4\overset{*}{p}_1^{1/c} \qquad (2)$$

where $p(i) = 1 - q(i)$ is the estimate of the probability of surviving up to age i estimated from the children ever born and children surviving tabulations, and ${}_1\overset{*}{p}_0$ and ${}_j p_1$ are the probabilities of surviving from birth to age 1 and from age 1 to age $1+j$, respectively, calculated from the vital registration system. Solving equation (1), based on $p(2)$, we obtain completeness estimates of 115 per cent for infant death registration and 122 per cent for registration in age-group 1-4. Solving the "$p(5)$ equation", we obtain estimates of 113 per cent completeness for infant death registration and 119 per cent for childhood death registration. These estimates are, of course, relative to completeness of birth registration.

The completeness estimates from the two equations are very close. Selecting the average of each range (114 per cent for infant death registration completeness and 120 per cent for completeness in age-group 1-4) we calculated corrected values of ${}_1q_0$ and ${}_4q_1$ for 1964-1966. These are displayed below and compared with the independently derived birth histories:

Our indirect estimates		*Birth histories*	
${}_1q_0$	${}_4q_1$	${}_1q_0$	${}_4q_1$
0.0749	0.0444	0.0786	0.0439

Our indirect estimates are very similar to the birth history estimates and therefore lend confidence to the reliability of the indirect approach in this case. The indirect approach, however, provided no information on the sex differential in early-age mortality. Sex differentials were available from the birth history data. In order to avoid the assumption of equal completeness by sex, we decided to keep the sex differential derived from birth histories but maintain the level obtained from the indirect approach. The following are the final estimates used in the life tables:

	Males	*Females*
${}_1q_0$	0.0766	0.0722
${}_4q_1$	0.0386	0.0503

[9]For population by age and sex, see *Demographic Yearbook, 1970* (United Nations publication, Sales No. E/F.71.XIII.1), pp. 258-259, table 6. For registered deaths by age and sex, see *Demographic Yearbook, 1966* (United Nations publication, Sales No. 67.XIII.1), pp. 380-381, table 18. Registered births by sex are available from *Demographic Yearbook, 1965* (United Nations publication, Sales No. 66.XIII.1), p. 540, table 22; and *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 446-447, table 20.

[10]J. E. Potter and M. Ordóñez G., "The completeness of enumeration in the 1973 census of the population of Colombia", *Population Index* (Princeton, N.J., Princeton University and Population Association of America, 1976), vol. 42, No. 3, pp. 377-403.

[11]This is at least true before 1968 at which time the registration of births via baptismal records was discontinued.

[12]See *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 966-967 and 1040-1041, tables 51 and 52; and República de Colombia, Departamento Administrativo Nacional de Estadística, *Encuesta Nacional de Fecundidad, Colombia 1976* (Bogotá, 1977), pp. 117-118 and 134, tables 2.2.1B and 2.3.1B.

[13]Unpublished tabulations from the Colombian World Fertility Survey.

[14]As a by-product of Puffer and Serrano's study of mortality in childhood, it was possible to determine the underregistration of births and childhood deaths within the survey areas. In the case of Colombia, the study area of the survey was the urban sectors of the cities Cali, Cartagena and Medellín. For more information, see R. R. Puffer and C. V. Serrano, *Patterns of Mortality in Childhood* (Washington, D.C., Pan American Health Organization, 1973), pp. 27-40.

[15]For the calculation of $q(2)$ and $q(5)$ from the vital registration data, it was necessary to know the age distribution of deaths in the age-group 1-4. As an estimate, we used the percentage distribution of deaths in age-group 1-4 observed in the Puffer and Serrano study. Small departures from the true distribution cause insignificant changes in the final results.

Calculation of mortality rates

For ages 5 and over, central death rates were calculated from three-year averages of the adjusted deaths in five-year age-sex groups and the corresponding census age-sex count moved to mid period. Death rates under age 5 were calculated as described in the notes on Chile.

Further adjustments to the life table

The central death rates in the life tables did not form a completely smooth progression from age to age. Therefore, from ages 25 on, for both males and females, the rates were smoothed by three-term moving averages through their logarithms.

Colombia Males 1963–1965

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.08120	.07661	100000	7661	94352	5767629	57.676	0.263
1	.00990	.03861	92339	3566	360163	5673277	61.440	1.422
5	.00270	.01341	88773	1190	440889	5313114	59.851	2.500
10	.00160	.00797	87583	698	436168	4872225	55.630	2.500
15	.00250	.01243	86885	1080	431925	4436056	51.057	2.686
20	.00400	.01981	85805	1700	424969	4004132	46.666	2.614
25	.00450	.02225	84105	1872	415908	3579162	42.556	2.533
30	.00490	.02421	82233	1991	406261	3163255	38.467	2.535
35	.00560	.02762	80243	2217	395811	2756993	34.358	2.563
40	.00700	.03442	78026	2686	383668	2361182	30.261	2.593
45	.00940	.04597	75341	3463	368445	1977514	26.248	2.616
50	.01340	.06494	71877	4668	348326	1609069	22.386	2.630
55	.02010	.09593	67210	6447	320756	1260743	18.758	2.628
60	.03030	.14125	60762	8583	283262	939987	15.470	2.606
65	.04520	.20361	52180	10625	235056	656725	12.586	2.568
70	.06590	.28303	41555	11761	178474	421669	10.147	2.509
75	.09110	.36949	29794	11009	120840	243195	8.163	2.445
80	.12580	.47275	18785	8881	70593	122355	6.513	2.373
85	.19135	******	9905	9905	51762	51762	5.226	5.226

Colombia Females 1963–1965

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.07620	.07217	100000	7217	94707	5966698	59.667	0.266
1	.01300	.05030	92783	4667	359029	5871991	63.287	1.407
5	.00240	.01193	88116	1051	437952	5512962	62.565	2.500
10	.00110	.00548	87065	478	434131	5075010	58.290	2.500
15	.00170	.00847	86587	733	431214	4640879	53.598	2.650
20	.00230	.01144	85854	982	426935	4209665	49.033	2.620
25	.00310	.01539	84872	1306	421239	3782730	44.570	2.609
30	.00400	.01981	83566	1655	413852	3361491	40.225	2.595
35	.00510	.02519	81911	2063	404584	2947639	35.986	2.591
40	.00650	.03200	79848	2555	393076	2543055	31.849	2.588
45	.00830	.04069	77293	3145	378920	2149980	27.816	2.602
50	.01150	.05597	74148	4150	360878	1771059	23.886	2.624
55	.01690	.08124	69998	5687	336486	1410181	20.146	2.626
60	.02490	.11752	64311	7558	303515	1073694	16.695	2.613
65	.03730	.17111	56753	9711	260349	770179	13.571	2.589
70	.05530	.24350	47042	11455	207136	509830	10.838	2.549
75	.08200	.34001	35588	12100	147562	302694	8.506	2.490
80	.11940	.45605	23488	10712	89713	155132	6.605	2.412
85	.19529	******	12776	12776	65420	65420	5.120	5.120

Life tables for Costa Rica were calculated for the periods 1962-1964 and 1972-1974 based on population census age-sex counts of 1 April 1963 and 14 May 1973 and registered vital events by age and sex for the indicated three-year periods. Death registration data were adjusted for incompleteness.

Sources of data

Census and vital registration data are available from the United Nations.[16]

Evaluation and adjustment of mortality data for ages under 1

Two independent sources of information are available for evaluating the quality of infant death registration in Costa Rica. A matching survey in which death registration certificates were compared with hospital records undertaken in 1964 estimated infant death registration to be 83 per cent complete for the 1962-1964 period.[17]

A second source of information is the set of probabilities of dying derived from pregnancy histories collected in the 1976 Costa Rican National Fertility Survey.[18] These values are displayed in the following table and compared with the probabilities of dying derived from the vital registration system. The last two columns in this table show the values of completeness implied by these rates:

Year	*Pregnancy history* $_1q_0$	*Vital registration* $_1q_0$	*Completeness in age-group* 0-1
1963	0.0782	0.0714	0.89
1967	0.0746	0.0620	0.82
1970	0.0704	0.0614	0.87
1973	0.0514	0.0454	0.89

The values of completeness for age-group 0-1 appear in reasonable agreement with the Matching Survey.

For 1963 we therefore accepted the results provided by the Matching Survey and infant death completeness was set equal to 0.83. Given that data for pregnancy histories are usually more reliable the closer the date of reference to the date of the survey, we accepted as valid the resulting estimate of infant mortality for the year 1973 (0.0514). This implies that for 1973, infant death registration completeness relative to birth registration completeness is approximately 0.89.[19]

No estimates of completeness were available for males and females separately. As a result we assumed infant death registration to be equally complete for both males and females and adjusted the male and female registered infant mortality rates by the same correction factor.

Evaluation and adjustment of mortality data at ages 1 and over

The 1963 Matching Survey, along with a second Matching Survey conducted in 1966, produced estimates of completeness of the death registration system of 86 per cent at ages 1 and over in 1963 and 88 per cent at all ages in 1966.[20] The 1963 estimate of completeness for ages 1 and over has been accepted for calculation of the 1962-1964 life tables and both male and female registered deaths for ages 1 and over were adjusted by these completeness estimates. For the 1972-1974 life table, no matching surveys were available to indicate completeness of death registration for ages 1 and over. The Preston and Brass methods were applied, however, and provided estimates of completeness which were not only similar but also internally consistent. Completeness estimates based on these methods implied registration for ages 1 and over to be approximately 96 per cent complete for both males and females and were accepted for adjustment of registered deaths for calculation of the 1972-1974 life tables.[21]

Calculation of mortality rates

For ages 5 and over central death rates were calculated from three-year averages of the adjusted deaths in five-year age-sex groups and the corresponding age-sex count moved to mid period. Death rates under age 5 were calculated as described in the notes on Chile.

Further adjustments to the life table

The central death rates in the life tables did not form a completely smooth progression from age to age. Therefore, from ages 20 on, for both males and females, the rates were smoothed by three-term moving averages through their logarithms.

[16]For populations by age and sex, see *Demographic Yearbook, 1970* (United Nations publication, Sales No. E/F.71.XIII.1), pp. 222-223, table 6; and *Demographic Yearbook, 1977* (United Nations publication, Sales No. E/F.78.XIII.1), pp. 198-199, table 7. For registered deaths by age and sex, see *Demographic Yearbook, 1966* (United Nations publication, Sales No. 67.XIII.1), pp. 370-371, table 18; *Demographic Yearbook, 1974* (United Nations publication, Sales No. E/F.75.XIII.1), pp. 552-553, table 25; and *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 326-327, table 13. For registered births by sex, see *Demographic Yearbook, 1975*, pp. 442-443, table 20.

[17]See República de Costa Rica, Dirección General de Estadística y Censos, *Evaluación del Censo de 1973 y Proyecciones de Población por Sexo y Grupos de Edades, Años 1950 al 2000* (San José, 1976), pp. 8-10.

[18]See V. Rodríguez and A. Ortega, "Costa Rica: estimates of fertility and mortality", working paper for the National Academy of Sciences Panel Workshop (Santiago, 1979) (unpublished mimeo.).

[19]Mortality data under age 1 could also be evaluated by comparison of the registered mortality rates with indirect estimates of early-age mortality from tabulations of the female population by age-group, number of children ever born and number of children still living. Available were the requisite tabulations of children ever born and children surviving by age of woman from both the 1973 census and the 1976 Fertility Survey. However, completeness estimates based on these tabulations proved to be inconsistent both internally and between the two sets of tabulations. See Costa Rica, Dirección General de Estadística y Censos, *Encuesta Nacional de Fecundidad* (San José, 1978), pp. 174 and 191, tables 2.2.1A and 2.3.1A; and *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 960-961 and 1038-1039, tables 51 and 52.

[20]See República de Costa Rica, Dirección General de Estadística y Censos, *Evaluación del Censo de 1973 y Proyecciones de Población por Sexo y Grupos de Edades, Años 1950 al 2000.*

[21]The estimates of completeness derived here for both infant deaths and deaths for ages 1 and over are consistent with those of other researchers. See, for example, United States Bureau of the Census, *Country Demographic Profiles: Costa Rica,* by Sylvia D. Quick (Washington, D.C., 1977), pp. 5-6, tables 3 and 4.

Costa Rica Males 1962–1964

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.10127	.09470	100000	9470	93511	6091354	60.914	0.315
1	.00750	.02942	90530	2663	355110	5997843	66.252	1.368
5	.00180	.00896	87867	787	437366	5642733	64.219	2.500
10	.00100	.00499	87080	434	434312	5205367	59.777	2.500
15	.00150	.00747	86645	648	431712	4771055	55.064	2.661
20	.00220	.01094	85998	941	427732	4339343	50.459	2.602
25	.00250	.01242	85057	1057	422689	3911612	45.988	2.545
30	.00280	.01391	84000	1168	417168	3488922	41.535	2.576
35	.00370	.01834	82832	1519	410534	3071754	37.084	2.613
40	.00500	.02471	81313	2009	401776	2661220	32.728	2.616
45	.00680	.03346	79304	2654	390221	2259444	28.491	2.626
50	.00980	.04789	76651	3671	374600	1869223	24.386	2.643
55	.01490	.07198	72979	5253	352540	1494624	20.480	2.648
60	.02310	.10954	67727	7419	321148	1142083	16.863	2.643
65	.03730	.17123	60308	10327	276857	820935	13.612	2.610
70	.05680	.24924	49981	12457	219315	544078	10.886	2.544
75	.08140	.33773	37524	12673	155690	324763	8.655	2.480
80	.11670	.44794	24851	11132	95389	169073	6.803	2.407
85	.18619	******	13719	13719	73684	73684	5.371	5.371

Costa Rica Females 1962–1964

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.08217	.07760	100000	7760	94435	6365156	63.652	0.283
1	.00788	.03089	92240	2849	361547	6270721	67.982	1.398
5	.00150	.00747	89391	668	445287	5909174	66.105	2.500
10	.00170	.00846	88723	751	441740	5463887	61.583	2.500
15	.00100	.00499	87972	439	438747	5022148	57.088	2.457
20	.00140	.00698	87534	611	436221	4583401	52.362	2.631
25	.00190	.00946	86923	822	432649	4147179	47.711	2.608
30	.00240	.01193	86101	1027	428043	3714531	43.142	2.604
35	.00320	.01588	85074	1351	422146	3286488	38.631	2.615
40	.00430	.02128	83723	1782	414370	2864342	34.212	2.619
45	.00590	.02909	81941	2384	404031	2449971	29.899	2.620
50	.00810	.03974	79557	3161	390307	2045941	25.717	2.634
55	.01220	.05931	76396	4531	371371	1655633	21.672	2.659
60	.01960	.09369	71865	6733	343525	1284263	17.870	2.653
65	.03100	.14437	65132	9403	303320	940737	14.444	2.624
70	.04850	.21703	55729	12095	249378	637418	11.438	2.580
75	.07400	.31266	43634	13643	184362	388040	8.893	2.522
80	.11290	.43796	29991	13135	116342	203678	6.791	2.441
85	.19301	******	16856	16856	87336	87336	5.181	5.181

Costa Rica Males 1972–1974

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.05894	.05630	100000	5630	95521	6745889	67.459	0.204
1	.00302	.01199	94370	1131	374633	6650368	70.471	.1.483
5	.00080	.00399	93239	372	465263	6275736	67.308	2.500
10	.00060	.00300	92866	278	463637	5810473	62.568	2.500
15	.00120	.00598	92588	554	461682	5346836	57.749	2.726
20	.00180	.00896	92034	825	458210	4885155	53.080	2.623
25	.00220	.01094	91209	998	453616	4426945	48.536	2.564
30	.00250	.01242	90211	1121	448314	3973329	44.045	2.552
35	.00290	.01440	89091	1283	442351	3525015	39.567	2.581
40	.00380	.01883	87808	1653	435113	3082664	35.107	2.625
45	.00550	.02715	86154	2339	425267	2647551	30.730	2.646
50	.00810	.03974	83815	3331	411235	2222284	26.514	2.646
55	.01200	.05835	80484	4696	391346	1811049	22.502	2.641
60	.01800	.08633	75788	6543	363475	1419703	18.732	2.636
65	.02760	.12950	69246	8968	324912	1056228	15.253	2.623
70	.04280	.19402	60278	11695	273249	731315	12.132	2.594
75	.06640	.28546	48583	13869	208863	458066	9.428	2.545
80	.10300	.40848	34715	14180	137674	249203	7.179	2.468
85	.18412	******	20534	20534	111529	111529	5.431	5.431

Costa Rica Females 1972–1974

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.04693	.04520	100000	4520	96319	7121896	71.219	0.186
1	.00307	.01218	95480	1163	378953	7025578	73.582	1.450
5	.00070	.00349	94316	330	470758	6646625	70.472	2.500
10	.00040	.00200	93987	188	469465	6175867	65.710	2.500
15	.00070	.00349	93799	328	468231	5706402	60.836	2.667
20	.00090	.00449	93471	420	466338	5238171	56.040	2.572
25	.00100	.00499	93052	464	464139	4771834	51.282	2.590
30	.00140	.00698	92587	646	461414	4307694	46.526	2.641
35	.00200	.00995	91941	915	457541	3846280	41.834	2.633
40	.00270	.01341	91026	1221	452236	3388739	37.228	2.628
45	.00380	.01883	89805	1691	445036	2936504	32.699	2.640
50	.00550	.02715	88114	2392	434952	2491467	28.275	2.651
55	.00830	.04071	85722	3490	420467	2056515	23.991	2.667
60	.01330	.06451	82232	5305	398863	1636048	19.895	2.682
65	.02270	.10781	76927	8293	365338	1237185	16.083	2.673
70	.03830	.17554	68634	12048	314562	871846	12.703	2.625
75	.06080	.26481	56586	14985	246457	557284	9.848	2.566
80	.09650	.38846	41602	16161	167469	310827	7.471	2.491
85	.17746	******	25441	25441	143358	143358	5.635	5.635

Life tables for El Salvador were calculated for the period 1970-1972 based on the population census age-sex count of 28 June 1971 and registered vital events during the 1970-1972 period by age and sex. Registration data were adjusted for incompleteness.

Sources of data

Census and vital registration data are available from the United Nations.[22]

Evaluation and adjustment of data

Since completeness of death registration is estimated relative to the census count, population census data were not adjusted for ages 1 and over. Infant mortality rates are based solely on registration data.

Registered deaths were adjusted separately for ages 5 and over and under age 5. For ages over 5 completeness was estimated by the Preston method. The estimates of completeness (relative to the census count) from this method were 98 per cent complete for males and 96 per cent complete for females. Registered deaths above age 5 were therefore adjusted by these estimates of completeness.

Mortality data under age 5 were evaluated by comparison of the registered mortality rates with indirect estimates of early-age mortality from tabulations of the female population by age-group, number of children ever born and number of children still living. Proportions of children still alive by age of mother calculated from these tabulations can be converted into conventional life table probabilities of death by Trussell regression equations. By using another series of equations developed by Trussell, the approximate reference dates to which these estimates refer can be calculated.

We had available the requisite tabulations of children ever born and children surviving by age of woman from the 1971 census and from the 1973 National Fertility Survey.[23] From the data available to us in the National Fertility Survey, we were only able to estimate the value $q(2)$, the probability of a child dying before age 2. We therefore decided to use $q(2)$ as our index of mortality and estimated that value for 1971 by interpolating between $q(2)$ values from the census and National Fertility Survey (with appropriate consideration to the reference dates to which these figures applied).

The evaluation of death registration data under age 5 was carried out under two assumptions: that death registration was equally complete between ages 1 and 2, 2 and 3, 3 and 4 and 4 and 5; and that the relation of completeness below 1 and between 1 and 4 followed a pattern observed by Puffer and Serrano for El Salvador, in which completeness of death registration for age-group 0-1 is about 93 per cent of that for age-group 1-4.[24]

From the civil registration data, values of the probabilities of dying before age 1 and between ages 1 and 2 were calculated by following artificial birth cohorts forward through time, reducing them by the deaths reported in those age-groups by the civil registration system.[25]

Estimates of completeness were then obtained by solving for c in the formula:

$$p(2) = {}_1\overset{*}{p}_0^{(1/0.93\,c)} \cdot {}_1\overset{*}{p}_1^{1/c}$$

where $p(2) = 1-q(2)$ is the estimate of the probability of surviving up to age 2 estimated from the children ever born and children surviving tabulations, and ${}_1\overset{*}{p}_0$ and ${}_1\overset{*}{p}_1$ are the probabilities of surviving from birth to age 1 and from age 1 to age 2, respectively, calculated from the civil registration system. The estimated completeness obtained from this formula is 0.50 for age-group 0-1 and 0.54 for age-group 1-4. These factors were utilized to inflate the reported number of deaths in the intervals 0-1 and 1-4. Completeness of death registration in these age-groups was assumed to be the same for both males and females. The final estimate for ${}_1q_0$ was calculated directly from adjusted births whereas the final estimate of ${}_4q_1$ was calculated from the adjusted mortality rate ${}_4M_1$ obtained from deaths (adjusted for completeness) and population 1-4 as reported in the census.[26]

Calculation of mortality rates

For ages 5 and over, central death rates were calculated from three-year averages of the adjusted deaths in five-year age-sex groups and the corresponding census age-sex count moved to mid period. Death rates under age 5 were calculated as described in the notes on Chile.

Further adjustments to the life table

The central death rates in the life tables did not form a completely smooth progression from age to age. Therefore, from ages 25 on, for both males and females, the rates were smoothed by three-term moving averages through their logarithms.

[22]For population by age and sex, see *Demographic Yearbook, 1974* (United Nations publication, Sales No. E/F.75.XIII.1), pp. 166-167, table 7. For registered deaths by age and sex, see *ibid.*, pp. 554-555, table 25. Registered births by sex are available from *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 442-443, table 20.

[23]See *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 960-961 and 1038-1039, tables 51 and 52; and H. Behm and D. Primante, "Mortalidad en los primeros años de vida en la América Latina", *Notas de Población*, Centro Latinoamericano de Demografía, Año VI, No. 16 (1978), p. 28, table 1.

[24]As a by-product of Puffer and Serrano's study of mortality in childhood, it was possible to determine the underregistration of births and childhood deaths within the survey areas. In the case of El Salvador, the study area of the survey was the urban *municipio* of San Salvador and the three rural *municipios* of Apopa, Nejapa and Quezaltepeque. For more information, see R. R. Puffer and C. V. Serrano, *Patterns of Mortality in Childhood* (Washington, D.C., Pan American Health Organization, 1973), pp. 27-40.

[25]Specifically, the registered mortality rates were calculated by matching births and deaths for the cohorts with birth dates centred in 1970 and 1971. In both cases the data for births correspond to three-year moving averages with a 7 per cent adjustment for underregistration as estimated by the United States Bureau of the Census (see United States Bureau of the Census, *World Population, 1977: Recent Demographic Estimates for the Countries and Regions of the World* (Washington, D.C., 1978), p. 264.

[26]A different procedure to calculate ${}_4q_1$ could also have been followed. The population 1-4 in June 1971 could have been reconstructed from the adjusted series of births and from adjusted deaths by single years of ages. Matching this reconstructed population 1-4 with the deaths during 1970-1972 in the interval 1-4 (adjusted for completeness) would result in an estimate of ${}_4q_1$ which differed by about 5 per cent from the one obtained by using the enumerated population 1-4.

El Salvador Males 1970–1972

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.12370	.11423	100000	11423	92346	5493500	54.935	0.330
1	.02040	.07742	88577	6857	336149	5401154	60.977	1.352
5	.00250	.01242	81719	1015	406059	5065005	61.981	2.500
10	.00120	.00598	80704	483	402314	4658946	57.729	2.500
15	.00190	.00946	80221	759	399389	4256633	53.061	2.736
20	.00380	.01883	79463	1497	393821	3857243	48.542	2.667
25	.00440	.02176	77966	1697	385655	3463422	44.422	2.540
30	.00480	.02372	76269	1809	376902	3077767	40.354	2.544
35	.00570	.02811	74460	2093	367213	2700865	36.273	2.570
40	.00710	.03490	72367	2526	355735	2333651	32.247	2.585
45	.00920	.04500	69841	3143	341648	1977917	28.320	2.595
50	.01230	.05974	66698	3985	323951	1636269	24.532	2.606
55	.01730	.08307	62713	5209	301117	1312318	20.926	2.610
60	.02480	.11703	57504	6730	271364	1011201	17.585	2.599
65	.03570	.16427	50774	8341	233629	739837	14.571	2.573
70	.05030	.22380	42434	9497	188798	506209	11.929	2.539
75	.07120	.30207	32937	9949	139740	317411	9.637	2.493
80	.09900	.39475	22988	9074	91661	177671	7.729	2.435
85	.16176	******	13913	13913	86010	86010	6.182	6.182

El Salvador Females 1970–1972

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.10260	.09608	100000	9608	93642	6010384	60.104	0.338
1	.01940	.07383	90392	6674	344002	5916742	65.456	1.368
5	.00260	.01292	83719	1081	415890	5572740	66.565	2.500
10	.00097	.00484	82637	400	412187	5156850	62.403	2.500
15	.00130	.00648	82238	533	409910	4744662	57.695	2.602
20	.00160	.00797	81705	651	406952	4334753	53.054	2.586
25	.00200	.00995	81054	807	403336	3927801	48.459	2.605
30	.00270	.01341	80247	1076	398675	3524465	43.920	2.623
35	.00370	.01834	79170	1452	392392	3125790	39.482	2.616
40	.00490	.02422	77719	1882	384096	2733398	35.170	2.610
45	.00660	.03249	75837	2464	373301	2349303	30.979	2.613
50	.00900	.04405	73373	3232	359158	1976001	26.931	2.616
55	.01260	.06117	70140	4291	340516	1616844	23.052	2.626
60	.01870	.08953	65850	5896	315287	1276327	19.382	2.632
65	.02860	.13385	59954	8025	280579	961041	16.030	2.608
70	.04190	.19012	51929	9873	235627	680462	13.104	2.567
75	.06000	.26122	42057	10986	183101	444834	10.577	2.526
80	.08640	.35453	31071	11015	127492	261733	8.424	2.471
85	.14940	******	20055	20055	134241	134241	6.694	6.694

Life tables for Guatemala were calculated for the period 1963-1965 based on the population census age-sex count of 18 April 1964 and registered vital events during the 1963-1965 period by age and sex. Registration data were adjusted for incompleteness.

Sources of data

Census and vital registration data are available from the United Nations.[27]

Evaluation and adjustment of the data

Since completeness of death registration is estimated relative to the census count, population census data were not adjusted for ages 5 and over. Mortality rates under age 5 are based solely on registration data.

Registered deaths were adjusted separately for ages 5 and over and under age 5. For ages over 5, completeness was estimated by the Preston method. The estimates of completeness (relative to the census count) from this method were 92 per cent complete for both males and females.[28] Registered deaths above age 5 were therefore adjusted by these estimates of completeness.

Mortality data for under age 5 were evaluated by comparison of the registered mortality rates with indirect estimates of early-age mortality from tabulations of the female population by age-group, number of children ever born and number of children still living. Proportions of children still alive by age of mother calculated from these tabulations can be converted into conventional life table probabilities of death by Trussell regression equations. By using another series of equations developed by Trussell, the approximate reference date to which these estimates refer can be calculated.

We had available the requisite tabulations of children ever born and children surviving by age of woman from the 1973 census.[29] The values of $q(2)$, the probabilities of dying before attaining the second birthday, estimated from these tabulations was compared with an estimate of the same probability obtained from registration data on births and deaths. This comparison was made for the year 1971. Using procedures similar to those outlined for Mexico, from this comparison we obtained, for 1971, ranges of death completeness in age-group 0-1 relative to birth completeness, and death completeness in age-group 1-4 relative to completeness of the population at risk in the age interval.[30]

The results of the calculations produced the following ranges of completeness (relative to birth):

Age-group	*Range of completeness*
0-1	0.83-0.86
1-4	0.92-0.96

Since these ranges are quite narrow and no independent information exists justifying the selection of any one figure within the ranges, it was decided to use the mid point of the range for $C_{0\text{-}1}$ which automatically determined the value for $C_{1\text{-}4}$. The resulting values of relative completeness were assumed to be valid within the period 1960-1974 for both sexes. Applying them to the observed values of the probabilities of dying before 1 year of life and between the first and fifth birthdays produced the following estimates for 1964:

	${}_1q_0$	${}_4q_1$
Males	0.1166	0.0984
Females	0.1017	0.1057
Total	0.1093	0.1020

Calculation of mortality rates

For ages 5 and over, central death rates were calculated from three-year averages of the adjusted deaths in five-year age-sex groups and the corresponding census age-sex count moved to mid period. Death rates under age 5 were calculated as described in the notes on Chile.

Further adjustments to the life table

The central death rates in the life tables did not form a completely smooth progression from age to age. Therefore, from ages 20 on, for both males and females, the rates were smoothed by three-term moving averages through their logarithms.

[27]For population by age and sex, see *Demographic Yearbook, 1971* (United Nations publication, Sales No. E/F.72.XIII.1), p. 194, table 7. For registered deaths by age and sex, see *Demographic Yearbook, 1966* (United Nations publication, Sales No. 67.XIII.1), pp. 372-373, table 18; and *Demographic Yearbook, 1974* (United Nations publication, Sales No. E/F.75.XIII.1), pp. 556-557, table 25. Registered births by sex are available from *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 442-443, table 20.

[28]Application of the Preston method requires knowledge of the population growth rate for some years before the date to which the completeness estimates refer. In the case of Guatemala, the intercensal growth rates between the 1950 and 1964 censuses were used, after correction of the census figures for underenumeration (8.4 per cent for males and 7.8 per cent for females in 1950; and 3.7 per cent for males and 3.4 per cent for females in 1964). For details of the estimated coverage of the censuses, see J. Chakiel, *Guatemala: Evaluación del Censo de 1973 y Proyección de la Población por Sexo y Edad 1950-2000* (San José, CELADE, 1976), pp. 16 and 21, tables 9-10.

[29]See H. Behm and E. Vargas, *La Mortalidad en los Primeros Años de Vida en Países de la América Latina: Guatemala* (San José, CELADE, 1978), pp. 50-51, tables 1A-2A.

[30]The population at risk in the age interval 1-4 was estimated from registered births and deaths during the previous five years.

Guatemala Males 1963–1965

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.12650	.11662	100000	11662	92186	4684522	46.845	0.330
1	.02630	.09835	88338	8688	330346	4592336	51.986	1.352
5	.00780	.03825	79650	3047	390633	4261990	53.509	2.500
10	.00380	.01882	76603	1442	379413	3871356	50.538	2.500
15	.00460	.02275	75162	1710	371655	3491944	46.459	2.571
20	.00560	.02762	73452	2029	362309	3120289	42.481	2.560
25	.00650	.03199	71423	2285	351530	2757979	38.615	2.556
30	.00780	.03827	69138	2646	339225	2406450	34.806	2.556
35	.00920	.04499	66492	2991	325156	2067225	31.090	2.558
40	.01130	.05499	63501	3492	309033	1742069	27.434	2.574
45	.01470	.07097	60009	4259	289709	1433036	23.880	2.573
50	.01860	.08899	55750	4961	266724	1143327	20.508	2.576
55	.02550	.12009	50789	6099	239186	876602	17.260	2.580
60	.03530	.16259	44690	7266	205842	637416	14.263	2.577
65	.05250	.23252	37424	8702	165750	431575	11.532	2.544
70	.07385	.31152	28722	8947	121158	265825	9.255	2.491
75	.10509	.41347	19774	8176	77799	144667	7.316	2.423
80	.14573	.52499	11598	6089	41783	66868	5.765	2.338
85	.21962	******	5509	5509	25085	25085	4.553	4.553

Guatemala Females 1963–1965

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.10890	.10170	100000	10170	93390	4800812	48.008	0.350
1	.02841	.10570	89830	9495	334263	4707422	52.404	1.361
5	.00820	.04018	80335	3228	393605	4373160	54.437	2.500
10	.00350	.01735	77107	1338	382191	3979555	51.611	2.500
15	.00420	.02079	75769	1575	375077	3597364	47.478	2.607
20	.00610	.03006	74194	2230	365590	3222287	43.431	2.588
25	.00680	.03344	71964	2406	353872	2856696	39.696	2.529
30	.00750	.03682	69557	2561	341463	2502824	35.982	2.531
35	.00850	.04163	66996	2789	328120	2161361	32.261	2.540
40	.00990	.04833	64207	3103	313415	1833241	28.552	2.544
45	.01160	.05641	61104	3447	297142	1519826	24.873	2.569
50	.01550	.07473	57657	4309	277985	1222685	21.206	2.609
55	.02290	.10860	53348	5794	252985	944699	17.708	2.626
60	.03560	.16394	47555	7796	218999	691714	14.546	2.592
65	.05080	.22578	39759	8977	176706	472714	11.890	2.540
70	.07153	.30322	30782	9334	130494	296008	9.616	2.491
75	.09962	.39640	21448	8502	85345	165514	7.717	2.425
80	.13490	.49693	12946	6433	47690	80169	6.192	2.351
85	.20053	******	6513	6513	32479	32479	4.987	4.987

Life tables for Guyana were calculated for the 1959-1961 period based on the population census count of 7 April 1960 and registered vital events by age and sex for 1959, 1960 and 1961.

Sources of data

Both census and vital registration data are available from various issues of the United Nations *Demographic Yearbook*.[31]

Evaluation of the data

Application of both the Brass and Preston methods showed death registration to be 100-106 per cent complete, relative to the census, for ages 5 and over. For ages under 5, the only external information

[31] Population by age and sex can be found in *Demographic Yearbook, 1970* (United Nations publication, Sales No. E/F.71.XIII.1), pp. 260-263, table 6. Registered births and deaths are from *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 330-331 and 446-447, tables 13 and 20; and *Demographic Yearbook, 1961* (United Nations publication, Sales No. 62.XIII.1), pp. 312-313, table 15.

Figure VIII. Guyana: registered infant mortality rates and indirect estimates from 1946 census

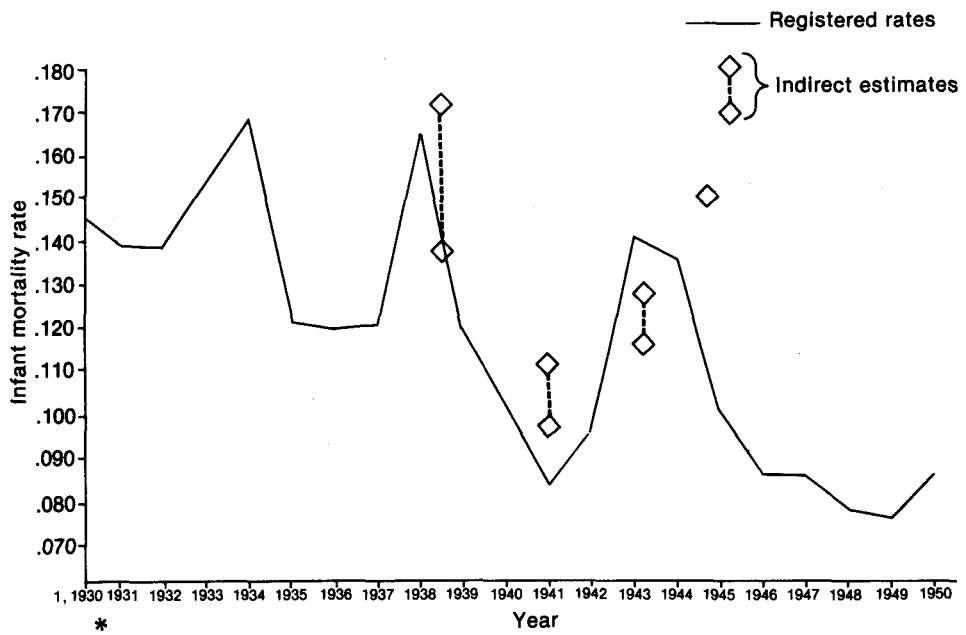
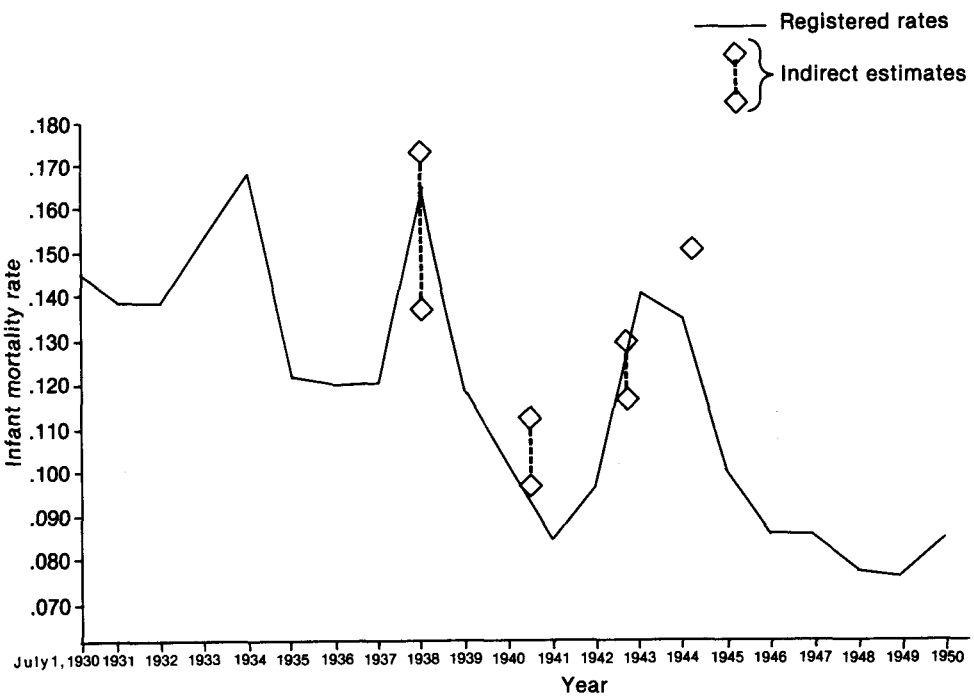


Figure IX. Guyana: registered infant mortality rates and indirect estimates from 1946 census (indirect estimates plotted one half year prior to calculated reference date)



available for evaluating mortality was the questions asked in the 1946 census on children ever born and children surviving[32] allowing application of Trussell regression equations to make indirect estimates of infant and childhood mortality. By using another series of equations developed by Trussell, the approximate reference date to which these estimates refer can be calculated. These estimates refer to a period of time long before that of 1960. However, if we can show infant death registration to be already complete in the 1940s, we can probably safely assume that it was complete around 1960.

The following table and figure VIII present a comparison of the indirect estimates of infant mortality with rates calculated directly from the civil registration system:

Reference date (year centred on)	*Infant mortality rate estimated from:*	
	Indirect technique	*Civil registration*
March 1945	0.151	0.111
September 1943	0.117-0.129	0.140
July 1941	0.098-0.112	0.084
January 1939	0.138-0.173	0.112

Sources: Indirect estimates of infant mortality were calculated from the 1946 census tabulations of children ever born and children surviving by age of mother. Estimated rates of child mortality were matched to West, North and South region Coale-Demeny model life tables to provide a range of estimates of infant mortality. The registered rates were interpolated from the calendar year infant mortality rates presented in *Demographic Yearbook, 1966* (United Nations publication, Sales No. 67. XIII.1), pp. 288-289, table 14.

For all but 1943 the indirectly estimated infant mortality rate is higher than rates calculated from the vital registration system, implying relative incompleteness of infant death registration. However, examination of figure VIII revealed that both the level and trend of the indirect estimates were identical to registered rates but with a lag of about one half year. Figure IX presents the same figures with the indirect estimates plotted one half year earlier. With this adjustment, there is now little difference between the two series of rates. This close matching of not only the level but also the trend (one that is quite unusual) leads to the conclusion that the registered infant mortality rates during the early 1940s are indeed accurate. And we will assume, therefore, that the registration system has not deteriorated and the data remain reliable for the years around 1960.[33]

As a result no adjustments for incompleteness need be made to the registered death rates.

Calculation of mortality rates

For ages 1 and over, central death rates were calculated from three-year averages of registered deaths in five-year age-sex groups (except for the four-year age-sex group 1-4) and the corresponding age-sex count from the census. Infant death rates were calculated from three-year averages of infant deaths and registered births.

Further adjustments to the life table

The female age-specific death rates did not progress smoothly from age to age but rather showed irregularities due apparently to random variation or unbiased age mis-statement. For ages 25-80, therefore, the rates were smoothed by three-term moving averages through their logarithms.

[32] *Demographic Yearbook, 1955* (United Nations publication, Sales No. 56.XIII.1), pp. 584-585 and 604-605, tables 17 and 18.

[33] The implication is not that there is no underregistration of infant deaths. Just as with adult deaths, we only concluded completeness relative to the census count; here we only conclude completeness relative to registered births. In fact, comparison of registered births with estimates based on cohort analyses of children ever born in the 1946, 1960 and 1970 censuses determined that births were 93 per cent registered during the 1946-1960 period and 94 per cent registered during the 1960-1970 period. Infant deaths apparently are equally underregistered.

Guyana Males 1959–1961

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.06409	.06103	100000	6103	95227	5953304	59.533	0.218
1	.00596	.02349	93897	2205	370006	5858076	62.388	1.469
5	.00096	.00479	91692	439	457361	5488070	59.854	2.500
10	.00091	.00454	91253	414	455227	5030710	55.129	2.500
15	.00147	.00733	90838	665	452673	4575482	50.370	2.718
20	.00263	.01307	90173	1178	448080	4122809	45.721	2.637
25	.00291	.01445	88994	1286	441797	3674729	41.292	2.530
30	.00313	.01553	87709	1362	435256	3232932	36.860	2.586
35	.00454	.02246	86346	1939	427176	2797677	32.401	2.651
40	.00675	.03322	84407	2804	415461	2370501	28.084	2.656
45	.01025	.05005	81603	4085	398498	1955040	23.958	2.670
50	.01695	.08150	77518	6318	372728	1556541	20.080	2.647
55	.02465	.11643	71200	8290	336300	1183813	16.627	2.623
60	.03920	.17918	62911	11273	287564	847514	13.472	2.606
65	.06062	.26350	51638	13606	224454	559949	10.844	2.521
70	.07933	.33025	38032	12560	158323	335495	8.821	2.465
75	.11345	.43820	25472	11162	98385	177172	6.956	2.404
80	.15569	.54903	14310	7857	50464	78787	5.506	2.316
85	.22785	******	6453	6453	28323	28323	4.389	4.389

Guyana Females 1959–1961

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.05554	.05320	100000	5320	95795	6364976	63.650	0.210
1	.00521	.02057	94680	1947	373729	6269181	66.215	1.437
5	.00083	.00414	92732	384	462702	5895452	63.575	2.500
10	.00063	.00315	92348	290	461016	5432750	58.829	2.500
15	.00144	.00718	92058	661	458817	4971734	54.007	2.770
20	.00234	.01164	91397	1063	454483	4512918	49.377	2.646
25	.00297	.01474	90334	1332	448455	4058435	44.927	2.587
30	.00366	.01814	89002	1614	441112	3609980	40.561	2.586
35	.00465	.02299	87387	2009	432072	3168868	36.262	2.579
40	.00559	.02758	85378	2355	421241	2736797	32.055	2.601
45	.00797	.03911	83024	3247	407440	2315555	27.890	2.636
50	.01162	.05655	79776	4512	388270	1908115	23.918	2.648
55	.01823	.08738	75265	6577	360764	1519845	20.193	2.634
60	.02657	.12491	68688	8580	322904	1159080	16.875	2.607
65	.03966	.18090	60108	10874	274172	836176	13.911	2.575
70	.05662	.24829	49235	12224	215903	562004	11.415	2.524
75	.07834	.32673	37010	12092	154356	346101	9.352	2.462
80	.10310	.40686	24918	10138	98332	191744	7.695	2.410
85	.15822	******	14780	14780	93412	93412	6.320	6.320

Life tables for Honduras were calculated for the 1960-1962 and 1973-1975 periods based on the population census age-sex counts of 17 April 1961 and 6 March 1974 and registered vital events by age and sex for the indicated three-year periods. Registration data were adjusted for incompleteness.

Sources of data

Both census and vital registration data are available from various issues of the United Nations *Demographic Yearbook* and official Honduras publications.[34]

Evaluation and adjustment of mortality data under age 5

The only external information available for evaluating mortality under age 5 was derived from the questions asked on children ever born and children surviving in the 1970-1972 National Demographic Survey (EDENH) and in the 1974 population census.[35]

Trussell regression equations were applied separately to both sets of data producing estimates of $q(2)$, $q(3)$ and $q(5)$, the probabilities of a child dying before ages 2, 3 and 5. Although the estimates obtained in EDENH were higher than those obtained in the population census, suggesting a decline in early-age mortality, neither source analysed separately supported the hypothesis of changes in mortality.[36] The difference in both sets of results may be produced by sampling errors to which EDENH was subjected and/or differential quality of responses. Because of the acknowledged quality of the data generated by EDENH, we accepted the estimates of $q(i)$ from this source and the population census results were not used.

EDENH also presents death rates by age based on the actual number of deaths which occurred within the time interval covered by the survey. These rates yield values of $q(i)$ which can be compared with those obtained from the retrospective questions on children ever born and children surviving. The following table summarizes the probabilities of dying before ages 2 and 5 as estimated from the children ever born and children surviving questions (Retro EDENH) and from the actual deaths recorded during the survey period (Prosp EDENH).

	Probability of dying before age i [q(i)] as estimated from:	
Age i	*Retro EDENH*	*Prosp EDENH*
2	0.1644	0.1484
5	0.1982	0.1815

The difference between the two sets of estimates may be due to a small recent decline in mortality (which would make the Retro EDENH estimates valid for a period of time before 1971), or to differences in the quality of data, or to both. If one assumes that the completeness of death registration in EDENH is constant in the age interval 1-4, and that mortality has changed little in the recent past,[37] the values of $q(2)$ and $q(5)$ may be manipulated to yield an estimate of completeness in age-group 1-4 thus:

$$C(1\text{-}4) = \frac{\ln {}_3p_2^{\text{Retro}}}{\ln {}_3p_2^{\text{Prosp}}} \qquad (1)$$

where $C(1\text{-}4)$ indicates completeness in the age interval 1-4 and ${}_3p_2$ indicates the probability of surviving from ages 2 to 3 in Retro EDENH or Prosp EDENH. The estimated value of $C(1\text{-}4)$ from the data of the above table is 0.96. Furthermore, if completeness in the age interval 0-1 is some constant multiple, K, of completeness in the age interval 1-4, we can estimate K utilizing either $q(2)$ or $q(5)$ and our estimate of $C(1\text{-}4)$ as:

$$K = \frac{(\ln {}_1p_0^{\text{Prosp}})\dfrac{1}{C(1-4)}}{\ln p(2)^{\text{Retro}} - \dfrac{1}{C(1-4)}(\ln {}_1p_1^{\text{Prosp}})} \qquad (2)$$

or as:

$$K = \frac{(\ln {}_1p_0^{\text{Prosp}})\dfrac{1}{C(1-4)}}{\ln p(2)^{\text{Retro}} - \dfrac{1}{C(1-4)}(\ln {}_4p_1^{\text{Prosp}})} \qquad (3)$$

In both cases we obtain a value of $K = 0.914$ indicating that Prosp EDENH detected about 87.7 per cent of the deaths occurring in the age interval 0-1. Applying these estimates of completeness of Prosp EDENH yields estimates of ${}_1q_0 = 0.1340$ and ${}_4q_1 = 0.1763$ for the 1970-1972 period.

Completeness of civil death registration for children under 5 can now be appraised by comparing registered rates to those just estimated from EDENH. A registered infant mortality rate was calculated for 1970-1972 from registered births during the period (adjusted for 13 per cent underregistration[38]) and registered infant deaths. A registered child mortality rate was estimated from the population age 1-4 developed from the adjusted registered births and registered deaths during the previous years and registered deaths during the three-year period. Comparison of these registered rates with estimated rates implies that 25 per cent of infant deaths and 47 per cent of childhood deaths are detected by the vital registration system.

Evaluation and adjustment of mortality data over age 5

The quality of death registration above age 5 was evaluated by Preston's method. Application of this method yielded the following estimates of completeness relative to the census counts:[39]

	Percentage completeness of death registration for ages 5 and over, relative to the census	
Period	*Males*	*Females*
1960-1962	58	55
1973-1975	66	66

Registered deaths above age 5 have been inflated, therefore, by the reciprocal of these completeness estimates.

[34]Population by age and sex can be found in *Demographic Yearbook, 1970* (United Nations publication, Sales No. E/F.71.XIII.1), pp. 232-233, table 6; and *Demographic Yearbook, 1977* (United Nations publication, Sales No. E/F.78.XIII.1), pp. 198-199, table 7. Registered births and deaths are from *Demographic Yearbook, 1961* (United Nations publication, Sales No. 62.XIII.1), pp. 300-303, table 15; *Demographic Yearbook, 1966* (United Nations publication, Sales No. 67.XIII.1), pp. 372-373, table 18; *Demographic Yearbook, 1965* (United Nations publication, Sales No. 66.XIII.1), p. 538, table 22; and Statistical Office of the United Nations.

[35]See K. A. Hill, A. Packer, G. A. Maccio, J. L. Somoza, *National Demographic Survey of Honduras: Methodology, Results, Indirect Estimates* (Santiago, CELADE, 1977), p. 136, table 6; and H. Behm and D. Pumante, *La Mortalidad en los Primeros Años de Vida en Países de América Latina: Honduras* (San José, CELADE, 1978).

[36]Each estimate $q(i)$ was transformed into a mortality level in each of four models of mortality developed by Coale and Demeny. Absence of evidence for mortality decline is reflected in the absence of a trend in the progression of estimated levels regardless of model used. In addition, the registered infant mortality rate has changed little in the past 10 years.

[37]See foot-note *36*.

[38]Underregistration of births in Honduras has been estimated by the United States Bureau of the Census. See United States Bureau of the Census, *Country Demographic Profiles: Honduras,* by G. S. Finch (Washington, D.C., 1977), p. 1.

[39]We have estimated here completeness of death registration (at ages 5 and over) relative to the census count. By combining these estimates with information on completeness of the 1961 and 1974 census counts we can obtain estimates of death registration completeness for ages 5 and over, independent of the census counts of 54 per cent for males and 52 per cent for females in 1960-1962, and 57 per cent for males and 59 per cent for females in 1973-1975. For estimates of the quality of the census, see United States Bureau of the Census, *Country Demographic Profiles: Honduras,* by G. S. Finch (Washington, D.C., 1977), p. 1.

Calculation of mortality rates

For ages 5 and over, central death rates were calculated from three-year averages of registered deaths in five-year age-sex groups and the corresponding age-sex count from the census moved to mid period. For ages under 5, mortality rates were estimated as previously described.

Further adjustments to the life table

Because the life tables did not exhibit a completely smooth progression of mortality rates from age to age, the rates were smoothed from ages 25 to 64 by three-term moving averages through their logarithms.

For both males and females, five-year age-specific mortality rates were available only through age-group 65-69. Mortality rates for ages 70-74, 75-79 and 80-84 were therefore estimated based on the age pattern of mortality change at the older ages displayed in the EDENH survey.[40]

[40]See A. Ortega and M. Rincón, *Encuesta Demografica Nacional: Mortalidad*, Fasiculo IV (Santiago, CELADE, 1975), pp. 49-50, tables 1.7 and 1.8.

Honduras Males 1960–1962

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.19620	.17341	100000	17341	88382	4061095	40.611	0.330
1	.03110	.11493	82659	9500	305481	3972713	48.061	1.352
5	.00650	.03198	73159	2340	359946	3667232	50.127	2.500
10	.00360	.01784	70819	1263	350938	3307286	46.700	2.500
15	.00550	.02715	69556	1889	343366	2956347	42.503	2.663
20	.00830	.04069	67667	2754	331771	2612982	38.615	2.615
25	.01040	.05071	64914	3292	316498	2281211	35.142	2.548
30	.01160	.05638	61622	3474	299498	1964712	31.883	2.521
35	.01290	.06251	58148	3635	281756	1665215	28.638	2.528
40	.01510	.07280	54513	3968	262806	1383459	25.378	2.540
45	.01820	.08711	50545	4403	241913	1120654	22.171	2.544
50	.02240	.10618	46142	4899	218713	878741	19.044	2.551
55	.02910	.13586	41243	5603	192550	660027	16.003	2.561
60	.04020	.18304	35640	6524	162279	467477	13.117	2.560
65	.05790	.25336	29116	7377	127405	305198	10.482	2.536
70	.08530	.35112	21739	7633	89486	177793	8.178	2.483
75	.12530	.47251	14106	6665	53195	88307	6.260	2.399
80	.18390	.61268	7441	4559	24790	35112	4.719	2.277
85	.27922	******	2882	2882	10322	10322	3.581	3.581

Honduras Females 1960–1962

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.15860	.14378	100000	14378	90654	4411924	44.119	0.350
1	.03090	.11428	85622	9785	316666	4321270	50.469	1.361
5	.00640	.03150	75837	2389	373215	4004603	52.805	2.500
10	.00330	.01636	73449	1202	364238	3631389	49.441	2.500
15	.00440	.02177	72247	1573	357482	3267150	45.222	2.615
20	.00600	.02957	70674	2090	348361	2909668	41.170	2.604
25	.00770	.03779	68584	2592	336627	2561307	37.346	2.573
30	.00920	.04498	65992	2969	322677	2224680	33.712	2.547
35	.01060	.05165	63023	3255	307096	1902003	30.180	2.537
40	.01220	.05922	59768	3540	290140	1594907	26.685	2.543
45	.01470	.07096	56228	3990	271428	1304767	23.205	2.566
50	.01940	.09267	52238	4841	249531	1033338	19.781	2.592
55	.02770	.12984	47397	6154	222176	783807	16.537	2.594
60	.04010	.18268	41243	7534	187890	561632	13.618	2.568
65	.05730	.25089	33708	8457	147593	373742	11.087	2.523
70	.07940	.33056	25251	8347	105128	226149	8.956	2.469
75	.10910	.42514	16904	7187	65872	121021	7.159	2.405
80	.14990	.53470	9718	5196	34663	55148	5.675	2.320
85	.22072	******	4522	4522	20486	20486	4.531	4.531

Honduras Males 1973–1975

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.15020	.13647	100000	13647	90857	5018497	50.185	0.330
1	.01670	.06397	86353	5524	330785	4927641	57.064	1.352
5	.00380	.01882	80829	1521	400343	4596855	56.871	2.500
10	.00220	.01094	79308	868	394370	4196512	52.914	2.500
15	.00340	.01687	78440	1323	389147	3802142	48.472	2.691
20	.00570	.02812	77117	2169	380445	3412995	44.257	2.629
25	.00670	.03296	74949	2470	368688	3032550	40.462	2.549
30	.00770	.03778	72478	2738	355645	2663862	36.754	2.536
35	.00860	.04211	69740	2937	341454	2308217	33.097	2.532
40	.00980	.04785	66803	3197	326193	1966764	29.441	2.552
45	.01220	.05925	63607	3769	308902	1640571	25.792	2.577
50	.01600	.07703	59838	4609	288072	1331669	22.255	2.588
55	.02180	.10354	55229	5719	262322	1043597	18.896	2.583
60	.02960	.13805	49510	6835	230913	781275	15.780	2.566
65	.04015	.18293	42675	7807	194438	550363	12.896	2.574
70	.06307	.27299	34869	9519	150923	355925	10.208	2.539
75	.09117	.37000	25350	9380	102879	205003	8.087	2.455
80	.12646	.47501	15971	7586	59988	102123	6.394	2.381
85	.19899	******	8384	8384	42135	42135	5.025	5.025

Honduras Females 1973–1975

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.12720	.11749	100000	11749	92363	5434182	54.342	0.350
1	.01510	.05809	88251	5126	339478	5341819	60.530	1.361
5	.00380	.01882	83125	1565	411715	5002341	60.178	2.500
10	.00180	.00896	81561	731	405977	4590626	56.285	2.500
15	.00230	.01144	80830	924	401926	4184649	51.771	2.595
20	.00290	.01440	79906	1151	396771	3782723	47.340	2.604
25	.00390	.01932	78755	1521	390125	3385952	42.994	2.601
30	.00490	.02421	77233	1870	381641	2995827	38.789	2.580
35	.00600	.02957	75363	2229	371428	2614186	34.688	2.582
40	.00770	.03780	73135	2764	359002	2242759	30.666	2.586
45	.00980	.04787	70371	3369	343725	1883757	26.769	2.587
50	.01290	.06257	67002	4192	324986	1540032	22.985	2.609
55	.01880	.08997	62810	5651	300599	1215047	19.345	2.620
60	.02770	.12988	57158	7424	268003	914448	15.998	2.604
65	.04080	.18565	49735	9233	226307	646445	12.998	2.578
70	.06047	.26313	40501	10657	176237	420138	10.373	2.535
75	.08835	.36101	29844	10774	121949	243900	8.172	2.469
80	.12589	.47380	19070	9035	71773	121951	6.395	2.390
85	.19998	******	10035	10035	50179	50179	5.001	5.001

Life tables for Hong Kong were calculated for 1960-1962, 1970-1972 and 1976 based on population censuses age-sex counts and registered vital events by age and sex.

Sources of data

Age-specific mortality probabilities (${}_nq_x$) for 1961, 1971 and 1976 calculated from vital registration and population census data are presented in Hong Kong publications.[41]

[41]Hong Kong, Census and Statistics Department, *Life Tables 1971-1991* (1973), p. 3, table 2.1, and *Hong Kong Life Tables* (1978), pp. 12-13, tables 1 and 2.

Evaluation and adjustment of data

Post-enumeration surveys following the censuses showed underenumeration of 0.6 per cent, 1.05 per cent, and 0.4 per cent for 1961, 1971 and 1976, respectively. Death registration in Hong Kong has been accurate since 1960.[42] Hence, no adjustment to the published mortality rates was necessary.

[42]United Nations Economic and Social Commission for Asia and the Pacific, *Population of Hong Kong*, Country Monograph Series No. 1 (1974), pp. 122 and 132; and Hong Kong, Census and Statistics Department, *Hong Kong By-Census 1976, Main Report*, vol. 1 (1979), p. 18.

Hong Kong Males 1960–1962

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.04208	.04064	100000	4064	96584	6367426	63.674	0.159
1	.00430	.01703	95936	1634	379709	6270842	65.365	1.531
5	.00096	.00480	94302	453	470379	5891133	62.471	2.500
10	.00066	.00330	93850	310	468474	5420753	57.760	2.500
15	.00076	.00377	93540	353	466866	4952280	52.943	2.638
20	.00129	.00645	93187	601	464522	4485413	48.133	2.647
25	.00155	.00773	92586	716	461218	4020891	43.429	2.607
30	.00220	.01093	91870	1004	456978	3559673	38.747	2.636
35	.00304	.01510	90866	1372	451119	3102695	34.146	2.658
40	.00484	.02394	89494	2142	442491	2651577	29.628	2.675
45	.00741	.03644	87352	3183	429463	2209086	25.290	2.708
50	.01414	.06846	84169	5762	407450	1779623	21.144	2.676
55	.01984	.09479	78406	7432	374682	1372173	17.501	2.666
60	.03818	.17488	70974	12412	325128	997491	14.054	2.604
65	.04778	.21384	58562	12523	262106	672363	11.481	2.548
70	.07752	.32458	46039	14943	192777	410258	8.911	2.496
75	.10170	.40366	31096	12552	123429	217481	6.994	2.447
80	.16584	.57360	18544	10637	64137	94052	5.072	2.313
85	.26432	******	7907	7907	29915	29915	3.783	3.783

Hong Kong Females 1960–1962

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.03555	.03451	100000	3451	97079	7111077	71.111	0.154
1	.00438	.01733	96549	1673	381959	7013998	72.647	1.468
5	.00082	.00411	94876	390	473404	6632039	69.902	2.500
10	.00046	.00230	94486	217	471886	6158635	65.180	2.500
15	.00067	.00335	94269	316	470590	5686749	60.325	2.617
20	.00081	.00406	93953	381	468860	5216159	55.519	2.631
25	.00127	.00632	93571	591	466459	4747298	50.735	2.637
30	.00159	.00791	92980	735	463141	4280840	46.040	2.609
35	.00217	.01079	92244	995	458868	3817699	41.387	2.634
40	.00309	.01534	91249	1400	452931	3358831	36.809	2.632
45	.00421	.02084	89849	1872	444868	2905901	32.342	2.661
50	.00699	.03440	87977	3026	432763	2461033	27.974	2.647
55	.00914	.04473	84951	3800	415811	2028269	23.876	2.647
60	.01552	.07483	81151	6073	391380	1612458	19.870	2.633
65	.02021	.09647	75078	7243	358327	1221078	16.264	2.644
70	.03792	.17412	67835	11811	311460	862750	12.718	2.653
75	.06166	.26805	56024	15017	243539	551291	9.840	2.564
80	.09556	.38548	41007	15807	165412	307752	7.505	2.493
85	.17704	******	25199	25199	142340	142340	5.649	5.649

Hong Kong Males 1970–1972

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.02370	.02321	100000	2321	97933	6757539	67.575	0.109
1	.00136	.00542	97679	529	389436	6659607	68.178	1.583
5	.00046	.00230	97150	223	485189	6270170	64.541	2.500
10	.00049	.00244	96926	236	484039	5784981	59.684	2.500
15	.00074	.00369	96690	357	482613	5300942	54.824	2.658
20	.00105	.00524	96333	505	480488	4818329	50.018	2.671
25	.00169	.00844	95828	809	477232	4337841	45.267	2.641
30	.00210	.01046	95019	994	472717	3860608	40.630	2.606
35	.00288	.01428	94025	1343	466965	3387891	36.032	2.645
40	.00434	.02146	92683	1989	458753	2920927	31.515	2.657
45	.00638	.03143	90694	2851	446853	2462174	27.148	2.679
50	.01092	.05327	87843	4679	428434	2015320	22.942	2.696
55	.01821	.08733	83164	7263	398901	1586887	19.081	2.671
60	.02971	.13874	75901	10531	354499	1187986	15.652	2.625
65	.04473	.20168	65371	13184	294755	833487	12.750	2.565
70	.06360	.27488	52187	14345	225565	538731	10.323	2.534
75	.09967	.39635	37842	14999	150476	313167	8.276	2.418
80	.11603	.44505	22843	10166	87616	162690	7.122	2.384
85	.16886	******	12677	12677	75075	75075	5.922	5.922

Hong Kong Females 1970–1972

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.01748	.01721	100000	1721	98454	7518388	75.184	0.102
1	.00108	.00431	98279	424	392055	7419934	75.499	1.496
5	.00035	.00176	97855	172	488847	7027879	71.819	2.500
10	.00033	.00164	97683	160	488015	6539032	66.941	2.500
15	.00052	.00259	97523	253	487025	6051017	62.047	2.666
20	.00073	.00365	97270	355	485498	5563991	57.201	2.593
25	.00082	.00408	96915	395	483623	5078494	52.401	2.587
30	.00112	.00559	96520	540	481331	4594871	47.605	2.648
35	.00168	.00839	95980	805	478010	4113540	42.858	2.650
40	.00234	.01165	95175	1109	473262	3635530	38.198	2.643
45	.00342	.01697	94066	1596	466629	3162268	33.617	2.680
50	.00576	.02840	92470	2626	456224	2695640	29.151	2.667
55	.00808	.03966	89844	3563	440799	2239416	24.926	2.637
60	.01204	.05856	86281	5053	419642	1798617	20.846	2.672
65	.02083	.09932	81228	8068	387286	1378975	16.977	2.663
70	.03241	.15045	73161	11007	339643	991690	13.555	2.623
75	.05207	.23138	62154	14381	276208	652047	10.491	2.597
80	.08685	.35740	47772	17074	196595	375839	7.867	2.524
85	.17127	******	30699	30699	179244	179244	5.839	5.839

Hong Kong Males 1976

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.01592	.01569	100000	1569	98568	6959729	69.597	0.088
1	.00084	.00336	98431	331	392932	6861160	69.705	1.606
5	.00046	.00230	98100	226	489937	6468228	65.935	2.500
10	.00039	.00193	97875	189	488901	5978291	61.081	2.500
15	.00069	.00344	97686	336	487663	5489390	56.194	2.723
20	.00113	.00565	97350	550	485448	5001726	51.379	2.635
25	.00133	.00664	96800	643	482456	4516279	46.656	2.600
30	.00186	.00924	96157	888	478659	4033823	41.950	2.608
35	.00228	.01133	95268	1079	473803	3555163	37.317	2.647
40	.00385	.01909	94189	1798	466787	3081361	32.715	2.687
45	.00582	.02872	92391	2653	455776	2614574	28.299	2.671
50	.00929	.04548	89738	4081	439188	2158798	24.057	2.672
55	.01461	.07065	85656	6052	414206	1719610	20.076	2.674
60	.02481	.11719	79605	9329	376088	1305404	16.399	2.649
65	.03822	.17498	70276	12297	321738	929316	13.224	2.590
70	.05588	.24581	57979	14252	255047	607578	10.479	2.555
75	.08696	.35701	43727	15611	179523	352531	8.062	2.495
80	.12986	.48566	28116	13655	105148	173009	6.153	2.405
85	.21310	******	14461	14461	67861	67861	4.693	4.693

Hong Kong Females 1976

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.01229	.01215	100000	1215	98890	7656843	76.568	0.086
1	.00084	.00336	98785	332	394312	7557953	76.509	1.504
5	.00034	.00171	98453	168	491845	7163641	72.762	2.500
10	.00029	.00143	98285	141	491072	6671796	67.882	2.500
15	.00041	.00207	98144	203	490243	6180724	62.976	2.649
20	.00059	.00294	97941	288	489022	5690481	58.101	2.628
25	.00077	.00384	97653	375	487373	5201459	53.265	2.621
30	.00106	.00528	97278	514	485163	4714086	48.460	2.611
35	.00133	.00661	96764	640	482308	4228922	43.703	2.632
40	.00202	.01006	96125	967	478367	3746615	38.977	2.666
45	.00300	.01488	95158	1416	472495	3268248	34.346	2.673
50	.00479	.02367	93742	2219	463564	2795753	29.824	2.681
55	.00750	.03686	91523	3374	449778	2332189	25.482	2.677
60	.01206	.05865	88149	5170	428614	1882411	21.355	2.653
65	.01764	.08469	82980	7028	398300	1453797	17.520	2.638
70	.02794	.13112	75952	9959	356419	1055497	13.897	2.656
75	.04939	.22105	65993	14588	295349	699078	10.593	2.627
80	.08424	.34925	51405	17953	213120	403729	7.854	2.554
85	.17550	******	33452	33452	190608	190608	5.698	5.698

Life tables for India were calculated for the 1970-1972 period based on the age-specific death rates from the Indian Sample Registration System (SRS).

Sources of data

Age-specific death rates for 1970, 1971 and 1972 by sex and rural/urban residence are available from official Indian publications.[43]

Rural and urban age-specific death rates for the three-year period 1970-1972 were calculated as the simple average of the age-specific death rates for the individual years. Age-specific death rates for all-India (rural and urban populations combined) were then calculated as the weighted average of the rural and urban rates, the weights being the proportion between rural and urban in each age-sex group from the 1971 census population.[44]

Evaluation of the death rates at ages 5 and over

The methods of Preston and Brass both imply that the registration of deaths in the SRS is approximately 95 per cent complete for males and 85 per cent complete for females during 1970-1972.[45] The death rates were therefore adjusted by the reciprocals of these completeness estimates.

Evaluation of death rates at ages under age 5

Because different mortality data under age 5 were available in the rural and urban areas, the data were evaluated separately for each place of residence.

In the rural area, data for 1970-1972 were not available for infant and childhood age-groups 0-1 and 1-4 but only for the one large age-group 0-4. However, it is possible to derive ${}_1M_0$ and ${}_4M_1$ from earlier years of the SRS (1968 and 1969), and since there was apparently only small change in mortality between 1968-1969 and 1970-1972, we assumed that the age pattern of mortality (although not the level) under age 5 was unchanged between 1968-1969 and 1970-1972.[46]

Questions on children ever born and children surviving were asked in the 1972 Fertility Survey and tabulated by age of mother, allowing application of Trussell regression equations to make indirect estimates of infant and childhood mortality from calculated proportions of children not surviving by age of mother.[47]

Comparison of these indirect estimates with mortality rates calculated directly from the SRS data gave no evidence of incompleteness of SRS mortality data during the infant and childhood years (see following table):

	Probability of dying before age x (${}_xq_0$) estimated from:					
	SRS[a] 1968-1969		*SRS[a] 1970-1972*		*Trussell regression equations[b]*	
Age x	*M*	*F*	*M*	*F*	*Estimate*	*Reference date*
2.....	0.17679	0.19581	0.16652	0.18134	0.13955	January 1970
3.....	0.20273	0.22838	0.19224	0.21330	0.16121	March 1968
5.....	0.23666	0.27164	0.22487	0.25574	0.17387	December 1965

[a] From values of ${}_1M_0$ and ${}_4M_1$ derived from the SRS surveys, ${}_1q_0$ and ${}_5q_0$ were calculated by usual life table procedures. Values of ${}_2q_0$ and ${}_3q_0$ were calculated from the complements of the ${}_1q_0$ and ${}_5q_0$ values (l_1 and l_5) using the interpolation coefficients of Coale and Demeny North model.

[b] Calculation made by the United Nations Population Division from tabulations of children ever born and children surviving by age of mother from the 1972 Indian Fertility Survey.

Central death rates from the two infant and childhood age-groups 0-1 and 1-4 were also not available for the 1970-1972 period in the urban areas. Only ${}_5M_0$, the central death rate for the combined age-group 0-4, was available. Furthermore, for the urban population there was no empirical standard such as earlier data from the SRS to estimate ${}_1M_0$ and ${}_4M_1$ from ${}_5M_0$. Hence, for each sex, we calculated ${}_1M_0$ and ${}_4M_1$ by sex on the assumption that the age pattern of mortality under age 5 in urban India is the same as that of the Coale-Demeny model life table system, North region.[48]

	Probability of dying before age x (${}_xq_0$) estimated from:			
	SRS[a] 1970-1972		*Trussell regression equations[b]*	
Age x	*M*	*F*	*Estimate*	*Reference date*
2.....	0.103416	0.109354	0.106458	April 1970
3.....	0.115006	0.123913	0.101798	June 1968
5.....	0.130709	0.143248	0.12421	March 1966

[a] From values of ${}_1M_0$ derived from the SRS surveys, ${}_1q_0$ and ${}_5q_0$ were calculated by usual life table procedures. Values of ${}_2q_0$ and ${}_3q_0$ were calculated from the complements of the ${}_1q_0$ and ${}_5q_0$ values (l_1 and l_5) using the interpolation coefficients of Coale and Demeny North model.

[b] Calculation made by the United Nations Population Division from tabulations of children ever born and children surviving by age of mother from the 1972 Indian Fertility Survey.

Hence, there is no evidence of incompleteness in the SRS mortality rates under age 5 and no adjustments were made at these ages.

Further adjustments to the life table

The male life table exhibited a relatively smooth progression of death rates from age to age. However, female mortality rates for ages 50-65 showed irregularities due apparently to random variation and age mis-statement. The female mortality rates for these ages were therefore smoothed by three-term moving averages through their logarithms.

For both males and females, five-year age-specific mortality rates were available only through age-group 65-69. Mortality rates for ages 70-74, 75-79 and 80-84 were therefore estimated by fitting a Makeham curve through the $q_x/(1-q_x)$ function for ages 40-44, 45-49, . . . , 65-69 and extrapolating the rates to ages 70-74, 75-79 and 80-84.

[43] For 1970, age-specific death rates by rural and urban residence have been taken from India, Ministry of Home Affairs, Registrar General, *Sample Registration Bulletin*, vol. IX, No. 4 (New Delhi, October 1975), tables 4(*a*)-4(*f*). For 1971 and 1972, death rates by rural and urban residence have been taken from *ibid.*, vol. XI, No. 4 (New Delhi, October 1977), tables 4(*a*) and 4(*b*).

[44] India, Registrar General and Census, *Census of India 1971, Series 1, Part II-C(ii), Social and Cultural Tables* (Delhi, 1977), table C-IV.

[45] For a detailed analysis of the quality of the mortality data from the SRS, see S. Preston, N. Chen and J. Hobcraft, "Preliminary report on application of techique for estimating death registration completeness to data from the Indian Sample Registration System" (mimeo.); and

India, Office of the Registrar General, "Some aspects for consideration in regard to the paper by Preston, Chen and Hobcraft" (mimeo.).

[46]Values of ${}_5M_0$ from the 1968-1969 and 1970-1972 SRS by sex are as follows:

	M	*F*
1968-1969	0.05872	0.06849
1970-1972	0.05573	0.06250

[47]India, Ministry of Home Affairs, Office of the Registrar General and Census Commissions, Vital Statistics Division, *Fertility Differentials in India; Results of the Fertility Survey in a Sub-sample of SRS (1972)* (New Delhi, 1976), table 47. Average number of children for women was calculated on the basis of data for average number of children per ever-married woman given in *ibid.*, table 40, and Indian 1971 census population by marital status given in India, Registrar General and Census, *Census of India 1971, Series 1, Part II-C (ii), Social and Cultural Tables* (Delhi, 1977), table C-II.

[48]According to the 1971 census, only 17.7 per cent of the population under 5 is in urban areas (*Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), p. 236, table 7). Misspecification of the age pattern of mortality under 5 in the urban areas would cause only small error in the infant and childhood age pattern for all India.

India Males 1970–1972

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.13127	.12066	100000	12066	91916	4911508	49.115	0.330
1	.02745	.10236	87934	9001	327902	4819592	54.809	1.352
5	.00496	.02450	78933	1934	389832	4491690	56.905	2.500
10	.00209	.01040	77000	800	382997	4101857	53.271	2.500
15	.00238	.01183	76199	902	378809	3718860	48.804	2.574
20	.00306	.01519	75298	1144	373708	3340050	44.358	2.569
25	.00341	.01691	74154	1254	367710	2966343	40.002	2.559
30	.00420	.02079	72900	1516	360847	2598633	35.646	2.589
35	.00544	.02685	71385	1917	352387	2237786	31.348	2.634
40	.00842	.04128	69468	2868	340597	1885399	27.141	2.649
45	.01212	.05892	66600	3924	323780	1544802	23.195	2.651
50	.01960	.09365	62676	5869	299455	1221022	19.482	2.628
55	.02722	.12778	56806	7259	266667	921567	16.223	2.608
60	.04317	.19538	49548	9681	224243	654899	13.218	2.573
65	.05948	.25909	39867	10329	173660	430657	10.802	2.514
70	.08381	.34555	29538	10207	121786	256997	8.701	2.462
75	.11473	.44131	19331	8531	74356	135210	6.995	2.386
80	.15289	.54148	10800	5848	38250	60854	5.635	2.307
85	.21907	******	4952	4952	22604	22604	4.565	4.565

India Females 1970–1972

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.13493	.12405	100000	12405	91937	4615488	46.155	0.350
1	.03609	.13181	87595	11546	319911	4523552	51.642	1.361
5	.00614	.03024	76049	2299	374498	4203640	55.275	2.500
10	.00275	.01366	73750	1007	366232	3829142	51.921	2.500
15	.00393	.01947	72743	1416	360365	3462910	47.605	2.635
20	.00547	.02699	71327	1925	351932	3102545	43.498	2.558
25	.00548	.02703	69402	1876	342363	2750614	39.633	2.524
30	.00649	.03194	67525	2157	332306	2408251	35.664	2.533
35	.00684	.03363	65369	2198	321407	2075945	31.757	2.527
40	.00791	.03881	63170	2451	309918	1754538	27.775	2.579
45	.01084	.05284	60719	3209	295988	1444621	23.792	2.629
50	.01641	.07900	57510	4543	276857	1148632	19.973	2.646
55	.02575	.12132	52967	6426	249559	871775	16.459	2.623
60	.03826	.17513	46541	8151	213037	622217	13.369	2.587
65	.05733	.25129	38390	9647	168274	409179	10.658	2.546
70	.08453	.34845	28743	10015	118484	240905	8.381	2.481
75	.12171	.46192	18728	8651	71076	122422	6.537	2.392
80	.16984	.58164	10077	5861	34510	51346	5.095	2.292
85	.25040	******	4216	4216	16836	16836	3.994	3.994

Life tables for Iran were constructed for the 1973-1976 period based on results of the Iranian Population Growth Survey.[49]

Source of data

The Population Growth Survey was a multiround follow-up survey of a nationally representative sample of 100,000 individuals. After an initial baseline enumeration of the sample population in October 1973, enumerators returned to the sample households six additional times at six-month intervals inquiring of births, deaths and moves among the enumerated population during the preceding six-month interval.

Evaluation and adjustment of the data

As part of the survey procedure itself, "completeness checks" of the recorded vital events were undertaken at the end of each survey year. Special investigators independently re-interviewed a sub-sample of households. The vital events recorded in the original interview and in the re-interview were matched to provide gross measures of completeness of birth and death recording and appropriate correction factors. These correction factors (1.058 for births, 1.093 for deaths) are incorporated into the published survey results.

To evaluate further the completeness of the survey mortality data, analytical techniques of Brass and Preston were applied to the data. Evaluation of the results of these tests indicated that the published results were well over 90 per cent complete for both males and females. As a result, no additional adjustments for completeness were made to the data.

Calculation of mortality rates

Age-sex specific mortality rates are given in the source publication for urban areas, rural areas and the whole country. They are calculated from recorded deaths during the survey period (adjusted by factors derived from the completeness checks) and the number of person-years lived during the survey period in each age-sex group. Urban and rural death rates are weighted by the urban and rural proportions for each age-sex group in the 1976 census to give the published rates for the whole country.

Further adjustments to the life table

The male and female age-specific death rates did not progress smoothly from age to age but, rather, showed quite large irregularities which were apparently due to random variation and unbiased age mis-statement. From ages 15 to 70 for males and 15 to 80 for females, therefore, the rates were smoothed by three-term moving averages through their logarithms. As this did not completely eliminate the irregularities in the female death rates, the procedure was carried out a second time for females in order to estimate re-smoothed death rates for ages 20-75.

[49] Iran, Statistical Centre of Iran, Plan and Budget Organization, *Population Growth Survey of Iran, Final Report 1973-1976* (Teheran, 1978), p. 98, table 39.

Iran Males 1973–1976

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.12950	.11916	100000	11916	92016	5718875	57.189	0.330
1	.01530	.05882	88084	5181	338617	5626859	63.881	1.352
5	.00220	.01094	82903	907	412248	5288242	63.788	2.500
10	.00120	.00598	81996	491	408754	4875994	59.466	2.500
15	.00145	.00722	81506	589	406086	4467240	54.809	2.552
20	.00156	.00777	80917	629	403037	4061154	50.189	2.539
25	.00178	.00886	80288	711	399708	3658117	45.562	2.565
30	.00217	.01079	79577	859	395833	3258409	40.947	2.613
35	.00313	.01554	78718	1223	390732	2862576	36.365	2.664
40	.00493	.02437	77495	1889	383082	2471845	31.897	2.675
45	.00761	.03739	75606	2827	371456	2088763	27.627	2.674
50	.01228	.05968	72779	4343	353696	1717307	23.596	2.652
55	.01781	.08545	68436	5848	328341	1363611	19.925	2.634
60	.02787	.13068	62588	8179	293470	1035269	16.541	2.619
65	.04176	.18967	54409	10320	247122	741799	13.634	2.585
70	.06360	.27455	44089	12105	190323	494677	11.220	2.511
75	.08330	.34284	31985	10966	131642	304355	9.516	2.421
80	.10010	.39670	21019	8338	83298	172712	8.217	2.386
85	.14182	******	12681	12681	89414	89414	7.051	7.051

Iran Females 1973–1976

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.14200	.13000	100000	13000	91550	5655854	56.559	0.350
1	.01920	.07310	87000	6359	331217	5564304	63.958	1.361
5	.00280	.01390	80641	1121	400400	5233087	64.894	2.500
10	.00130	.00648	79519	515	396309	4832687	60.774	2.500
15	.00164	.00817	79004	645	393449	4436378	56.154	2.563
20	.00179	.00891	78359	698	390073	4042929	51.595	2.534
25	.00197	.00980	77661	761	386451	3652856	47.036	2.566
30	.00251	.01247	76899	959	382185	3266405	42.476	2.590
35	.00311	.01544	75940	1172	376901	2884220	37.980	2.612
40	.00443	.02192	74768	1639	369944	2507319	33.535	2.623
45	.00586	.02890	73129	2114	360676	2137375	29.227	2.648
50	.00958	.04686	71016	3328	347342	1776699	25.018	2.675
55	.01495	.07223	67688	4889	327039	1429357	21.117	2.668
60	.02493	.11771	62799	7392	296507	1102318	17.553	2.634
65	.03656	.16798	55407	9307	254570	805811	14.544	2.586
70	.05439	.23994	46100	11061	203367	551241	11.958	2.547
75	.07894	.32849	35039	11510	145804	347874	9.928	2.447
80	.09270	.37398	23529	8799	94924	202070	8.588	2.418
85	.13747	******	14729	14729	107146	107146	7.274	7.274

Life tables for the Jewish population of Israel were constructed for the periods 1948-1949, 1960-1962 and 1971-1973 based on the age-sex counts from the population registration of 8 November 1948 and the population censuses of 22 May 1961 and 20 May 1972, and on registered vital events by age and sex.

Sources of data

Population and vital registration data are available from official Israeli publications.[50]

Evaluation and adjustment of data

Because of the unusually large volume of migration that has characterized the development of the Israeli population from the creation of the State in 1948 to the present day, the age structure of the population is far from stable and neither the Brass nor Preston methods gave usable results.[51] However, registration of both births and deaths among the Jewish population is known to have been complete for many years[52] and no adjustment was made to the mortality data.

Calculation of mortality rates

For the 1948-1949 life tables, central death rates were calculated based on the two-year average of registered deaths by age and sex and the corresponding age-sex distribution from the population registration moved to 31 December 1948 based on registered births, deaths and migrants. Infant death rates were calculated from registered infant deaths and births in 1949.

For the 1960-1962 and 1971-1973 life tables, central death rates were calculated from three-year averages of deaths by age and sex and the corresponding age-sex distributions from the censuses moved to mid period, again based on registered births, deaths and migrants. Infant death rates were calculated from registered infant deaths and births during the three-year period surrounding the censuses.

Further adjustments to the life table

The age-specific death rates did not progress smoothly from age to age but, rather, showed irregularities due apparently to random variation or age mis-statement. Therefore, the death rates were smoothed from ages 15 on for females and 25 on for males by three-term moving averages through their logarithms.

[50]For populations by age and sex, see Israel, Central Bureau of Statistics, *Statistical Abstract of Israel 1963* (Jerusalem, 1963), p. 38, table 15; and *Statistical Abstract of Israel 1978* (Jerusalem, 1978), p. 31, table ii/1. Registered deaths by age and sex, and births by sex are found in Israel, Central Bureau of Statistics, *Vital Statistics 1972* (Jerusalem, 1974), p. 127, table 99; *Vital Statistics 1973-1976* (Jerusalem, 1978), p. 131, table 99; *Statistical Abstract of Israel 1978* (Jerusalem, 1978), p. 90, table iii/19; and *Late Fetal and Infant Deaths in Israel 1948-72* (Jerusalem, 1974), pp. 113-114, table I.

[51]For both methods, estimates of completeness were well over 100 per cent.

[52]See R. Bachi, *The Population of Israel*, CICRED Series (Jerusalem, n.d.), p. 407.

Israel Males (Jewish population) 1948–1949

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.05861	.05600	100000	5600	95540	6509631	65.096	0.203
1	.00421	.01666	94400	1573	373644	6414091	67.946	1.484
5	.00124	.00618	92827	574	462702	6040447	65.072	2.500
10	.00087	.00434	92254	400	460267	5577744	60.461	2.500
15	.00144	.00718	91853	659	457704	5117477	55.714	2.630
20	.00165	.00822	91194	749	454095	4659773	51.097	2.497
25	.00144	.00717	90445	649	450613	4205678	46.500	2.516
30	.00181	.00901	89796	809	447037	3755066	41.818	2.599
35	.00236	.01173	88987	1044	442440	3308029	37.174	2.611
40	.00316	.01568	87943	1379	436477	2865589	32.585	2.654
45	.00509	.02515	86563	2177	427799	2429112	28.062	2.696
50	.00850	.04169	84386	3518	413867	2001313	23.716	2.708
55	.01506	.07277	80868	5885	390773	1587445	19.630	2.695
60	.02515	.11873	74983	8903	353994	1196673	15.959	2.650
65	.03980	.18164	66080	12003	301580	842679	12.752	2.599
70	.06019	.26226	54077	14182	235625	541099	10.006	2.549
75	.09192	.37335	39895	14895	162040	305474	7.657	2.487
80	.14162	.51664	25000	12916	91202	143434	5.737	2.383
85	.23136	******	12084	12084	52232	52232	4.322	4.322

Israel Females (Jewish population) 1948–1949

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.04596	.04430	100000	4430	96380	6763917	67.639	0.183
1	.00414	.01639	95570	1566	378291	6667537	69.766	1.452
5	.00093	.00464	94004	436	468931	6289246	66.904	2.500
10	.00065	.00324	93568	304	467082	5820315	62.204	2.500
15	.00087	.00434	93265	405	465361	5353233	57.398	2.624
20	.00119	.00593	92860	551	462977	4887873	52.637	2.601
25	.00143	.00713	92309	658	459947	4424896	47.936	2.573
30	.00171	.00851	91651	780	456355	3964949	43.261	2.565
35	.00199	.00990	90871	900	452208	3508594	38.611	2.616
40	.00304	.01509	89971	1358	446702	3056386	33.971	2.679
45	.00484	.02393	88613	2121	438136	2609685	29.450	2.676
50	.00743	.03651	86492	3158	425044	2171549	25.107	2.651
55	.01078	.05256	83334	4380	406348	1746505	20.958	2.643
60	.01647	.07932	78954	6262	380227	1340158	16.974	2.678
65	.02986	.13963	72691	10150	339914	959931	13.206	2.680
70	.05279	.23456	62542	14670	277894	620017	9.914	2.627
75	.09308	.37879	47871	18133	194815	342123	7.147	2.544
80	.16508	.57710	29738	17162	103960	147309	4.954	2.394
85	.29012	******	12576	12576	43348	43348	3.447	3.447

Israel Males (Jewish population) 1960–1962

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.03028	.02950	100000	2950	97426	7076373	70.764	0.127
1	.00123	.00491	97050	476	387040	6978948	71.911	1.564
5	.00052	.00260	96574	251	482243	6591908	68.258	2.500
10	.00046	.00230	96323	221	481062	6109665	63.429	2.500
15	.00103	.00514	96102	494	479370	5628603	58.569	2.692
20	.00117	.00583	95608	558	476649	5149233	53.858	2.505
25	.00107	.00534	95050	507	473987	4672584	49.159	2.505
30	.00121	.00603	94543	570	471331	4198597	44.409	2.571
35	.00152	.00757	93973	712	468173	3727266	39.663	2.623
40	.00222	.01104	93261	1030	463916	3259093	34.946	2.678
45	.00366	.01815	92231	1674	457333	2795177	30.306	2.716
50	.00648	.03193	90558	2891	446211	2337844	25.816	2.726
55	.01153	.05616	87666	4924	427038	1891633	21.578	2.706
60	.01959	.09367	82742	7750	395622	1464595	17.701	2.666
65	.03110	.14488	74992	10865	349353	1068973	14.254	2.643
70	.05312	.23563	64127	15110	284456	719620	11.222	2.606
75	.08782	.35904	49017	17599	200400	435164	8.878	2.461
80	.10600	.41629	31418	13079	123386	234764	7.472	2.423
85	.16466	******	18339	18339	111378	111378	6.073	6.073

Israel Females (Jewish population) 1960–1962

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.02430	.02379	100000	2379	97910	7264362	72.644	0.121
1	.00120	.00479	97621	467	389308	7166453	73.411	1.485
5	.00041	.00205	97154	199	485271	6777144	69.757	2.500
10	.00029	.00145	96955	140	484422	6291874	64.895	2.500
15	.00053	.00265	96814	256	483471	5807452	59.986	2.657
20	.00062	.00310	96558	299	482065	5323981	55.138	2.574
25	.00076	.00379	96259	365	480418	4841916	50.301	2.596
30	.00099	.00494	95894	474	478343	4361499	45.483	2.621
35	.00137	.00683	95420	652	475569	3883156	40.695	2.648
40	.00204	.01015	94769	962	471614	3407586	35.957	2.681
45	.00334	.01657	93807	1555	465456	2935973	31.298	2.699
50	.00548	.02706	92252	2496	455510	2470516	26.780	2.696
55	.00905	.04432	89756	3978	439605	2015006	22.450	2.694
60	.01521	.07346	85778	6301	414278	1575402	18.366	2.681
65	.02518	.11895	79476	9454	375456	1161123	14.610	2.681
70	.04661	.21009	70022	14711	315616	785667	11.220	2.655
75	.08449	.34912	55311	19310	228552	470050	8.498	2.514
80	.11604	.44765	36001	16116	138882	241499	6.708	2.448
85	.19378	******	19885	19885	102616	102616	5.160	5.160

Israel Males (Jewish population) 1971–1973

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.02106	.02067	100000	2067	98144	7054832	70.548	0.102
1	.00075	.00299	97933	293	391026	6956688	71.035	1.591
5	.00049	.00245	97640	239	487602	6565662	67.244	2.500
10	.00042	.00210	97401	204	486494	6078060	62.403	2.500
15	.00085	.00424	97197	412	485042	5591567	57.528	2.719
20	.00121	.00603	96784	584	482473	5106524	52.762	2.518
25	.00094	.00469	96200	451	479875	4624052	48.067	2.501
30	.00123	.00613	95749	587	477356	4144176	43.281	2.632
35	.00179	.00891	95162	848	473831	3666820	38.532	2.665
40	.00277	.01376	94314	1298	468573	3192988	33.855	2.691
45	.00460	.02276	93016	2117	460207	2724415	29.290	2.698
50	.00750	.03686	90899	3351	446748	2264208	24.909	2.688
55	.01220	.05932	87549	5194	425697	1817460	20.759	2.681
60	.02016	.09627	82355	7928	393262	1391763	16.900	2.665
65	.03293	.15283	74427	11374	345413	998501	13.416	2.651
70	.05776	.25349	63052	15983	276717	653088	10.358	2.588
75	.08967	.36579	47069	17217	192007	376371	7.996	2.483
80	.13038	.48677	29852	14531	111451	184364	6.176	2.398
85	.21013	******	15321	15321	72913	72913	4.759	4.759

Israel Females (Jewish population) 1971–1973

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.01679	.01654	100000	1654	98511	7346108	73.461	0.100
1	.00065	.00260	98346	255	392745	7247597	73.695	1.497
5	.00037	.00185	98091	181	490000	6854852	69.883	2.500
10	.00028	.00140	97909	137	489205	6364852	65.008	2.500
15	.00041	.00205	97772	200	488386	5875647	60.095	2.620
20	.00050	.00250	97572	244	487272	5387262	55.213	2.582
25	.00061	.00305	97329	296	485933	4899990	50.345	2.607
30	.00084	.00419	97032	407	484198	4414056	45.491	2.632
35	.00116	.00578	96625	559	481824	3929859	40.671	2.668
40	.00190	.00946	96067	909	478243	3448035	35.892	2.701
45	.00310	.01539	95158	1465	472433	2969792	31.209	2.708
50	.00533	.02633	93693	2467	462815	2497359	26.655	2.709
55	.00892	.04370	91226	3987	446966	2034543	22.302	2.701
60	.01528	.07380	87240	6438	421339	1587578	18.198	2.692
65	.02613	.12322	80801	9956	381028	1166238	14.433	2.692
70	.04986	.22294	70845	15794	316777	785210	11.083	2.629
75	.07989	.33332	55051	18349	229681	468434	8.509	2.516
80	.11992	.45847	36701	16826	140314	238752	6.505	2.433
85	.20190	******	19875	19875	98438	98438	4.953	4.953

Life tables for the non-Jewish population of Israel were constructed for the period 1971-1973 based on the population census age-sex count of 20 May 1972 and registered vital events by age and sex for 1971, 1972 and 1973.

Sources of data

Both census and vital registration data are available from official Israeli publications.[53]

Evaluation of the data

Application of both the Brass and Preston methods show completeness of death registration, relative to the census, to be around 100 per cent for ages 1 and over. For ages under 1, the only external information available for evaluating mortality was a statistical evaluation survey undertaken by the Israel Central Bureau of Statistics in 1962-1963.[54] Registered births which occurred between September 1962 and August 1963 were followed up via linkage with immunization reports and other administrative records and, when necessary, by home interviews. Matching infant deaths determined in this way with those recorded in the death registration system showed underreporting of about 10 per cent in the registration system. Since 1963, the quality of the infant death registration system is believed to have improved considerably because of various social, economic and administrative changes which have occurred, including the large increase in the proportion of non-Jewish births taking place in hospitals (over 90 per cent in 1972).[55] As a consequence, infant deaths were also accepted as accurately reported and no adjustments were made to the registered deaths.

Calculation of mortality rates

For ages 1 and over, central death rates were calculated from three-year averages of registered deaths in five-year age-sex groups (except for the four-year age-sex group 1-4) and the corresponding age-sex count from the census moved to mid period. Infant death rates were calculated from three-year averages of infant deaths and registered births.

Further adjustments to the life table

Because the death rates did not exhibit a fully smooth pattern from age to age, they were smoothed from ages 15 on by three-term moving averages through their logarithms.

[53]For the census population by age and sex, see Israel, Central Bureau of Statistics, *Statistical Abstract of Israel 1972* (Jerusalem, 1972), p. 43, table II/16. Deaths by age and sex are available in Israel, Central Bureau of Statistics, *Vital Statistics 1972* (Jerusalem, 1974), p. 128, table 100; and *Vital Statistics 1973-1976* (Jerusalem, 1978), p. 131, table 99. For 1971 and 1972, the age distribution of deaths for the non-Jewish population of East Jerusalem was not available although total deaths, including East Jerusalem, were. Deaths by age and sex for these two years were estimated by assuming that the age distribution of deaths in East Jerusalem was the same as in other areas of Israel. Registered births by sex are available in Israel, Central Bureau of Statistics, *Statistical Abstract of Israel 1978* (Jerusalem, 1979), p. 90, table iii/19.

[54]U. O. Schmelz, "Infant and early childhood mortality among the non-Jewish population of Palestine and Israel", in *Late Fetal and Infant Deaths in Israel 1948-1972* (Jerusalem, Israel Central Bureau of Statistics, 1974), pp. 63-65.

[55]See U. O. Schmelz, op cit.

Israel Males (Non–Jewish population) 1971–1973

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.04439	.04280	100000	4280	96429	6663536	66.635	0.166
1	.00204	.00812	95720	777	380956	6567107	68.607	1.524
5	.00080	.00399	94943	379	473767	6186152	65.157	2.500
10	.00063	.00315	94564	298	472075	5712385	60.408	2.500
15	.00120	.00598	94266	564	470036	5240310	55.591	2.704
20	.00170	.00847	93702	794	466598	4770274	50.909	2.589
25	.00187	.00931	92909	865	462434	4303676	46.322	2.562
30	.00233	.01159	92044	1067	457670	3841241	41.733	2.611
35	.00326	.01617	90977	1471	451392	3383572	37.192	2.626
40	.00440	.02177	89506	1949	442904	2932180	32.760	2.626
45	.00624	.03075	87557	2692	431431	2489276	28.430	2.640
50	.00915	.04479	84865	3801	415437	2057845	24.248	2.662
55	.01488	.07189	81064	5828	391661	1642408	20.261	2.656
60	.02248	.10669	75236	8027	357069	1250747	16.624	2.619
65	.03300	.15296	67209	10280	311533	893678	13.297	2.616
70	.05444	.24068	56929	13702	251681	582145	10.226	2.594
75	.08941	.36578	43227	15812	176845	330464	7.645	2.515
80	.14307	.52157	27416	14299	99946	153619	5.603	2.403
85	.24438	******	13116	13116	53673	53673	4.092	4.092

Israel Females (Non–Jewish population) 1971–1973

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.03544	.03441	100000	3441	97086	6988892	69.889	0.153
1	.00213	.00847	96559	818	384165	6891805	71.374	1.468
5	.00055	.00275	95741	263	478048	6507640	67.971	2.500
10	.00053	.00265	95478	253	476757	6029593	63.152	2.500
15	.00080	.00399	95225	380	475224	5552836	58.313	2.630
20	.00100	.00499	94845	473	473069	5077612	53.536	2.559
25	.00107	.00534	94372	504	470624	4604543	48.792	2.551
30	.00129	.00643	93868	604	467881	4133919	44.040	2.586
35	.00164	.00817	93264	762	464506	3666038	39.308	2.619
40	.00232	.01154	92502	1067	460018	3201532	34.610	2.665
45	.00370	.01834	91435	1677	453331	2741514	29.983	2.709
50	.00656	.03232	89758	2901	442170	2288183	25.493	2.718
55	.01127	.05491	86857	4769	423201	1846013	21.254	2.676
60	.01710	.08220	82087	6748	394576	1422812	17.333	2.649
65	.02738	.12868	75340	9695	354065	1028236	13.648	2.665
70	.04973	.22256	65645	14610	293803	674171	10.270	2.644
75	.08983	.36800	51035	18781	209063	380367	7.453	2.545
80	.15134	.54400	32254	17546	115942	171304	5.311	2.417
85	.26567	******	14708	14708	55362	55362	3.764	3.764

Life tables for Kuwaiti nationals were constructed for the period 1974-1976 based on the population census age-sex count of 21 April 1975 and registered vital events for 1974, 1975 and 1976.

Sources of data

Both census and vital registration data are available from official Kuwaiti publications.[56]

Evaluation of the data

Application of both the Brass and Preston methods showed death registration to be approximately complete, relative to the census, for ages 5 and over. For ages under 5, the only external information available for evaluating mortality was the questions on children ever born and children surviving asked in the 1975 census[57] allowing application of Trussell regression equations to make indirect estimates of infant and childhood mortality. By using another series of equations developed by Trussell, the approximate reference date to which these estimates refer can be calculated. The following table presents a comparison of the indirect estimates of infant and childhood mortality with rates calculated directly from the civil registration system:

Infant mortality rates estimated from indirect techniques and from civil registration

Indirect techniques		*Civil registration*	
Reference date	*Infant mortality rate*	*Reference date*	*Infant mortality rate*
Year centred on:			
January 1974	0.048-0.052	1973-1974	0.053
March 1972	0.038-0.044	1971-1973	0.047
November 1969	0.042-0.051	1969-1970	0.037

Sources: Indirect estimates of infant mortality were calculated from the 1975 census tabulations of children ever born and children surviving by duration of marriage. Estimated rates of child mortality were matched to West, North and South region Coale-Demeny model life tables to provide a range of estimates of infant mortality. Registered infant mortality rates were calculated from infant deaths during the given years and the corresponding birth cohorts.

The registered rates are quite similar to those indirectly estimated. We therefore accepted the data as reliable and no adjustments for incompleteness were made to the registered death rates at any age.

Calculation of mortality rates

For ages 1 and over, central death rates were calculated from three-year averages of registered deaths in five-year age-sex groups (except for the four-year age-sex group 1-4) and the corresponding age-sex count from the census moved to mid period. Infant death rates were calculated from three-year averages of infant deaths and registered births.

Further adjustments to the life table

For both males and females the age-specific death rates did not progress smoothly from age to age but instead showed irregularities due apparently to random variation or unbiased age mis-statement. From ages 15 on, therefore, the rates were smoothed by three-term moving averages through their logarithms.

[56] See Kuwait, Central Statistical Office, *Annual Statistical Abstract 1978* (Kuwait, 1978), pp. 33, 50 and 52, tables 30, 47 and 49.

[57] *Ibid.*, pp. 60-63, tables 56 and 57.

Kuwait Males 1974–1976

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.05007	.04810	100000	4810	96060	6591772	65.918	0.181
1	.00265	.01053	95190	1002	378263	6495712	68.239	1.508
5	.00087	.00434	94188	409	469917	6117449	64.949	2.500
10	.00068	.00339	93779	318	468100	5647532	60.222	2.500
15	.00089	.00444	93461	415	466322	5179432	55.418	2.635
20	.00131	.00653	93046	608	463792	4713110	50.654	2.636
25	.00173	.00861	92438	796	460285	4249318	45.969	2.606
30	.00222	.01104	91642	1012	455776	3789033	41.346	2.595
35	.00279	.01386	90630	1256	450165	3333257	36.779	2.623
40	.00412	.02040	89374	1824	442637	2883092	32.259	2.679
45	.00685	.03371	87550	2951	430873	2440456	27.875	2.669
50	.00994	.04856	84599	4109	413334	2009583	23.754	2.649
55	.01544	.07448	80490	5995	388279	1596249	19.832	2.636
60	.02226	.10577	74495	7880	353981	1207970	16.215	2.653
65	.04014	.18315	66616	12201	303957	853989	12.820	2.613
70	.05724	.25098	54415	13657	238589	550032	10.108	2.548
75	.08962	.36622	40758	14927	166554	311443	7.641	2.505
80	.14391	.52320	25832	13515	93914	144889	5.609	2.392
85	.24161	******	12316	12316	50975	50975	4.139	4.139

Kuwait Females 1974–1976

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.04329	.04180	100000	4180	96553	7032185	70.322	0.175
1	.00281	.01116	95820	1069	380560	6935632	72.382	1.456
5	.00070	.00349	94751	331	472927	6555072	69.182	2.500
10	.00037	.00185	94420	175	471663	6082145	64.416	2.500
15	.00043	.00215	94245	202	470749	5610483	59.531	2.641
20	.00073	.00364	94043	343	469417	5139734	54.653	2.672
25	.00099	.00494	93700	463	467401	4670317	49.843	2.623
30	.00133	.00663	93237	618	464709	4202916	45.078	2.609
35	.00169	.00842	92619	779	461237	3738207	40.361	2.614
40	.00234	.01164	91840	1069	456710	3276970	35.681	2.671
45	.00393	.01947	90771	1768	449752	2820260	31.070	2.678
50	.00572	.02823	89004	2512	439208	2370508	26.634	2.687
55	.01023	.04996	86491	4321	422410	1931299	22.329	2.675
60	.01467	.07093	82170	5828	397269	1508890	18.363	2.670
65	.02674	.12581	76342	9605	359186	1111620	14.561	2.655
70	.04029	.18384	66738	12269	304523	752434	11.275	2.623
75	.07218	.30758	54468	16754	232109	447911	8.223	2.599
80	.13310	.49793	37715	18779	141093	215802	5.722	2.472
85	.25345	******	18935	18935	74709	74709	3.946	3.946

Life tables for Matlab were calculated for 1974 and 1976 based on data from the Demographic Surveillance System (DSS) in the rural area of Matlab-Thana, Bangladesh. The DSS consists of periodic censuses with intervening registration of vital events, including births, deaths and migrations.[58] At the census of 1974 the total population of the surveillance area was 263,507.[59]

Sources of data and calculation of death rates

Age-specific death rates were calculated from recorded deaths by age and sex for 1974 and 1976, and the 1975 mid year population by age and sex.[60] Owing to the food shortage following the 1974 flood, both the absolute number and age-sex distribution of deaths in 1975 were severely affected and differed considerably from those of the preceding and following years. Therefore the 1975 death data were excluded from the calculation of the death rates.

For ages 1 and over, central death rates were calculated from the average of 1974 and 1976 registered deaths and the 1975 population by age and sex. Infant deaths were calculated from monthly figures of infant deaths by age and sex for 1974 and 1976.[61]

Evaluation of the mortality data

Because Matlab is a small area which has experienced significant migration, both in and out, as well as unusual disturbances to its demographic structure from the recent floods and food shortage, demographic techniques, especially those based on assumptions of stability, cannot be relied upon to evaluate accurately the quality of the death registration system. However, the careful procedures used in collecting the data make it likely that a high degree of completeness is obtained in the registration of births and deaths.

Households are visited daily (except during the monsoon season when visits take place every two or three days) by female workers who inquire about births, deaths and other demographic events. Field assistants visit each household monthly to verify the accuracy of this first registration. Further checks are undertaken by senior field assistants who visit households at least quarterly and by field surveillance assistants who make random field visits.[62] We have assumed the data are relatively reliable and made no adjustments for incompleteness.

Adjustments to the life tables

Owing to random variation and age mis-statement, male and female mortality rates showed considerable irregularities from age to age. Therefore, for both males and females, mortality rates for ages 15-69 were smoothed by three-term moving averages through their logarithms. In addition, male mortality rates were graphically adjusted for ages 60-69 and female mortality rates for ages 55-69 to account for the additional disturbances that still appeared after the smoothing.

For both males and females, five-year age-specific mortality rates were available only through age-group 65-69. Mortality rates for ages 70-74, 75-79 and 80-84 were therefore estimated by fitting a Makeham curve through the $q_x/1-q_x$ function for ages 40-44, 45-49, . . . , 65-69 and extrapolating the rates to ages 70-74, 75-79 and 80-84.

[58] A detailed description of the DSS is given in Cholera Research Laboratory, *Demographic Surveillance System—Matlab*, vol. 1, *Methods and Procedures*, Scientific Report No. 9 (Dacca, 1978).

[59] *Ibid.*, vol. 2, *Census 1974*, Scientific Report No. 10 (Dacca, 1978), p. 2, table 1.

[60] *Ibid.*, vol. 4, *Vital Events and Migration 1975*, Scientific Report No. 12 (Dacca, 1978), table 2.

[61] *Ibid.*, vol. 3, *Vital Events and Migration 1974*, Scientific Report No. 11 (Dacca, 1978), pp. 8, 29 and 33, tables 6, C.1, C.2 and C.5; and vol. 5, *Vital Events, Migration, and Marriages 1976*, Scientific Report No. 13 (Dacca, 1978), pp. 7, 35-36 and 40, tables 7, C.1, C.2 and C.5.

[62] *Ibid.*, vol. 1, *Methods and Procedures*, Scientific Report No. 9 (Dacca, 1978), pp. 7-8.

Matlab Males 1974 and 1976

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.12992	.11952	100000	11952	91992	5263632	52.636	0.330
1	.02093	.07934	88048	6986	333694	5171640	58.737	1.352
5	.00480	.02372	81062	1923	400504	4837946	59.682	2.500
10	.00115	.00573	79139	453	394564	4437442	56.071	2.500
15	.00126	.00628	78686	494	392224	4042878	51.380	2.560
20	.00155	.00772	78192	604	389531	3650654	46.688	2.634
25	.00243	.01208	77588	937	385747	3261123	42.031	2.659
30	.00340	.01687	76651	1293	380216	2875377	37.513	2.650
35	.00517	.02554	75358	1925	372249	2495160	33.111	2.641
40	.00704	.03462	73433	2542	361147	2122912	28.909	2.632
45	.01047	.05109	70891	3622	345924	1761765	24.852	2.645
50	.01565	.07544	67269	5075	324342	1415841	21.047	2.635
55	.02337	.11069	62194	6884	294568	1091499	17.550	2.617
60	.03471	.16014	55310	8857	255205	796930	14.408	2.590
65	.05097	.22656	46453	10524	206484	541725	11.662	2.550
70	.07361	.31074	35928	11164	151677	335242	9.331	2.495
75	.10396	.40992	24764	10151	97646	183565	7.413	2.422
80	.14289	.51772	14613	7565	52944	85919	5.880	2.341
85	.21372	******	7047	7047	32975	32975	4.679	4.679

Matlab Females 1974 and 1976

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.12414	.11487	100000	11487	92533	5276141	52.761	0.350
1	.02120	.08032	88513	7109	335290	5183608	58.563	1.361
5	.00639	.03145	81404	2560	400618	4848318	59.559	2.500
10	.00166	.00827	78843	652	392587	4447700	56.412	2.500
15	.00246	.01223	78191	956	388673	4055112	51.861	2.611
20	.00290	.01440	77235	1112	383450	3666440	47.471	2.549
25	.00320	.01587	76123	1208	377632	3282990	43.127	2.531
30	.00347	.01720	74915	1289	371429	2905358	38.782	2.559
35	.00439	.02172	73626	1599	364264	2533930	34.416	2.581
40	.00535	.02641	72027	1902	355585	2169666	30.123	2.608
45	.00777	.03815	70125	2675	344368	1814080	25.869	2.661
50	.01253	.06085	67450	4104	327687	1469713	21.790	2.670
55	.01994	.09525	63345	6034	302543	1142026	18.029	2.649
60	.03130	.14565	57312	8347	266683	839483	14.648	2.619
65	.04826	.21602	48964	10577	219172	572800	11.698	2.575
70	.07270	.30786	38387	11818	162547	353628	9.212	2.513
75	.10640	.41773	26569	11099	104315	191081	7.192	2.429
80	.15012	.53631	15470	8297	55268	86766	5.608	2.338
85	.22775	******	7173	7173	31498	31498	4.391	4.391

Life tables for Mexico were calculated for the 1969-1971 period based on the population census age-sex count of 28 January 1970 and registered vital events by age and sex for 1969, 1970 and 1971.

Sources of data

Both census and vital registration data are available from various issues of United Nations *Demographic Yearbook*.[63]

Evaluation of mortality data below age 5

Using the data gathered by the 1976 World Fertility Survey (WFS) in Mexico, life table probabilities of a child dying before ages 2 and 5 [$q(2)$ and $q(5)$] were calculated from tabulations of children ever born and children surviving by age of mother and by duration of union.[64] For male and female children combined, proportions of children still alive were converted into the previously mentioned life table probabilities of death, using Trussell's regression equations in the case of tabulation by duration of union, and Sullivan's regression equations for tabulation by age of mother. Trussell has developed another set of equations which provide the approximate reference date to which these estimates refer. In the case of Mexico there were only minimal differences between estimates based on duration of union tabulations and on age of mother tabulations. To minimize possible errors it was decided to take the average value of the estimates of $q(2)$ and the average of the estimates of $q(5)$ as the best representation of mortality probabilities below ages 2 and 5, respectively.

The estimate of $q(5)$ was matched with the value of $q(5)$ calculated from vital statistics for the corresponding reference period.[65] (The same exercise could not be repeated using $q(2)$ for no vital registration data were available for the reference year 1975). Using procedures similar to those for Peru, from this comparison we obtained for 1970 ranges of death completeness in age-group 0-1 relative to birth completeness, and death completeness in age-group 1-4 relative to completeness of the population at risk in the age interval.[66]

The results of the calculations produced the following ranges of completeness (relative to population at risk):[67]

Age-group	*Range of completeness*
0-1	0.74-0.86
1-4	0.86-1.24

Pregnancy history data from the WFS provided independent evidence of completeness of death registration. The probability of dying before age 1 calculated from births and deaths reported during the period 1972-1973 is about 0.0717.[68] The same probability calculated directly from registered births and deaths is about 0.0572. Thus, the estimated completeness of infant deaths (relative to births) is about 0.80, in the middle of the range estimated from the children ever born/children surviving tabulations. If we accept the value of $q(5)$ estimated earlier, we can calculate completeness of death registration (relative to population at risk) for the interval 1-4 by assuming that the value of completeness in the interval 0-1 (i.e., 0.80) applies to a period of five years or so (1970 to 1975). An easy calculation shows that such value is 0.90, again within the range estimated from the survivorship statistics.

Utilizing the children ever born/children surviving technique for males and females separately, we can calculate the probability of dying before age 5 for each sex. A comparison of these estimates with those obtained from vital statistics yields the following ranges of completeness:

Age-group	*Males*	*Females*
0-1	0.74-0.84	0.72-0.84
1-4	0.84-1.24	0.84-1.20

As these estimates of completeness show no evidence of differential death registration by sex, we assumed males and females had identical levels of completeness, 80 per cent complete in age-group 0-1 and 90 per cent complete in age-group 1-4.

The following are the corrected values of ${}_1q_0$ and ${}_4q_1$ for 1970:

	${}_1q_0$	${}_4q_1$	${}_5q_0$
Males	0.0886	0.0379	0.1231
Females	0.0746	0.0390	0.1107

Evaluation of mortality data for ages 5 and over

Estimation of adult death completeness is somewhat hindered in Mexico since its population is, and has been, affected by migration. Thus, one of the conditions required for the application of the Preston method does not hold. However, the results obtained are internally consistent and confirmed by other sources. Application of the Preston method showed death registration around 1970 to be approximately 100 per cent complete, relative to the census, for both males and females. The United States Bureau of the Census has estimated death registration to be nearly 99 per cent complete for ages 1 and over in 1970.[69] Hence, death rates for ages 5 and over were accepted as accurate without any adjustment for incompleteness of registration.

Calculation of mortality rates

For ages 5 and over, central death rates were calculated from three-year averages of registered deaths in five-year age-sex groups and the corresponding age-sex count from the census moved to mid period. For ages under 5, mortality rates were estimated as previously described.

Further adjustments to the life table

Because the age-specific death rates did not progress completely smoothly from age to age but, rather, showed some irregularities, the death rates were smoothed, beginning with ages 20-24 for males and females, by three-term moving averages through their logarithms.

[63] Population by age and sex can be found in *Demographic Yearbook, 1972* (United Nations publication, Sales No. E/F.73.XIII.1), pp. 146, 147, table 6. Registered births and deaths are from *Demographic Yearbook, 1974* (United Nations publication, Sales No. E/F. 75.XIII.1), pp. 558-559, table 25; and *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 442-443, table 20.

[64] The requisite tabulations appear in Mexico, Dirección General de Estadística, *Encuesta Mexicana de Fecundidad* (Mexico, D.F., 1979), vol. 2, pp. 191-193, 275 and 276, tables 2.2.1B, 2.2.2B, 2.3.1B and 2.3.2B.

[65] The distribution of deaths in the interval 1-4 required for these calculations was taken from vital statistics corresponding to 1970. Minor variations in the distribution of deaths do not change the results significantly.

[66] The population at risk in the age interval 1-4 was estimated from registered births and deaths during the previous five years.

[67] These ranges may be taken quite appropriately as ranges of death completeness since birth registration seems to be virtually complete except for transitory irregularities during the period 1973-1975.

[68] See Mexico, Dirección General de Estadística, *Encuesta Mexicana de Fecundidad* (Mexico, D.F., 1979), vol. L, p. 174, table VII.18.

[69] United States Bureau of the Census, *Country Demographic Profiles: Mexico*, by P. M. Rowe (Washington, D.C., 1979), p. 23.

Mexico Males 1969–1971

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.09448	.08860	100000	8860	93774	5877722	58.777	0.297
1	.00972	.03792	91140	3456	355528	5783948	63.462	1.386
5	.00200	.00995	87685	872	436242	5428420	61.909	2.500
10	.00130	.00648	86812	562	432654	4992179	57.506	2.500
15	.00200	.00995	86250	859	429275	4559524	52.864	2.702
20	.00350	.01736	85391	1482	423453	4130249	48.369	2.637
25	.00400	.01981	83909	1662	415493	3706796	44.176	2.562
30	.00490	.02421	82247	1991	406418	3291303	40.017	2.581
35	.00620	.03054	80256	2451	395349	2884885	35.946	2.581
40	.00770	.03780	77804	2941	381904	2489536	31.997	2.579
45	.00980	.04787	74864	3584	365677	2107633	28.153	2.589
50	.01300	.06303	71280	4493	345600	1741955	24.438	2.596
55	.01770	.08489	66787	5670	320312	1396355	20.907	2.597
60	.02470	.11656	61118	7124	288412	1076043	17.606	2.589
65	.03470	.16002	53994	8640	248993	787632	14.587	2.572
70	.04940	.22029	45354	9991	202243	538639	11.876	2.545
75	.07060	.30007	35363	10612	150305	336396	9.513	2.502
80	.10090	.40089	24752	9923	98342	186091	7.518	2.439
85	.16899	******	14829	14829	87749	87749	5.917	5.917

Mexico Females 1969–1971

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.07887	.07460	100000	7460	94583	6293421	62.934	0.274
1	.01000	.03899	92540	3608	360790	6198838	66.985	1.403
5	.00190	.00946	88932	841	442560	5838048	65.646	2.500
10	.00100	.00499	88092	439	439359	5395489	61.249	2.500
15	.00140	.00698	87652	612	436818	4956129	56.543	2.641
20	.00200	.00995	87041	866	433152	4519311	51.922	2.633
25	.00270	.01341	86174	1156	428110	4086159	47.417	2.611
30	.00350	.01735	85018	1475	421543	3658049	43.027	2.594
35	.00440	.02177	83543	1819	413309	3236506	38.741	2.577
40	.00530	.02616	81724	2138	403440	2823197	34.545	2.577
45	.00670	.03297	79586	2624	391630	2419757	30.404	2.599
50	.00910	.04454	76962	3428	376662	2028127	26.352	2.622
55	.01320	.06400	73535	4706	356531	1651465	22.458	2.632
60	.01960	.09364	68828	6445	328837	1294934	18.814	2.625
65	.02930	.13690	62383	8540	291467	966098	15.486	2.606
70	.04360	.19713	53843	10614	243448	674630	12.530	2.572
75	.06410	.27665	43229	11959	186569	431183	9.974	2.527
80	.09420	.38019	31270	11888	126203	244613	7.823	2.464
85	.16368	******	19382	19382	118410	118410	6.109	6.109

Life tables for Peru were calculated for the period 1968-1971 based on the population age-sex distribution of 1 January 1970 (estimated from the census of 4 June 1972) and registered vital events for 1968, 1970 and 1971 by age and sex. Registration data were adjusted for incompleteness.

Sources of data

The latest figures of registered deaths by age and sex were for 1968, 1970 and 1971. However, the population census was taken on 4 June 1972. In order to have a base population corresponding approximately to the mid point of the available vital registration data, we estimated the population by age and sex for 1 January 1970 by assuming a 3 per cent population growth rate and a constant age-sex distribution between 1 January 1970 and the census date. The vital registration data were available from the United Nations. The census population age-sex count appears in official census volumes.[70]

Evaluation and adjustment of mortality data over age 5

In order to estimate completeness of death registration at ages above 5, the methods devised by Brass and Preston were applied. Both produced almost identical results and showed little variability according to selection of the initial age-group. The final values for completeness were 0.72 for males and 0.75 for females. Death rates above age 5 were therefore adjusted by these estimates of completeness.

Evaluation and adjustment of mortality data under age 5

External information available for evaluating mortality under age 5 included the questions on children ever born and children surviving asked in the 1974-1976 National Demographic Survey (EDENP) and in the 1972 population census.[71] Trussell regression equations were applied separately to both sets of data producing estimates of $q(2)$, $q(3)$ and $q(5)$, the probabilities of a child dying before ages 2, 3 and 5.

EDENP also presents death rates by age based on number of reported deaths during the time period of the survey.[72] These rates yield values of $q(i)$ which can be compared with those obtained from the retrospective children ever born and children surviving questions. The following table summarizes the probabilities of dying before ages 1, 2, 3 and 5 as estimated from the children ever born and children surviving questions from the census and from EDENP (designated Retro EDENP), and from the actual deaths recorded during the survey period (Prosp EDENP).

	Probability of dying before age i [q(i)] as estimated from:		
Age i	*Prosp EDENP*	*Retro EDENP*	*Census*
1	0.1213	—	—
2	0.1613	0.1436	0.1749
3	0.1749	0.1505	0.1856
5	0.1844	0.1670	0.2058

Considering that the Retro EDENP estimates refer to some years before the time of the survey whereas the Prosp EDENP estimates refer to 1974-1976, an inconsistency clearly emerges: either the former are too low or the latter are too high. It is very unlikely that a prospective survey will overcount deaths although it is possible that the exposure time may be underestimated, thus slightly inflating the death rates. Comparing the census and Retro EDENP estimates, and remembering that the difference in periods between which the estimates apply is around three years, the mortality change implied by census and Retro EDENP is exceedingly fast. Apparently there is an underestimation of mortality in Retro EDENP. The Retro EDENP estimates were therefore discarded and the retrospective questions in the census were used to obtain estimates of completeness of death registration in the age intervals 0-1 and 1-4.

When reliable retrospective estimates of early-age mortality are available, completeness of death registration in the two age-groups 0-1 and 1-4 can be estimated through the following relationships:

$$ln\,[p(2)] = \frac{ln\,({}_1p_0)}{KC\,(1\text{-}4)} + \frac{ln\,({}_1p_1)}{C\,(1\text{-}4)} \qquad (1)$$

$$ln\,[p(5)] = \frac{ln\,({}_1p_0)}{KC\,(1\text{-}4)} + \frac{ln\,({}_4p_1)}{C\,(1\text{-}4)} \qquad (2)$$

where $p(2)$ and $p(5)$ are, respectively, the census retrospective estimates of the probabilities of surviving up to ages 2 and 5; ${}_1p_1$ and ${}_4p_1$ are the probabilities of dying between ages 0-1, 1-2 and 1-4, respectively, calculated from registration data; $C(1\text{-}4)$ is completeness of death registration in age-group 1-4; and $KC(1\text{-}4)$ is completeness in age-group 0-1.[73] The figures in equation (1) refer to 1971; those in equation (2) to 1965.[74]

Without *a priori* knowledge of the value of K, we decided to solve equations (1) and (2) simultaneously for $C(1\text{-}4)$ and K. The completeness values that are thus derived as well as the implied mortality rates for 1970 are presented in the following table. For comparison, recorded rates from Prosp EDENP are also shown.

		Mortality rate (${}_nq_x$) estimated from:	
Age-group	*Death registration completeness*	*Equations (1) and (2) 1970*	*Prosp EDENP 1974-1976*
0-1	0.44	0.1408	0.1213
1-5	0.70	0.0624	0.0718

Our estimate of ${}_4q_1$ for 1970 is clearly too low relative to the recorded rate from Prosp EDENP, likely due to an initial underestimate of $q(5)$ from the retrospective data. The completeness estimate for the first age-group appears very reasonable however. This is because the value of $KC(1\text{-}4)$, completeness in age-group 0-1, is very robust to changes in K.[75] In fact, as K ranges from 0.3 to 1.0, values of completeness of death registration for ages under 1 range only from 0.38 to 0.52.[76] Our completeness estimate of 0.44 is nearly at the mid point of this range and we accept it as reliable in the absence of additional information.

[70]For the census population by age and sex, see República del Perú, Oficina Nacional de Estadística y Censos, *Censos Nacionales, VII de Población y II de Vivienda* (Lima, 1974), vol. 1, pp. 1-2, table 1. Registered deaths by age and sex can be found in *Demographic Yearbook, 1974* (United Nations publication, Sales No. E/F.75.XIII.1), pp. 568-569, table 25; and *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 332-333, table 13. Registered births by sex are available in *Demographic Yearbook, 1975*, pp. 446-447, table 20.

[71]República del Perú, Instituto Nacional de Estadística, *Encuesta Demográfica Nacional del Perú, La Mortalidad en el Perú: Diferenciales, Niveles y Aspectos Metodologicos para su Medición (1970-75)*, fascículo 2 (Lima, 1978), p. 79, table 1; and *Censos Nacionales, VII de Población y II de Vivienda*, pp. 317-321, table 13.

[72]República del Perú, Instituto Nacional de Estadística, *Encuesta Demográfica Nacional del Perú*.

[73]Solution of these equations for K and $C(1\text{-}4)$ requires the assumption that death registration in age-group 1-2 is identical to that in age-group 2-5. It is also necessary to assume that completeness has been more or less constant during the 1965-1971 period. Tabulated registered deaths by single years for age-group 1-4 was unavailable for Honduras. We therefore assumed that the percentage distribution of deaths in age-group 1-4 as recorded in Prosp EDENP was applicable to the registration data for the necessary years. Small departures from the actual distribution of deaths affect the completeness estimates only slightly. Since we did not correct birth registration, resulting values for $C(1\text{-}4)$ and $KC(1\text{-}4)$ (equivalent to completeness in the interval 0-1) are estimates of completeness of deaths registration relative to completeness of births.

[74]These reference dates are estimated from regression equations developed by Trussell which relate average parity of women in the first three age-groups to the reference dates of the various retrospective mortality estimates.

[75]The estimate of $C(1\text{-}4)$ itself, however, is very sensitive to alternative values of K. The differential sensitivity of completeness in age-groups 0-1 and 1-4 arises from the fact that most of the deaths that occur before age 2 or 5 take place before the first birthday.

[76]Experience has shown that values of K outside the interval (0.3, 1.0) are unlikely.

Although the estimated values of ${}_nq_x$ from Prosp EDENP may contain errors, we may still be able to accept the resulting pattern of mortality under age 5, that is, the relation between the recorded values of ${}_1q_0$ and ${}_4q_1$.[77] Therefore we assumed that the ratio ${}_1q_0/{}_4q_1$ applied to the year 1970 as well as to 1974-1976 and multiplied this ratio by the corrected value of ${}_1q_0$ for 1970 to obtain an estimate of ${}_4q_1$.

Proceeding in this way, and assuming similar underregistration of deaths for both males and females, we obtain the following final life table estimates of mortality under age 5:

		Mortality rate $({}_nq_x)$		
Age-group	*Death registration completeness*	*Both sexes*	*Males*	*Females*
0-1	44%	0.1408	0.1496	0.0821
1-4	51%	0.0833	0.1316	0.0846

[77] It is very likely that, despite the efforts put into Prosp EDENP, some deaths in age-groups 0-1 and 1-4 may have gone undetected. On the other hand, in such multiround surveys omissions at these age-groups may very well be invariable with age, leaving the age pattern of mortality unaffected.

Calculation of mortality rates

For ages 5 and over, central death rates were calculated from three-year averages of the adjusted deaths in five-year age-sex groups and the corresponding estimated population by age and sex. Death rates under age 5 were calculated as described in the notes for Chile.

Further adjustments to the life table

For both males and females, five-year age-specific mortality rates were available only through age-group 70-74. Mortality rates for ages 75-79 and 80-84 were therefore estimated by fitting a Makeham curve through the $q_x/(1\text{-}q_x)$ function for ages 45-49, 50-54, . . . 70-74 in the case of males and for ages 60-64, 65-69 and 70-74 in the case of females and extrapolating the rates to ages 75-79 and 80-84.

Peru Males 1969–1971

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.16627	.14960	100000	14960	89977	5334698	53.347	0.330
1	.02170	.08210	85040	6982	321672	5244722	61.674	1.352
5	.00230	.01143	78058	892	388061	4923049	63.069	2.500
10	.00150	.00747	77166	576	384389	4534989	58.769	2.500
15	.00210	.01045	76590	800	381059	4150600	54.193	2.640
20	.00300	.01489	75789	1129	376231	3769541	49.737	2.594
25	.00340	.01686	74661	1259	370230	3393310	45.450	2.558
30	.00410	.02030	73402	1490	363398	3023080	41.185	2.576
35	.00510	.02519	71912	1811	355191	2659682	36.985	2.589
40	.00660	.03248	70100	2277	345021	2304491	32.874	2.593
45	.00850	.04165	67824	2825	332312	1959470	28.891	2.591
50	.01110	.05406	64999	3514	316572	1627159	25.034	2.603
55	.01560	.07521	61485	4624	296440	1310587	21.316	2.625
60	.02360	.11171	56861	6352	269138	1014146	17.836	2.613
65	.03390	.15665	50509	7912	233405	745008	14.750	2.581
70	.04890	.21834	42597	9301	190195	511603	12.010	2.550
75	.07021	.29865	33296	9944	141623	321409	9.653	2.500
80	.09882	.39437	23352	9209	93191	179785	7.699	2.441
85	.16332	******	14143	14143	86594	86594	6.123	6.123

Peru Females 1969–1971

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.14391	.13160	100000	13160	91446	5734684	57.347	0.350
1	.02240	.08460	86840	7347	327972	5643238	64.984	1.361
5	.00190	.00946	79493	752	395587	5315266	66.864	2.500
10	.00120	.00598	78741	471	392529	4919680	62.479	2.500
15	.00190	.00946	78270	740	389618	4527150	57.840	2.657
20	.00260	.01292	77530	1002	385249	4137533	53.367	2.603
25	.00320	.01588	76528	1215	379704	3752283	49.031	2.583
30	.00400	.01981	75313	1492	372955	3372579	44.781	2.580
35	.00490	.02421	73821	1787	364745	2999623	40.634	2.560
40	.00560	.02762	72034	1990	355283	2634879	36.578	2.544
45	.00640	.03151	70044	2207	344827	2279596	32.545	2.556
50	.00780	.03828	67837	2597	332930	1934769	28.521	2.591
55	.01070	.05218	65240	3404	318143	1601839	24.553	2.633
60	.01640	.07894	61836	4881	297641	1283697	20.760	2.636
65	.02420	.11439	56955	6515	269214	986056	17.313	2.612
70	.03570	.16435	50440	8290	232188	716842	14.212	2.586
75	.05227	.23166	42150	9764	186796	484654	11.498	2.547
80	.07538	.31710	32386	10269	136240	297859	9.197	2.499
85	.13684	******	22116	22116	161619	161619	7.308	7.308

Life tables for the Philippines were calculated for the period 1969-1971 based on the population census age-sex count of 6 May 1970 and registered vital events during the 1969-1971 period by age and sex. Registration data were adjusted for incompleteness.

Sources of data

Census and vital registration data are available from various issues of the United Nations *Demographic Yearbook*.[78]

Evaluation and adjustment of data

Since completeness of death registration is estimated relative to the census count, population census data was not adjusted for ages 1 and over. Mortality rates under age 1 are based solely on registration data.

Registered deaths were adjusted separately for ages 1 and over and under age 1. For ages over 1 completeness was estimated by the Preston method. The estimates of completeness (relative to the census count) from this method—75 per cent complete for males and 71 per cent complete for females—were consistent with the results from the 1964 national sample survey to study completeness of the birth and death registration systems. This survey provided an estimate of death registration completeness for all ages combined (including deaths of those under age 5) of 70 per cent in 1963.[79] There is no evidence of significant improvement in registration since 1963.

For ages under 1, the registered infant mortality rate for the 1968-1972 period of 65.5 infant deaths per 1,000 births (72.7 for males and 57.6 for females) is in agreement with indirect estimates from the 1973 National Demographic Survey obtained by application of the Brass infant and childhood mortality technique to the tabulation of proportion of children still living by broad age-group of woman.[80] This technique estimated that around 1971 7.1 per cent of all children died before age 2, corresponding to an infant mortality rate of around 60-65 per 1,000 live births. Assuming the approximate accuracy of the indirect estimate, the implication is that infant deaths and births must be approximately equally registered. Further evidence supports that this may very well be true. The 1964 survey demonstrated that death registration for all ages combined was at a higher level than birth registration (70 per cent to 60 per cent) and in the sample registration areas of the Philippines Sample Vital Registration Project in 1972-1973 both births and infant deaths were equally well registered.[81] Apparently, in the case of the Philippines, because of approximately equal registration of births and infant deaths, the registered infant mortality rates are close to the real values and hence acceptable estimates.

Calculation of mortality rates

For ages 1 and over, central death rates were calculated from three-year averages of the adjusted deaths in five-year age-sex groups (except for the four-year age-sex group 1-4) and the corresponding age-sex count moved to mid period at the preceding intercensal growth rate. Infant death rates were calculated from average infant deaths during the five-year period surrounding the census and births for the same period.

[78]Population by age and sex is from *Demographic Yearbook, 1974* (United Nations publication, Sales No. E/F.75.XIII.1), pp. 204-205, table 7. Registered deaths by age and sex are from *ibid.*, pp. 578-579, table 25. Live births by sex are given in *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1), pp. 450-451, table 20.

[79]D. M. Mortel "Causes of non-registration of vital events in the Philippines, 1973" in Republic of the Philippines, National Census and Statistics Office, *Seminar on Development and Maintenance of a Sample Vital Registration System in the Philippines* (Manila, 1975), p. 78, table 4.

[80]United Nations Economic and Social Commission for Asia and the Pacific, *Population of the Philippines*, Country Monograph Series No. 5 (Bangkok, 1978), p. 109, table 84.

[81]D. M. Mortel, loc. cit.

Philippines Males 1969–1971

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.07272	.06891	100000	6891	94767	5871310	58.713	0.241
1	.01083	.04215	93109	3925	362408	5776543	62.041	1.445
5	.00251	.01247	89184	1112	443138	5414136	60.708	2.500
10	.00144	.00717	88071	632	438777	4970998	56.443	2.500
15	.00213	.01060	87440	927	435062	4532220	51.833	2.696
20	.00376	.01864	86513	1612	428796	4097158	47.359	2.663
25	.00483	.02387	84901	2027	419581	3668362	43.208	2.571
30	.00556	.02743	82874	2273	408801	3248781	39.201	2.550
35	.00649	.03194	80601	2575	396727	2839979	35.235	2.561
40	.00797	.03909	78026	3050	382717	2443252	31.313	2.569
45	.00980	.04787	74976	3589	366213	2060535	27.483	2.585
50	.01321	.06403	71387	4571	346000	1694322	23.734	2.607
55	.01873	.08961	66817	5987	319653	1348322	20.179	2.590
60	.02453	.11586	60829	7047	287298	1028669	16.911	2.609
65	.04044	.18401	53782	9896	244720	741370	13.785	2.556
70	.04803	.21472	43886	9423	196193	496650	11.317	2.534
75	.07709	.32361	34462	11152	144666	300457	8.718	2.521
80	.11487	.44393	23310	10348	90084	155791	6.683	2.442
85	.19727	******	12962	12962	65707	65707	5.069	5.069

Philippines Females 1969–1971

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.05763	.05514	100000	5514	95674	6399236	63.992	0.215
1	.01007	.03927	94486	3710	368426	6303562	66.714	1.434
5	.00210	.01045	90776	948	451511	5935135	65.382	2.500
10	.00107	.00534	89828	479	447942	5483624	61.046	2.500
15	.00135	.00673	89349	601	445318	5035682	56.360	2.629
20	.00201	.01000	88748	888	441640	4590364	51.724	2.636
25	.00265	.01317	87860	1157	436532	4148724	47.220	2.608
30	.00346	.01716	86703	1488	429946	3712192	42.815	2.600
35	.00444	.02196	85215	1872	421556	3282247	38.517	2.584
40	.00542	.02675	83344	2229	411308	2860691	34.324	2.573
45	.00665	.03272	81114	2654	399160	2449383	30.197	2.584
50	.00868	.04252	78460	3336	384346	2050223	26.131	2.616
55	.01263	.06132	75124	4607	364734	1665877	22.175	2.637
60	.01900	.09094	70517	6413	337514	1301143	18.451	2.649
65	.03130	.14559	64105	9333	298173	963629	15.032	2.605
70	.04306	.19492	54772	10676	247941	665456	12.150	2.572
75	.06814	.29174	44095	12864	188795	417516	9.468	2.537
80	.10176	.40453	31231	12634	124155	228721	7.324	2.467
85	.17785	******	18597	18597	104566	104566	5.623	5.623

Sources of data

Life tables for the Republic of Korea for the 1971-1975 period were constructed from two sources: (*a*) five-year mortality rates ($_5q_x$) for ages 5 and over estimated by Coale, Cho and Goldman[82] from registered deaths (adjusted for incompleteness) and the 1970 and 1975 census age-sex counts; and (*b*) cross-tabulations of currently married women by duration of marriage, children ever born and children still living from the 1974 Korean National Fertility Survey (KNFS).[83]

Evaluation and adjustment of the data

For ages 5 and over, incompleteness of registered death rates was estimated by Coale, Cho and Goldman from comparison of registered rates by age and sex during the 1970-1975 intercensal period with the census population age-sex counts. The authors found death registration (above age 5) to be approximately 79 per cent complete for males and 69 per cent complete for females, without major differentials by age. Registered deaths above age 5 have been inflated by the reciprocal of these completeness estimates.

For ages under 5, mortality rates were estimated in the United Nations Population Division from the 1974 Korean National Fertility Survey using tabulations of currently married women by duration of marriage, number of children ever born and still living and sex of child. For male and female children separately, proportions of children still alive by duration of mother's marriage were converted into life table probabilities of death by Trussell regression equations and West region model life tables. Levels and trends of infant mortality estimated by this technique were very close to those estimated from the pregnancy history of the KNFS.

Independent estimates of the age pattern of mortality during the early ages were available from the October 1971 Korean Special Demographic Survey.[84] This survey, which queried households about deaths in the previous nine months, appears to have obtained quite accurate estimates of early-age mortality. The results substantiated both the level of mortality indicated by the children ever born/children surviving tabulations from the KNFS and the extremely close similarity between the Korean pattern of early-age mortality and that of West region:

	Death rates based on:			
	$_3q_0$ estimated from children ever born/children surviving tabulation from 1974 KNFS and West region model life tables		*Reported deaths in the previous nine months from 1971 Special Demographic Survey*	
Age-group	*Males*	*Females*	*Males*	*Females*
0-1	0.05611	0.04471	0.0527	0.0457
1-4	0.00397	0.00367	0.0036	0.0032
5-9	0.00133	0.00111	0.0015	0.0014

Rates based on $_3q_0$ were used for this comparison as they referred to early 1971, the same period as the Special Demographic Survey. However, for the 1971-1975 life table, estimates based on $_2q_0$ were used, these estimates referring to approximately the mid point of the 1971-1975 period. The infant and childhood mortality rates in the 1971-1975 life table, therefore, are those of the Coale and Demeny West region with the same level of $_2q_0$ as estimated from the KNFS.

[82] A. J. Coale, L. Cho and N. Goldman, *Estimation of Recent Trends in Fertility and Mortality in the Republic of Korea*, National Academy of Sciences (Washington, D.C., 1980), p. 27, table 8.

[83] National Bureau of Statistics of the Economic Planning Board and Korean Institute for Family Planning, *The Korean National Fertility Survey (WFS), First Country Report* (Seoul, 1974), pp. T250 and T296, tables 2.2.2B and 2.3.2B.

[84] United Nations Economic and Social Commission for Asia and the Pacific, *Population of the Republic of Korea*, Country Monograph Series No. 2 (Bangkok, 1975), p. 171, table 173.

Korea Males 1971–1975

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.04097	.03960	100000	3960	96659	5927160	59.272	0.156
1	.00230	.00915	96040	879	381993	5830501	60.709	1.534
5	.00213	.01060	95161	1009	473284	5448508	57.256	2.500
10	.00169	.00843	94153	794	468778	4975224	52.842	2.500
15	.00293	.01455	93359	1358	463578	4506445	48.270	2.632
20	.00329	.01630	92000	1500	456262	4042868	43.944	2.506
25	.00311	.01543	90501	1396	449044	3586606	39.631	2.522
30	.00377	.01868	89104	1664	441493	3137562	35.212	2.579
35	.00472	.02335	87440	2042	432378	2696070	30.833	2.638
40	.00767	.03769	85398	3219	419517	2263692	26.507	2.678
45	.01197	.05825	82180	4787	399760	1844175	22.441	2.673
50	.01988	.09493	77393	7347	369637	1444415	18.663	2.642
55	.02885	.13494	70046	9452	327637	1074777	15.344	2.610
60	.04495	.20263	60594	12278	273175	747140	12.330	2.573
65	.06432	.27735	48316	13400	208355	473965	9.810	2.521
70	.09444	.38086	34915	13298	140802	265611	7.607	2.460
75	.13659	.50308	21617	10875	79619	124808	5.774	2.382
80	.21040	.66452	10742	7138	33927	45189	4.207	2.229
85	.31999	******	3604	3604	11262	11262	3.125	3.125

Korea Females 1971–1975

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.03785	.03668	100000	3668	96919	6610542	66.105	0.160
1	.00271	.01077	96332	1037	382697	6513623	67.616	1.464
5	.00218	.01085	95295	1034	473888	6130926	64.337	2.500
10	.00164	.00817	94261	770	469378	5657038	60.015	2.500
15	.00225	.01120	93490	1047	464954	5187661	55.489	2.615
20	.00291	.01444	92443	1335	458960	4722706	51.088	2.560
25	.00310	.01536	91108	1399	452083	4263746	46.799	2.528
30	.00343	.01703	89709	1528	444775	3811663	42.489	2.532
35	.00374	.01855	88181	1636	436929	3366888	38.181	2.568
40	.00495	.02445	86546	2116	427665	2929959	33.855	2.607
45	.00659	.03242	84430	2737	415643	2502294	29.638	2.624
50	.00958	.04681	81692	3824	399371	2086651	25.543	2.623
55	.01306	.06334	77868	4932	377647	1687280	21.668	2.629
60	.02025	.09663	72936	7048	347960	1309634	17.956	2.628
65	.02950	.13779	65888	9079	307743	961673	14.596	2.610
70	.04613	.20756	56810	11791	255604	653930	11.511	2.588
75	.07131	.30337	45018	13657	191508	398326	8.848	2.541
80	.11459	.44341	31361	13906	121357	206818	6.595	2.451
85	.20425	******	17455	17455	85462	85462	4.896	4.896

Life tables for Singapore were calculated for the 1969-1971 period based on the population census count of 22 June 1970 and registered vital events by age and sex for 1969, 1970 and 1971.

Sources of data

Both census and vital registration data are from official Singapore publications.[85]

Evaluation of the data

Population census data were assumed to be complete and were not adjusted. Application of the Preston method showed death registration, relative to the census, to be complete for ages 5 and over. Questions on children ever born and children surviving were asked in the 1970 census and tabulated by age of mother[86] allowing application of the Brass technique to make indirect estimates of infant and childhood mortality from calculated proportion of children not surviving by age of mother.[87] Comparison of these indirect estimates with mortality rates calculated directly from the vital registration data showed death registration also to be complete for ages under 5 (see following table):

	Probability of dying before age x as estimated from:	
Age x	*Vital registration*	*Brass technique*
2	0.02268	0.02126
5	0.02562	0.02396

As a result, no adjustments were made to the census or vital registration data.

Calculation of mortality rates

For ages 1 and over, central death rates were calculated from three-year averages of registered deaths in five-year age-sex groups (except for the four-year age-sex group 1-4) and the corresponding age-sex count from the census. Infant death rates were calculated from three-year averages of infant deaths and registered births.

[85]Population by age and sex are from Republic of Singapore, *Report on the Census of Population 1970, Singapore*, vol. 2 (Singapore, n.d.), pp. 6-9, table 6. Registered births and deaths are from Republic of Singapore, *Report on the Registration of Births and Deaths and Marriages 1969* (Singapore, 1970), pp. 36 and 55, tables 8 and 35; *Report on the Registration of Births and Deaths and Marriages 1970* (Singapore, n.d.), pp. 50 and 70, tables 8 and 35; *Report on Registration of Births and Deaths and Marriages 1971* (Singapore, n.d.), pp. 46 and 66, tables 8 and 35.

[86]Republic of Singapore, *Report on the Census of Population, 1970, . . .*, pp. 499 and 504, tables 234 and 239.

[87]Application of the Brass technique requires the data to be available in either five-year age-groups or in 10-year age-groups, 15-24, 25-34, ... However, data on children surviving for Singapore were available only for 10-year age-groups 10-19, 20-29, 30-39, ... Interpolation was therefore required before the Brass technique could be applied, to estimate proportions not surviving for the requisite 10-year age-groups.

Singapore Males 1969–1971

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.02311	.02264	100000	2264	97979	6591044	65.910	0.108
1	.00136	.00542	97736	530	389663	6493065	66.435	1.585
5	.00049	.00245	97206	238	485434	6103402	62.788	2.500
10	.00053	.00265	96968	257	484198	5617968	57.936	2.500
15	.00117	.00583	96711	564	482259	5133770	53.083	2.700
20	.00140	.00698	96147	671	479096	4651511	48.379	2.556
25	.00155	.00772	95476	737	475536	4172416	43.701	2.497
30	.00140	.00698	94739	661	472119	3696879	39.022	2.614
35	.00272	.01352	94078	1272	467505	3224760	34.277	2.731
40	.00435	.02153	92807	1998	459425	2757255	29.710	2.694
45	.00722	.03551	90808	3225	446666	2297830	25.304	2.713
50	.01301	.06315	87583	5531	425107	1851164	21.136	2.684
55	.01989	.09503	82053	7797	392031	1426057	17.380	2.662
60	.03451	.15953	74255	11846	343258	1034026	13.925	2.635
65	.05365	.23733	62409	14811	276076	690768	11.068	2.571
70	.08317	.34376	47598	16362	196730	414692	8.712	2.478
75	.11109	.43105	31236	13464	121200	217962	6.978	2.402
80	.15788	.55375	17772	9841	62333	96762	5.445	2.305
85	.23034	******	7931	7931	34429	34429	4.341	4.341

Singapore Females 1969–1971

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.01844	.01814	100000	1814	98375	7216728	72.167	0.104
1	.00124	.00494	98186	485	391527	7118353	72.499	1.494
5	.00049	.00245	97700	239	487905	6726825	68.852	2.500
10	.00031	.00155	97461	151	486930	6238921	64.014	2.500
15	.00052	.00260	97310	253	485960	5751991	59.110	2.656
20	.00066	.00329	97058	320	484529	5266031	54.257	2.624
25	.00095	.00474	96738	458	482599	4781502	49.427	2.621
30	.00119	.00593	96279	571	480038	4298903	44.650	2.620
35	.00171	.00852	95708	815	476647	3818865	39.901	2.675
40	.00281	.01396	94893	1325	471393	3342219	35.221	2.680
45	.00418	.02070	93569	1937	463333	2870826	30.682	2.672
50	.00668	.03289	91632	3014	451189	2407492	26.274	2.687
55	.01099	.05359	88618	4749	432097	1956303	22.076	2.685
60	.01814	.08700	83869	7297	402244	1524206	18.174	2.656
65	.02790	.13087	76572	10021	359174	1121961	14.652	2.636
70	.04608	.20740	66551	13803	299539	762788	11.462	2.593
75	.06923	.29598	52749	15613	225518	463249	8.782	2.552
80	.11795	.45339	37136	16837	142748	237732	6.402	2.450
85	.21371	******	20299	20299	94984	94984	4.679	4.679

Life tables for Sri Lanka were calculated for the periods 1945-1947, 1952-1954, 1962-1964 and 1970-1972 based on population census counts of 19 March 1946, 20 March 1953, 8 July 1963 and 9 October 1971 and registered vital events by age and sex for the indicated three-year periods. Registration data were adjusted for incompleteness.

Sources of data

Census and vital registration data are available from official Sri Lanka publications as well as from various issues of the United Nations *Demographic Yearbook*.[88]

Evaluation and adjustment of the data

As completeness of death registration for ages 5 and above is estimated relative to completeness of the census counts, no adjustment was made to the censuses for these ages. Mortality rates under age 5 are based solely on registration data.

Registered births are adjusted for underregistration according to the surveys on the completeness of birth and death registration conducted in 1953 and 1968.[89] The 1953 survey found birth registration to be 88.1 percent complete, the 1968 survey 98.7 percent in 1967. Completeness of birth registration is assumed to improve from 85 percent in 1946 to 88.1 percent in 1953 and then linearly to 98.7 percent in 1967 and thereafter.

Registered deaths were adjusted separately for ages 5 and over and under 5. For ages over 5 completeness was estimated by the Preston method. Estimates of completeness from this method for both sexes combined—87.6 percent in 1946, 90.5 percent in 1953, 94.7 percent in 1963 and 98.0 percent in 1971—were both internally consistent and consistent with results from the 1953 and 1967 surveys on the completeness of birth and death registration. The surveys provided estimates of death registration completeness for all ages combined (including deaths of those under age 5) of 88.6 percent in 1953 and 92.3 percent in 1967. Preston's method gave no clear evidence of a sex differential in completeness, and registration was therefore assumed to be equally complete for males and females.

For ages under 5, estimates of completeness of death registration can be derived from various sources. The 1967 survey on completeness of birth and death registration provided a separate estimate of completeness for infant deaths.[90] Registered death rates under age 1 can also be compared with those recorded in the pregnancy history of the Sri Lanka World Fertility Survey (WFS)[91] or with the indirect estimates obtained by application of Trussell regression equations to the tabulation of women by children ever born and children surviving (CEB/CS) and age of women (in the case of the 1971 census tabulation) or duration of marriage (as in the WFS).[92] In addition, levels of completeness under age 5 for 1953 and 1967 can be calculated which are consistent with both the all-age completeness estimates from the surveys on completeness of birth and death rates and the adult mortality completeness estimates for the same years previously estimated by Preston's method. All these estimates of completeness are presented in the following table:

Period	Completeness	Source
Age-group 0-1:		
1953	85-87%	Accepting estimate for all ages (88.6%) from 1953 survey on completeness of birth and death registration and Preston estimate for ages 5+ (90.5%).
1967	84.4%	1967 survey on completeness of birth and death registration.
1966-1967	81.0-90.0%	Trussell regression estimates based on children ever born and children surviving data from 1971 census and WFS.
1968	87.5%	Trussell regression estimates based on CEB/CS data from 1971 census.
1969-1970	81%	WFS pregnancy history.
1969-1970	96%	Trussell regression estimates based on CEB/CS data from 1971 census.
1971-1972	93%	Trussell regression estimates based on CEB/CS data from WFS.
1972-1973	89%	WFS pregnancy history.
Age-group 1-4:		
1953	88%	Accepting estimate for all ages from 1953 survey on completeness of birth and death registration, Preston estimate for ages 5+ and assuming infant death registration is 85% complete.
1967	84.4%	Accepting estimate for all ages and for infant deaths from 1967 survey on completeness of birth and death registration, and Preston estimate for ages 5+.
1970-1972	70.4-75.6%	Trussell regression estimates based on CEB/CS data from 1971 census and WFS.

For infant death registration, the estimates point to a completeness of about 85% until the mid to late 1960s with improved registration thereafter. We assumed that registration was 85% complete until 1967 and then improved linearly to 93% in 1971-1972 (the estimate based on CEB/CS data from the WFS). This trend followed well that delineated by the various estimates. For death registration in the 1-4 age-group, the 1953 and 1967 estimates showed levels of completeness similar to that for infants. The 1970-1972 estimates, however, gave completeness estimates less than those for both infants and adults, a surprising and very unlikely result. It was concluded on the basis of the 1953 and 1967 results that registration for the 1-4 age-group was equally complete as that for infants. Comparison of the Trussell regression results from the WFS by sex showed slightly better completeness of infant death registration among males (92 per cent) than among females (89 per cent) for the period around 1970. However, the differential was very small, and, as in the case of adult mortality, no differential was assumed for ages under 5. Therefore, registered death rates were adjusted for completeness by age as follows:

Period of life table	Completeness of registration by age (percentage): 0-5	5 and over
1945-1947	85	87.6
1952-1954	85	90.5
1962-1964	85	94.7
1970-1972	92.1	98.0

[88]Census populations by age and sex are available from United Nations Economic and Social Commission for Asia and the Pacific, *Population of Sri Lanka*, Country Monograph Series No. 4 (Bangkok, 1976), pp. 396-97, annex III, table 6. Deaths by age and sex are available from *Demographic Yearbook 1951* (United Nations publication, Sales No. 52.XIII.9), pp 246-47, table 16; *Demographic Yearbook 1957* (United Nations publication, Sales No. 58.XIII.1), pp. 250-53, table 10; Sri Lanka Department of Census and Statistics, *Life Tables 1970-72, Sri Lanka* (Colombo, 1978), pp. 4-5, table 3; and Statistical Office of the United Nations. Registered births by sex are given in United Nations Economic and Social Commission for Asia and the Pacific, *Population of Sri Lanka*, pp. 390-92, annex III, table 1.

[89]See Sri Lanka, Department of Census and Statistics, *Post Enumeration Survey, 1953* (Colombo, 1953), p. 18, table II; *Life Tables, Ceylon 1962-67* (Colombo, 1970), p. 33; and *A Study of the Extent of Underregistration of Births and Deaths in Ceylon* (Colombo, 1970), p. 17.

[90]Sri Lanka, Department of Census and Statistics, *Life Tables, Ceylon 1962-67* (Colombo, 1970), p. 33.

[91]Sri Lanka, Department of Census and Statistics, *World Fertility Survey, Sri Lanka 1975* (Colombo, 1978), p. 102, table 5.17.

[92]The 1971 census tabulations of children ever born and children surviving appear in Sri Lanka, Department of Census and Statistics, *Census of Population 1971, Preliminary Report* (Colombo, 1974), pp. 96-99, tables 21 and 22. The WFS tabulations appear in Sri Lanka, Department of Census and Statistics, *World Fertility Survey, Sri Lanka 1975*, pp. 265 and 332, tables 2.2.2B and 2.3.2B.

Calculation of mortality rates

For ages 5 and over central death rates were calculated from three-year averages of the adjusted deaths in five-year age-sex groups and the corresponding census age-sex count moved to mid period at the preceding intercensal growth rate. Infant death rates were calculated from average infant deaths during the three-year period and births for the same period. The death rate for age-group 1-4 was calculated from average deaths during the three-year period and a corresponding 1-4 year population derived from registered births and deaths (adjusted for underregistration) during the preceding years.

Further adjustments to the life table

The life tables for 1952-1954, 1962-1964 and 1970-1972 exhibited relatively smooth progression of death rates from age to age and no further adjustments were necessary. However, since deaths for 1945-1947 were only available in 10-year age-groups for ages 15 and on, further adjustment was necessary for the 1945-1947 life tables. Sprague multipliers were used to estimate deaths in five-year age-groups prior to the computation of the five-year death rates. Because of this implicit smoothing of the deaths (the numerator of the death rate) without a corresponding adjustment of the population base (the denominator) the resultant five-year rates exhibited a saw-toothed pattern (on semi-logarithmic paper). From ages 15 on, therefore, the rates were smoothed by three-term moving averages through their logarithms. As this did not always completely eliminate the saw-toothed pattern, the procedure was repeated a second time to estimate re-smoothed death rates for ages 20-75 for males and 25 to 45 for females.

Sri Lanka Males 1945–1947

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.14594	.13294	100000	13294	91093	4482322	44.823	0.330
1	.02481	.09312	86706	8074	325443	4391229	50.645	1.352
5	.00707	.03474	78632	2731	386330	4065787	51.707	2.500
10	.00345	.01710	75900	1298	376256	3679457	48.477	2.500
15	.00471	.02329	74602	1737	368861	3303200	44.278	2.611
20	.00617	.03040	72865	2215	358972	2934339	40.271	2.583
25	.00747	.03668	70650	2592	346940	2575368	36.452	2.565
30	.00909	.04446	68058	3026	332904	2228428	32.743	2.559
35	.01084	.05281	65032	3434	316804	1895524	29.147	2.566
40	.01393	.06737	61598	4150	297917	1578720	25.629	2.573
45	.01766	.08467	57448	4864	275431	1280802	22.295	2.572
50	.02349	.11109	52584	5842	248683	1005371	19.119	2.563
55	.03020	.14060	46742	6572	217621	756688	16.188	2.552
60	.04070	.18503	40170	7433	182619	539067	13.420	2.547
65	.05682	.24911	32738	8155	143531	356448	10.888	2.528
70	.08232	.34094	24582	8381	101810	212917	8.661	2.482
75	.11884	.45325	16201	7343	61791	111107	6.858	2.383
80	.15426	.54507	8858	4828	31300	49316	5.567	2.309
85	.22367	******	4030	4030	18017	18017	4.471	4.471

Sri Lanka Females 1945–1947

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.13230	.12182	100000	12182	92081	4307923	43.079	0.350
1	.02994	.11099	87818	9747	325548	4215842	48.007	1.361
5	.00816	.03998	78071	3122	382550	3890293	49.830	2.500
10	.00384	.01902	74949	1425	371182	3507744	46.802	2.500
15	.00648	.03192	73524	2347	362153	3136562	42.661	2.671
20	.00931	.04553	71177	3241	348095	2774409	38.979	2.596
25	.01129	.05493	67936	3732	330519	2426313	35.715	2.545
30	.01291	.06254	64205	4015	311019	2095795	32.642	2.508
35	.01338	.06473	60189	3896	291191	1784775	29.653	2.496
40	.01448	.06988	56293	3934	271660	1493584	26.532	2.507
45	.01599	.07691	52360	4027	251830	1221924	23.337	2.525
50	.01912	.09133	48333	4414	230879	970094	20.071	2.557
55	.02541	.11968	43918	5256	206847	739215	16.832	2.575
60	.03535	.16278	38663	6294	178035	532368	13.770	2.572
65	.05123	.22776	32369	7372	143904	354334	10.947	2.566
70	.08116	.33761	24997	8439	103982	210429	8.418	2.511
75	.12182	.46291	16558	7665	62918	106448	6.429	2.408
80	.17604	.59623	8893	5302	30120	43530	4.895	2.295
85	.26776	******	3591	3591	13410	13410	3.735	3.735

Sri Lanka Males 1952–1954

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.08858	.08328	100000	8328	94020	5836742	58.367	0.282
1	.01564	.06012	91672	5511	352370	5742722	62.644	1.402
5	.00346	.01715	86161	1478	427109	5390352	62.562	2.500
10	.00151	.00752	84683	637	421822	4963244	58.610	2.500
15	.00181	.00901	84046	757	418407	4541422	54.035	2.594
20	.00241	.01198	83289	998	414034	4123014	49.503	2.586
25	.00280	.01390	82291	1144	408654	3708980	45.072	2.553
30	.00320	.01588	81147	1288	402615	3300326	40.671	2.580
35	.00425	.02104	79858	1680	395256	2897711	36.286	2.598
40	.00535	.02641	78178	2065	385953	2502455	32.010	2.608
45	.00753	.03699	76113	2815	373874	2116502	27.807	2.622
50	.01038	.05066	73298	3713	357716	1742628	23.774	2.637
55	.01611	.07760	69585	5400	335178	1384912	19.902	2.639
60	.02378	.11253	64185	7223	303747	1049734	16.355	2.621
65	.03661	.16834	56962	9589	261924	745987	13.096	2.613
70	.05903	.25787	47373	12216	206951	484063	10.218	2.551
75	.08448	.34879	35157	12262	145153	277112	7.882	2.502
80	.13870	.50912	22894	11656	84038	131959	5.764	2.389
85	.23452	******	11238	11238	47921	47921	4.264	4.264

Sri Lanka Females 1952–1954

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.07342	.06963	100000	6963	94840	5726377	57.264	0.259
1	.01896	.07229	93037	6726	354733	5631537	60.530	1.411
5	.00412	.02039	86311	1760	427156	5276805	61.137	2.500
10	.00159	.00792	84551	670	421083	4849649	57.357	2.500
15	.00244	.01213	83882	1018	417060	4428566	52.795	2.692
20	.00409	.02025	82864	1678	410362	4011506	48.411	2.641
25	.00501	.02475	81186	2009	401001	3601144	44.357	2.547
30	.00539	.02660	79177	2106	390670	3200144	40.418	2.524
35	.00594	.02927	77071	2256	379724	2809473	36.453	2.504
40	.00582	.02869	74815	2146	368762	2429749	32.477	2.524
45	.00705	.03466	72669	2519	357260	2060987	28.361	2.583
50	.00932	.04559	70151	3198	343132	1703727	24.287	2.617
55	.01356	.06569	66953	4398	324354	1360596	20.322	2.633
60	.02024	.09661	62554	6043	298575	1036242	16.565	2.651
65	.03424	.15845	56511	8954	261512	737667	13.053	2.650
70	.05850	.25601	47557	12175	208122	476155	10.012	2.564
75	.08340	.34570	35382	12231	146661	268033	7.575	2.527
80	.15330	.54694	23150	12662	82595	121373	5.243	2.381
85	.27048	******	10489	10489	38778	38778	3.697	3.697

Sri Lanka Males 1962–1964

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.07236	.06859	100000	6859	94785	6214198	62.142	0.240
1	.00901	.03523	93141	3281	364186	6119413	65.700	1.446
5	.00213	.01059	89860	952	446920	5755227	64.047	2.500
10	.00129	.00643	88908	572	443111	5308307	59.706	2.500
15	.00152	.00757	88336	669	440076	4865195	55.076	2.598
20	.00210	.01045	87668	916	436137	4425119	50.476	2.598
25	.00248	.01232	86752	1069	431122	3988982	45.982	2.534
30	.00254	.01262	85682	1082	425790	3557860	41.524	2.575
35	.00365	.01809	84601	1531	419364	3132070	37.022	2.621
40	.00472	.02334	83070	1939	410753	2712706	32.656	2.628
45	.00708	.03482	81132	2825	398962	2301953	28.373	2.630
50	.00944	.04617	78307	3615	382980	1902990	24.302	2.634
55	.01479	.07145	74692	5336	360810	1520010	20.350	2.630
60	.02042	.09742	69355	6757	330888	1159200	16.714	2.649
65	.03703	.17030	62598	10660	287886	828312	13.232	2.645
70	.05930	.25892	51938	13448	226773	540425	10.405	2.552
75	.08607	.35369	38490	13614	158171	313653	8.149	2.482
80	.12854	.48140	24877	11976	93167	155482	6.250	2.393
85	.20703	******	12901	12901	62315	62315	4.830	4.830

Sri Lanka Females 1962–1964

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.05905	.05645	100000	5645	95593	6262557	62.626	0.219
1	.01072	.04173	94355	3938	367310	6166963	65.359	1.432
5	.00237	.01178	90418	1065	449425	5799653	64.143	2.500
10	.00115	.00573	89353	512	445482	5350228	59.878	2.500
15	.00162	.00807	88840	717	442538	4904746	55.209	2.681
20	.00278	.01381	88123	1217	437748	4462208	50.636	2.643
25	.00331	.01642	86906	1427	431020	4024460	46.308	2.539
30	.00346	.01715	85480	1466	423795	3593440	42.039	2.542
35	.00420	.02079	84013	1746	415783	3169645	37.728	2.547
40	.00452	.02235	82267	1839	406859	2753862	33.475	2.566
45	.00603	.02972	80428	2390	396384	2347003	29.181	2.592
50	.00746	.03665	78038	2860	383409	1950619	24.996	2.630
55	.01210	.05883	75178	4423	365496	1567209	20.847	2.650
60	.01731	.08322	70755	5888	340153	1201713	16.984	2.686
65	.03519	.16261	64867	10548	299753	861561	13.282	2.670
70	.05553	.24467	54319	13290	239330	561808	10.343	2.572
75	.08676	.35669	41029	14635	168680	322478	7.860	2.508
80	.13767	.50703	26394	13383	97207	153798	5.827	2.402
85	.22993	******	13012	13012	56590	56590	4.349	4.349

Sri Lanka Males 1970–1972

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.05677	.05430	100000	5430	95648	6382416	63.824	0.199
1	.00551	.02174	94570	2056	373119	6286768	66.477	1.489
5	.00168	.00836	92514	774	460636	5913649	63.922	2.500
10	.00109	.00544	91740	499	457455	5453013	59.440	2.500
15	.00154	.00767	91242	700	454564	4995558	54.751	2.651
20	.00228	.01134	90542	1027	450234	4540995	50.154	2.589
25	.00242	.01203	89515	1077	444910	4090761	45.699	2.524
30	.00262	.01302	88438	1151	439427	3645852	41.225	2.598
35	.00398	.01971	87287	1721	432362	3206425	36.734	2.633
40	.00515	.02544	85566	2177	422660	2774063	32.420	2.624
45	.00760	.03733	83390	3113	409556	2351403	28.198	2.625
50	.01013	.04946	80277	3971	391971	1941847	24.189	2.629
55	.01563	.07535	76306	5750	367868	1549876	20.311	2.624
60	.02143	.10194	70557	7193	335633	1182009	16.753	2.616
65	.03373	.15615	63364	9894	293330	846376	13.357	2.626
70	.05495	.24247	53470	12965	235939	553046	10.343	2.577
75	.08467	.34984	40505	14170	167357	317107	7.829	2.518
80	.13982	.51288	26335	13507	96601	149749	5.686	2.403
85	.24137	******	12828	12828	53148	53148	4.143	4.143

Sri Lanka Females 1970–1972

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.04714	.04540	100000	4540	96305	6671853	66.719	0.186
1	.00647	.02546	95460	2430	375643	6575548	68.883	1.450
5	.00180	.00896	93030	834	463065	6199904	66.644	2.500
10	.00100	.00499	92196	460	459832	5736839	62.224	2.500
15	.00143	.00713	91736	654	457135	5277008	57.524	2.633
20	.00192	.00956	91083	870	453319	4819873	52.918	2.594
25	.00229	.01139	90212	1027	448545	4366554	48.403	2.550
30	.00250	.01242	89185	1108	443229	3918008	43.931	2.566
35	.00323	.01602	88077	1411	436938	3474779	39.452	2.557
40	.00340	.01686	86666	1461	429791	3037841	35.052	2.579
45	.00488	.02412	85204	2055	421152	2608050	30.609	2.630
50	.00667	.03283	83149	2730	409301	2186898	26.301	2.639
55	.01017	.04967	80419	3994	392733	1777597	22.104	2.656
60	.01560	.07527	76425	5752	368747	1384864	18.121	2.674
65	.02743	.12894	70673	9112	332203	1016117	14.378	2.678
70	.04820	.21598	61560	13296	275847	683914	11.110	2.597
75	.07064	.30120	48265	14537	205791	408067	8.455	2.556
80	.12768	.48099	33727	16223	127058	202276	5.997	2.437
85	.23272	******	17505	17505	75218	75218	4.297	4.297

A life table for Thailand was calculated for the period 1969-1971 based on the population census count of 1 April 1970, registered deaths by age and sex, and prospective data from the Thailand Surveys of Population Change (SPC).

Sources of data

Census and vital registration data are available from various issues of the United Nations *Demographic Yearbook*.[93] Survey data are available from official Thai publications.[94]

Evaluation and adjustment of the data

Population census data were not adjusted since completeness of death registration is estimated relative to the census count.

Registered deaths were adjusted separately for ages 5 and over and under age 5. For ages 5 and over both the Preston and Brass techniques estimated death registration, relative to the census count, to be about 86 per cent complete for males and 76 per cent complete for females. The United States Bureau of the Census estimated the 1970 census enumeration (for ages 10 and over) to be 90.4 per cent complete for males and 95.2 per cent complete for females.[95] Acceptance of these estimates would imply that death registration, independent of the census count, is 77 per cent complete for males, 72 per cent complete for females, and 75 per cent complete for both sexes combined. This is very close to the estimated completeness of death registration for ages 10 and over found from the 1964-1965 and 1974-1975 Surveys of Population Change (71 per cent and 72 per cent, respectively, both sexes combined).[96]

Mortality under age 5 for the 1969-1971 period was estimated by assuming a linear change in the central death rates for ages 0-1 and 1-5 from the 1964-1965 and 1974-1975 Surveys of Population Change.[97] These estimated mortality values can be compared with indirect estimates of early-age mortality from tabulations of the female population by age-group (or marital duration), number of children ever born and number of children still living. Proportions of children still alive by age of mother or by duration of mother's marriage calculated from these tabulations can be converted into conventional life table probabilities of death by Trussell regression equations. The following table compares our estimated values with those from the indirect technique:

Source	Reference date	$_5q_0$	Reference date	$_3q_0$	Reference date	$_2q_0$
Our estimates (*a*)	1969-1971	0.1039	1969-1971	0.0918-0.0961	1969-1971	0.0832-0.0875
1970 census (*b*)	1964.3	0.1223	1966.5	0.0967	1968.1	0.0753
1974 SPC (*b*)	1969.2	0.1064	1970.2	0.0791	1971.7	0.0667
1975 SPC (*b*)	1970.2	0.1043	1971.1	0.0769	1972.7	0.0716
1975 SOFT (age) (*b*)	1969.6	0.1169	1971.4	0.0883	1973.1	0.0786
1975 SOFT (dur) (*c*)	1969.5	0.0999	1972.0	0.0857	1974.1	0.0591

Sources: (*a*) Estimated values of $_5q_0$, $_3q_0$, and $_1q_0$ were obtained as follows: Central death rates, $_1M_0$ and $_4M_1$ for the 1969-1971 period were interpolated from the values for 1964-1965 and 1974-1975 found in Thailand, National Statistical Office, *Report of the Survey of Population Change 1974-75*, pp. 29, table 11. From these values, $_1q_0$ and $_5q_0$ were calculated by usual life table procedures. Values of $_3q_0$ and $_2q_0$ were calculated from the complements of the $_1q_0$ and $_5q_0$ values (1_1 and 1_5) using the interpolation coefficients of Coale and Demeny, *Regional Model Life Tables and Stable Population* (Princeton, N.J., University of Princeton Press, 1966). Since Coale and Demeny present different interpolation coefficients for each of four "regions," a range of estimates is given.

(*b*) Estimates are presented in the United States National Academy of Sciences, *Fertility and Mortality Changes in Thailand, 1950-75*, table 9. The 1970 census estimates are calculated from census tabulations of children ever born and children surviving by age of mother. The 1974 and 1975 SPC estimates are calculated from similar tabulations from rounds 1 and 5 of the 1974-1975 Survey of Population Change. Lastly, the 1975 SOFT (age) estimates are calculated from similar tabulations from the 1975 Survey of Fertility in Thailand (SOFT-WFS).

(*c*) Calculated at the United Nations Population Division from tabulations of children ever born and children surviving by duration of mother's marriage from the 1975 Survey of Fertility in Thailand. Institute of Population Studies, Chulalongkorn University and Thailand National Statistical Office, *Survey of Fertility in Thailand Country Report* (Bangkok, 1977), pp. 77 and 126, tables 2.2.2B and 2.3.2B.

Our estimate of $_5q_0$ and our interpolated estimate of $_3q_0$ are in line with the indirect estimates, although the SPC estimates of $_3q_0$ appear to be somewhat low, not only in comparison with our estimate but also with the other indirect estimates. However, all the indirect estimates of $_2q_0$ appear to be too low. In some cases they are lower even than the direct estimates of the 1974-1975 SPC (the interpolated $_2q_0$ value from 1974-1975 SPC is 0.0705).

Calculation of mortality rates

For ages 5 and over, central death rates were calculated from three-year averages of the adjusted deaths in five-year age-sex groups and the corresponding census age-sex count moved to mid period. The infant death rate and the death rate at age-group 1-4 were interpolated by sex from the 1964-1965 and 1974-1975 Surveys of Population Change.

[93] Population by age and sex, and registered deaths by age and sex can be found in *Demographic Yearbook 1974* (United Nations publication, Sales No. E/F.75.XIII.1), pp. 176-177 and 580-581, tables 7 and 25.

[94] Results of the Surveys of Population Change are from Thailand, National Statistical Office, *Report of the Survey of Population Change* 1964-67 (Bangkok, 1969, 1970) and *Report of the Survey of Population Change 1974-75* (Bangkok, 1977).

[95] Calculated from data presented in United States Bureau of the Census, *Country Demographic Profiles: Thailand* (Washington, D.C., 1978), pp. 5 and 25, tables 2 and A-1.

[96] United States National Academy of Sciences, *Fertility and Mortality Changes in Thailand, 1950-75* (Washington, D.C., 1980), p. 16, table 7.

[97] Thailand, National Statistical Office, *Report of the Survey of Population Change 1974-75* (Bangkok, 1977), p. 29, table 11.

Thailand Males 1969–1971

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.08551	.08051	100000	8051	94155	5651313	56.513	0.274
1	.00925	.03613	91949	3323	359191	5557159	60.438	1.410
5	.00271	.01346	88626	1193	440150	5197967	58.650	2.500
10	.00184	.00916	87434	801	435166	4757818	54.416	2.500
15	.00277	.01376	86633	1192	430362	4322652	49.896	2.650
20	.00388	.01922	85441	1642	423215	3892290	45.555	2.571
25	.00405	.02005	83799	1680	414847	3469075	41.398	2.532
30	.00472	.02333	82118	1916	405941	3054227	37.193	2.572
35	.00601	.02962	80202	2376	395324	2648286	33.020	2.606
40	.00833	.04084	77827	3178	381545	2252962	28.949	2.613
45	.01122	.05464	74648	4079	363513	1871417	25.070	2.615
50	.01616	.07779	70570	5489	339687	1507904	21.368	2.602
55	.02155	.10244	65080	6667	309372	1168218	17.950	2.596
60	.03173	.14737	58413	8608	271302	858846	14.703	2.588
65	.04512	.20333	49805	10127	224439	587544	11.797	2.572
70	.07044	.29981	39678	11896	168881	363105	9.151	2.519
75	.10013	.39948	27782	11099	110841	194224	6.991	2.471
80	.16664	.57679	16684	9623	57747	83383	4.998	2.332
85	.27543	******	7061	7061	25636	25636	3.631	3.631

Thailand Females 1969–1971

AGE	M(X)	Q(X)	l(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.06243	.05956	100000	5956	95406	6079096	60.791	0.229
1	.00978	.03816	94044	3589	366942	5983690	63.627	1.427
5	.00276	.01371	90455	1240	449176	5616748	62.094	2.500
10	.00164	.00817	89215	729	444256	5167572	57.922	2.500
15	.00217	.01079	88487	955	440169	4723317	53.379	2.629
20	.00311	.01543	87532	1351	434385	4283147	48.933	2.577
25	.00324	.01607	86181	1385	427513	3848762	44.659	2.552
30	.00413	.02045	84796	1734	419811	3421249	40.347	2.597
35	.00537	.02651	83062	2202	410017	3001438	36.135	2.597
40	.00693	.03408	80860	2756	397637	2591421	32.048	2.582
45	.00853	.04179	78104	3264	382657	2193785	28.088	2.591
50	.01166	.05671	74840	4244	364004	1811127	24.200	2.597
55	.01530	.07380	70596	5210	340513	1447123	20.499	2.607
60	.02271	.10771	65386	7043	310127	1106611	16.924	2.614
65	.03320	.15378	58343	8972	270243	796484	13.652	2.607
70	.05284	.23411	49371	11558	218745	526240	10.659	2.568
75	.07805	.32718	37813	12371	158507	307495	8.132	2.530
80	.13325	.49556	25441	12608	94616	148989	5.856	2.415
85	.23603	******	12834	12834	54372	54372	4.237	4.237

Life tables for Trinidad and Tobago were calculated for the 1920-1922, 1945-1947 and 1959-1961 periods based on the population census counts of 24 April 1921, 9 April 1946 and 7 April 1960 and registered vital events by age and sex for 1920-1922, 1945-1947 and 1959-1961.

Sources of data

Probabilities of dying (${}_nq_x$) values have been calculated by Roberts.[98] For calculation of remaining life tables, census and vital registration data are available from official Trinidad and Tobago publications and various issues of United Nations *Demographic Yearbook*.[99]

Evaluation of the data

Application of both the Brass and Preston methods shows completeness of death registration, relative to the census, to be around 100 per cent for ages 5 and over. For ages under 5, the only external information available for evaluating mortality was the questions on children ever born and children surviving asked in the 1946 census[100] allowing application of Trussell regression equations to make indirect estimates of infant and childhood mortality. By using another series of equations developed by Trussell, the approximate reference date to which these estimates refer can be calculated. These estimates refer to the 1938-1945 period. However, if we can show infant death registration to be already complete during this period, we can probably safely assume that it was complete before and after the period.

The following table presents a comparison of the indirect estimates of infant mortality with rates calculated directly from the civil registration system:

Infant mortality rates estimated from indirect techniques and from civil registration

Indirect technique		*Civil registration*	
Reference date year centred on:	*Infant mortality rate*	*Reference date*	*Infant mortality rate*
November 1944	0.093		
April 1943	0.100	1940-1944	0.1004
February 1941	0.097		
July 1938	0.098	1935-1939	0.1036

Sources: Indirect estimates of infant mortality were calculated from the 1946 census tabulations of children ever born and children surviving by age of mother. Estimated rates of child mortality were matched to South region Coale-Demeny model life tables to provide infant mortality estimates. The registered rates are presented in *Demographic Yearbook 1966*, pp. 286-287, table 14.

The registered infant mortality rates are quite similar to those indirectly estimated. We will assume, therefore, that the registration system has not deteriorated and the data remain reliable for all years. As a result no adjustments for incompleteness need be made to the registered death rates.

Calculation of mortality rates

For ages 1 and over, central death rates were calculated from three-year averages of registered deaths in five-year age-sex groups (except for the four-year age-sex group 1-4) and the corresponding age-sex count from the census. Infant death rates were calculated from three-year averages of infant deaths and registered births.

Further adjustments to the life table

Neither the female age-specific death rates for 1945-1947 nor the male rates for 1959-1961 progressed smoothly from age to age but instead showed irregularities due apparently to random variation or unbiased age mis-statement. For ages 20 on for the 1945-1947 female population and for ages 15 on for the 1959-1961 male population, therefore, the rates were smoothed by three-term moving averages through their logarithms.

[98] G. W. Roberts, "Life tables for Trinidad and Tobago 1900-1903 and 1945-1947", *Trinidad and Tobago Research Papers* (Port of Spain, Central Statistical Office, 1968), pp. 52-64.

[99] Populations by age and sex can be found in *Demographic Yearbook, 1960* (United Nations publication, Sales No. 61.XIII.1), pp. 198-199, table 5, and *Demographic Yearbook, 1970* (United Nations publication, Sales No. E/F.71.XIII.1), pp. 248-251, table 6. Registered births and deaths are from *Demographic Yearbook, 1951* (United Nations publication, Sales No. 52.XIII.1), pp. 236-237, table 16; *Demographic Yearbook, 1961* (United Nations publication, Sales No. 62.XIII.1), pp. 310-311, table 15; *Demographic Yearbook, 1966* (United Nations publication, Sales No. 67.XIII.1), pp. 376-377, table 18; and Republic of Trinidad and Tobago, Central Statistical Office, *Population and Vital Statistics, 1975, Report* (Port of Spain, 1978), pp. 1-2, table 1.

[100] *Demographic Yearbook, 1955* (United Nations publication, Sales No. 56.XIII.1), pp. 582-583 and 604-605, tables 17 and 18.

Trinidad and Tobago Males 1920–1922

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.17633	.15770	100000	15770	89434	3761992	37.620	0.330
1	.02447	.09191	84230	7742	316420	3672558	43.602	1.352
5	.00604	.02974	76488	2275	376755	3356138	43.878	2.500
10	.00499	.02462	74214	1827	366500	2979383	40.146	2.500
15	.00730	.03589	72387	2598	355830	2612882	36.096	2.651
20	.01108	.05396	69789	3766	339897	2257052	32.341	2.598
25	.01305	.06323	66023	4175	319844	1917155	29.038	2.540
30	.01529	.07372	61848	4559	298127	1597311	25.826	2.562
35	.02052	.09771	57289	5598	272806	1299184	22.678	2.564
40	.02549	.11992	51691	6199	243150	1026378	19.856	2.531
45	.03072	.14271	45492	6492	211340	783228	17.217	2.517
50	.03759	.17192	39000	6705	178367	571887	14.664	2.519
55	.04908	.21877	32295	7065	143950	393520	12.185	2.519
60	.06740	.28845	25230	7278	107971	249570	9.892	2.502
65	.09731	.38950	17952	6992	71860	141599	7.887	2.440
70	.13358	.49280	10960	5401	40432	69739	6.363	2.340
75	.17158	.58169	5559	3234	18845	29307	5.272	2.232
80	.20565	.64926	2325	1510	7341	10462	4.499	2.161
85	.26137	******	816	816	3120	3120	3.826	3.826

Trinidad and Tobago Females 1920–1922

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.15911	.14420	100000	14420	90627	4014293	40.143	0.350
1	.02474	.09289	85580	7950	321341	3923666	45.848	1.361
5	.00555	.02735	77630	2123	382844	3602324	46.403	2.500
10	.00487	.02408	75507	1818	372991	3219480	42.638	2.500
15	.00898	.04398	73689	3241	360864	2846489	38.628	2.661
20	.01154	.05609	70448	3951	342533	2485625	35.283	2.543
25	.01239	.06012	66497	3998	322587	2143092	32.229	2.524
30	.01468	.07083	62499	4427	301631	1820506	29.129	2.546
35	.01788	.08558	58072	4970	277999	1518875	26.155	2.513
40	.01864	.08903	53102	4728	253684	1240876	23.368	2.498
45	.02134	.10138	48375	4904	229761	987193	20.407	2.530
50	.02667	.12515	43470	5440	204010	757432	17.424	2.548
55	.03501	.16127	38030	6133	175161	553422	14.552	2.556
60	.04952	.22076	31897	7042	142209	378261	11.859	2.547
65	.07183	.30446	24855	7567	105351	236052	9.497	2.499
70	.10108	.40128	17288	6937	68630	130701	7.560	2.433
75	.14297	.51700	10351	5351	37430	62071	5.997	2.323
80	.18089	.60358	4999	3018	16682	24641	4.929	2.244
85	.24901	******	1982	1982	7959	7959	4.016	4.016

Trinidad and Tobago Males 1945–1947

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.09393	.08810	100000	8810	93796	5296388	52.964	0.296
1	.00719	.02823	91190	2574	358034	5202592	57.052	1.388
5	.00192	.00955	88615	847	440961	4844558	54.669	2.500
10	.00185	.00921	87769	808	436824	4403597	50.173	2.500
15	.00326	.01618	86961	1407	431563	3966773	45.616	2.697
20	.00491	.02426	85554	2076	422780	3535210	41.321	2.596
25	.00544	.02684	83478	2241	411900	3112431	37.284	2.550
30	.00659	.03243	81237	2635	399812	2700530	33.243	2.581
35	.00856	.04194	78602	3296	385104	2300718	29.270	2.601
40	.01165	.05667	75306	4268	366339	1915615	25.438	2.612
45	.01648	.07929	71038	5632	341766	1549276	21.809	2.616
50	.02403	.11355	65406	7427	309071	1207509	18.462	2.582
55	.03107	.14444	57979	8374	269533	898438	15.496	2.569
60	.04558	.20513	49604	10176	223246	628905	12.678	2.565
65	.06699	.28708	39429	11319	168970	405659	10.288	2.511
70	.09387	.37787	28110	10622	113153	236689	8.420	2.421
75	.11716	.44715	17488	7820	66744	123536	7.064	2.353
80	.14985	.53259	9668	5149	34362	56792	5.874	2.285
85	.20148	******	4519	4519	22430	22430	4.963	4.963

Trinidad and Tobago Females 1945–1947

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.07818	.07397	100000	7397	94614	5577053	55.771	0.272
1	.00712	.02796	92603	2589	363689	5482439	59.204	1.404
5	.00202	.01005	90014	905	447807	5118750	56.866	2.500
10	.00175	.00871	89109	776	443604	4670943	52.418	2.500
15	.00413	.02046	88333	1807	437545	4227339	47.857	2.721
20	.00527	.02602	86526	2251	427191	3789794	43.800	2.585
25	.00654	.03218	84274	2712	414717	3362603	39.901	2.546
30	.00703	.03455	81562	2818	400851	2947886	36.143	2.530
35	.00812	.03981	78744	3135	386036	2547034	32.346	2.548
40	.00962	.04701	75610	3554	369446	2160999	28.581	2.580
45	.01312	.06360	72055	4583	349298	1791552	24.864	2.604
50	.01810	.08672	67473	5851	323286	1442254	21.375	2.594
55	.02471	.11654	61621	7182	290632	1118968	18.159	2.567
60	.03193	.14807	54440	8061	252456	828337	15.216	2.551
65	.04341	.19613	46379	9096	209541	575881	12.417	2.543
70	.06046	.26305	37283	9807	162207	366340	9.826	2.532
75	.09257	.37575	27476	10324	111525	204133	7.430	2.496
80	.14954	.53705	17152	9211	61598	92608	5.399	2.377
85	.25606	******	7940	7940	31010	31010	3.905	3.905

Trinidad and Tobago Males 1959–1961

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.05523	.05288	100000	5288	95741	6240847	62.408	0.195
1	.00340	.01349	94712	1277	375648	6145106	64.882	1.494
5	.00076	.00379	93435	354	466289	5769458	61.748	2.500
10	.00079	.00394	93081	367	464486	5303169	56.974	2.500
15	.00120	.00598	92714	555	462269	4838683	52.190	2.657
20	.00170	.00847	92159	780	458925	4376414	47.488	2.603
25	.00200	.00995	91379	909	454702	3917489	42.871	2.589
30	.00266	.01322	90469	1196	449496	3462788	38.276	2.616
35	.00358	.01775	89274	1585	442633	3013291	33.753	2.643
40	.00547	.02701	87689	2368	432953	2570658	29.316	2.681
45	.00901	.04413	85321	3765	417867	2137705	25.055	2.679
50	.01415	.06848	81556	5585	394706	1719838	21.088	2.659
55	.02228	.10583	75971	8040	360849	1325132	17.443	2.636
60	.03398	.15721	67931	10679	314279	964283	14.195	2.624
65	.05667	.24882	57252	14246	251380	650005	11.353	2.552
70	.07670	.32116	43006	13812	180078	398625	9.269	2.469
75	.10536	.41374	29194	12079	114642	218547	7.486	2.406
80	.14029	.51049	17115	8737	62280	103904	6.071	2.334
85	.20128	******	8378	8378	41625	41625	4.968	4.968

Trinidad and Tobago Females 1959–1961

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.04552	.04389	100000	4389	96409	6658850	66.589	0.182
1	.00270	.01073	95611	1026	379833	6562441	68.637	1.453
5	.00054	.00270	94586	255	472292	6182608	65.365	2.500
10	.00043	.00215	94331	203	471148	5710316	60.535	2.500
15	.00083	.00414	94128	390	469759	5239168	55.660	2.737
20	.00135	.00673	93738	631	467224	4769409	50.880	2.673
25	.00193	.00961	93108	894	463402	4302185	46.207	2.611
30	.00235	.01168	92213	1077	458471	3838783	41.629	2.591
35	.00306	.01519	91136	1384	452405	3380312	37.091	2.635
40	.00463	.02290	89752	2056	443972	2927907	32.622	2.672
45	.00731	.03594	87696	3152	431130	2483935	28.324	2.668
50	.01116	.05437	84544	4596	411870	2052805	24.281	2.639
55	.01593	.07675	79948	6136	385161	1640935	20.525	2.624
60	.02372	.11226	73812	8286	349322	1255774	17.013	2.618
65	.03553	.16363	65526	10722	301772	906452	13.833	2.588
70	.05166	.22919	54804	12561	243140	604680	11.033	2.541
75	.07264	.30793	42244	13008	179078	361540	8.558	2.529
80	.12288	.46670	29236	13644	111037	182462	6.241	2.425
85	.21829	******	15591	15591	71425	71425	4.581	4.581

Life tables for Tunisia were constructed for the 1968-1969 period based on results of the Tunisian Enquête nationale démographique (END). Recorded death rates were adjusted for underenumeration of deaths.

Source of data

The Enquête nationale démographique was a multiround follow-up survey of a nationally representative sample of 115,000 persons.[101] Interviewers visited households four times at six-monthly intervals, beginning in January 1968. At each interview after the first, interviewers determined if any births, deaths or moves occurred during the preceding six months.

Evaluation and adjustment of the data

The results from END were evaluated by Vallin,[102] who noted that the 1969-1970 Algerian survey, carried out with the same techniques and in a socio-cultural environment similar to that of Tunisia, missed about 8 per cent of all deaths. He expects a similar level of omission to be applicable to Tunisia. In fact, application of Preston's method to the survey data yields a similar omission rate of about 10 per cent. However application of Preston's method separately to the male and female distribution produces disparate estimates of zero omissions for males and 20 per cent omissions for females, highly unlikely results. We chose to accept Vallin's analysis and adjusted survey deaths (males and females) for 8 per cent incompleteness.

Vallin concluded that it was likely that infant deaths and births were equally well enumerated in the survey and that mortality rates calculated from the recorded events were approximately correct. Comparison with infant mortality estimated from children ever born/children surviving tabulations in the 1966 and 1975 censuses confirmed the approximate accuracy of the survey rate.[103] Based on these tabulations, infant mortality rates of about 146 per thousand and about 118 per thousand for 1963-1964 and 1972, respectively, can be estimated. The recorded survey rate of 135 per thousand for 1968-1969 is clearly in line with these figures. Therefore, no adjustment for incompleteness was made to the infant mortality rate.

Calculation of the mortality rates

For ages 1 and over, central death rates were calculated from the adjusted survey deaths and recorded average population by age and sex. The infant mortality rate was calculated from recorded infant deaths and births.

Further adjustments to the life table

The age-specific death rates from the survey did not progress smoothly from age to age but rather showed large fluctuations due probably to sampling error. Death rates calculated from the civil registration system, however, showed a quite similar pattern of mortality and a rather smooth progression. The survey death rates were therefore smoothed using the registered rates as a standard.

[101] For a description of the survey and relevant data, see Tunisia, Institut national de la statistique, *Enquête nationale démographique, 1968-1969, synthèse: méthode—résultats généraux*, fasicule 1 (Tunis, 1974); and *Enquête nationale démographique, 1968-1969, mouvement de la population—naissances, décès, migration*, fasicule 3 (Tunis, 1974).

[102] See J. Vallin, "Mortalité et fécondité en Tunisie: Résultats commentés de l'enquête nationale démographique (END)", *Population* (Paris, 1975), vol. 30, No. 6, pp. 1160-1165.

[103] For the tabulations, see C. Tarifa and R. Lapham, "Estimations de la mortalité juvenile pour la Tunisie", *Actes du 3e Colloque de Démographie Maghrébine*, tome I (Tunis, 1978), p. 16, table 6.

Tunisia Males 1968–1969

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.15012	.13640	100000	13640	90861	5270547	52.705	0.330
1	.01915	.07290	86360	6296	328769	5179685	59.978	1.352
5	.00289	.01435	80064	1149	397449	4850916	60.588	2.500
10	.00178	.00886	78915	699	392829	4453467	56.433	2.500
15	.00239	.01188	78216	929	388837	4060638	51.916	2.585
20	.00274	.01361	77287	1052	383856	3671801	47.509	2.548
25	.00309	.01533	76235	1169	378305	3287945	43.129	2.544
30	.00349	.01730	75066	1299	372167	2909639	38.761	2.563
35	.00432	.02138	73768	1577	365046	2537472	34.398	2.595
40	.00575	.02836	72191	2047	356094	2172426	30.093	2.626
45	.00839	.04114	70143	2886	343915	1816333	25.895	2.643
50	.01241	.06029	67258	4055	326754	1472418	21.892	2.649
55	.01940	.09276	63203	5863	302208	1145664	18.127	2.645
60	.03025	.14111	57340	8091	267472	843456	14.710	2.624
65	.04751	.21308	49249	10494	220884	575984	11.695	2.583
70	.07261	.30761	38755	11921	164194	355100	9.163	2.519
75	.10742	.42093	26833	11295	105152	190906	7.114	2.431
80	.15272	.54283	15538	8435	55228	85754	5.519	2.337
85	.23271	******	7104	7104	30526	30526	4.297	4.297

Tunisia Females 1968–1969

AGE	M(X)	Q(X)	I(X)	D(X)	L(X)	T(X)	E(X)	A(X)
0	.14666	.13390	100000	13390	91297	5245449	52.454	0.350
1	.02263	.08542	86610	7398	326916	5154152	59.510	1.361
5	.00254	.01262	79212	1000	393560	4827236	60.941	2.500
10	.00156	.00777	78212	608	389541	4433676	56.688	2.500
15	.00240	.01193	77604	926	385822	4044135	52.112	2.624
20	.00290	.01440	76679	1104	380708	3658312	47.710	2.568
25	.00343	.01701	75574	1286	374750	3277604	43.369	2.572
30	.00423	.02094	74289	1556	367668	2902854	39.075	2.572
35	.00506	.02499	72733	1818	359242	2535186	34.856	2.566
40	.00611	.03010	70916	2135	349380	2175944	30.684	2.565
45	.00734	.03606	68781	2480	337948	1826564	26.556	2.598
50	.01053	.05138	66301	3407	323483	1488615	22.452	2.645
55	.01639	.07892	62894	4964	302863	1165132	18.525	2.661
60	.02691	.12651	57931	7329	272336	862269	14.884	2.637
65	.04142	.18845	50602	9536	230216	589932	11.658	2.610
70	.06897	.29537	41066	12130	175880	359716	8.759	2.572
75	.11669	.45032	28936	13031	111669	183836	6.353	2.467
80	.18864	.62621	15906	9960	52801	72167	4.537	2.317
85	.30701	******	5945	5945	19365	19365	3.257	3.257

كيفية الحصول على منشورات الامم المتحدة

يمكن الحصول على منشورات الامم المتحدة من المكتبات ودور التوزيع في جميع انحاء العالم . استعلم عنها من المكتبة التي تتعامل معها أو اكتب الى : الامم المتحدة ،قسم البيع في نيويورك او في جنيف .

如何购取联合国出版物

联合国出版物在全世界各地的书店和经售处均有发售。请向书店询问或写信到纽约或日内瓦的联合国销售组。

HOW TO OBTAIN UNITED NATIONS PUBLICATIONS

United Nations publications may be obtained from bookstores and distributors throughout the world. Consult your bookstore or write to: United Nations, Sales Section, New York or Geneva.

COMMENT SE PROCURER LES PUBLICATIONS DES NATIONS UNIES

Les publications des Nations Unies sont en vente dans les librairies et les agences dépositaires du monde entier. Informez-vous auprès de votre libraire ou adressez-vous à : Nations Unies, Section des ventes, New York ou Genève.

КАК ПОЛУЧИТЬ ИЗДАНИЯ ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ

Издания Организации Объединенных Наций можно купить в книжных магазинах и агентствах во всех районах мира. Наводите справки об изданиях в вашем книжном магазине или пишите по адресу: Организация Объединенных Наций, Секция по продаже изданий, Нью-Йорк или Женева.

COMO CONSEGUIR PUBLICACIONES DE LAS NACIONES UNIDAS

Las publicaciones de las Naciones Unidas están en venta en librerías y casas distribuidoras en todas partes del mundo. Consulte a su librero o diríjase a: Naciones Unidas, Sección de Ventas, Nueva York o Ginebra.

Printed in U.S.A.
81-40741—June 1982—5,875

02300

United Nations publication
Sales No. E.81.XIII.7
ST/ESA/SER.A/77