Medical Journal of the
Islamic Republic of Iran

Volume 4
Number 3
Payiz 1369
Rabiolawwal 1411
Fall 1990

ESTIMATING INFANT AND CHILD MORTALITY IN IRAN, 1989

KAZEM MOHAMMAD AND MAHMOOD M.M. FARAHANI

From the Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Islamic Republic of Iran.

ABSTRACT

This paper presents estimates of infant and child mortality in the rural and urban areas of Iran for 1989. Data are from a one percent sample of the urban and rural population. The study makes use of data on the number of children born alive and children surviving, classified by age of the mother. Based on these data estimates of infant and child mortality for the urban and the rural areas have been calculated separately by using the Trussell version of the Brass method. The results of this study show that the infant mortality rates in the rural and urban areas of Iran are 70 and 35 per thousand, respectively.

The estimates obtained from previous retrospective studies are compared with the current rates. Datails of the method, limitations of the data and discussion of the results are given in the paper.

MJIRI, Vol. 4, No. 3, 215-218, 1990

INTRODUCTION

Infant and child mortality rates are often considered as significant indicators of a nation's health conditions and provide guidelines for structuring of public health programs. They also represent a substantial proportion of total mortality in developing countries and therefore also greatly affect population dynamics. They are also

Table I. Distribution of number of women and data on children ever born and children surviving by age of women and place of residence in 1989, Iran (Retrospective Survey of Fertility and Mortality)

Place of Residence	Age groups of mothers	No. of Women	Children ever born			
			Children surviving		Children died later	
			Living with family	Living else where	Martyred	Other reasons
Rural	15-19	14487	3277	23	1	387
	20-24	9828	13227	83	8	1228
	25-29	7822	23695	228	11	2702
	30-34	6555	29382	798	22	4197
	35-39	5688	30540	2227	55	5791
	40-44	4323	2204	4016	96	5735
	45-49	3675	15572	5582	128	5734
Urban	15-19	16032	2839	12	4	133
	20-24	14136	15241	89	9	635
	25-29	12452	29764	197	19	1465
	30-34	10448	37053	606	29	2404
	35-39	8347	35363	2112	100	3048
	40-44	6023	24385	4337	174	3184
	45-49	4441	15939	6131	199	3266

Table II. Results of the various steps of the application of the Trussell version of the Brass method to data for both sexes from 1367(1989) Iran retrospective survey

Age groups of mothers	No. of women	Children born alive	Children surviving	Children born per woman Pi	Children surviving per woman Si	Proportion of children dead $\frac{1-Si}{Pi}$	Multiplier k(i)	Probaility of dying by age q(x)	Age x	Time reference t(i)	Reference date	Common index q'(5)
15-19	30519	6676	6156	0.2187	0.2017	0.0777	0.9530	0.0740	1	1.1	1365.9	0.0971
20-24	23964	30520	28657	1.2736	1.1958	0.0611	1.0441	0.0638	2	2.4	1364.6	0.0705
25-29	20274	58081	53914	2.8648	2.6593	0.0717	1.0278	0.0737	3	4.1	1362.9	0.0774
30-34	17003	74491	67890	4.3811	3.9928	0.0886	1.0362	0.0918	5	6.2	1360.8	0.0918
35-39	14064	79236	70397	5.6340	5.0055	0.1116	1.0544	0.1177	10	8.5	1358.5	0.1119
40-44	10346	63974	55055	6.1835	5.3214	0.1394	1.0322	0.1439	15	11.1	1355.9	0.1314
45-49	8116	52551	43551	6.4750	5.3661	0.1713	1.0180	0.1744	20	14.2	1352.8	0.1501

p(1)/p(2) = 0.1717 p(2)/p(3) = 0.4446 Multipliers based on South model Sex ratio at birth = 1.05

useful for the purposes of identifying target population groups for which mortality is high and also assessing program impact in terms of mortality reductions.

The conventional measurement of mortality requires two pieces of information: the number of deaths on one hand and the populationsubjectof risk of dying on the other. Typically, the first type of information is derived from registration systems that record deaths as they occur, while the latter is obtained mostly from censuses. However, in the majority of developing countries registration systems either do not exist or are so affected by omission and other errors that measures based on the data that they produce fail to reflect properly either levels or trends of mortality.

Over the last twenty years, a number of methods based on information obtained exclusively from censuses or surveys have been developed. Since during that period survey and census data have also become more commonly available, considerable advances have been made to fill the gap produced by lack of reliable vital registration data. A procedure of estimating the levels of infant and child mortality from reports of women of their children surviving or dead has been derived, known as the Brass method. Other methods also exist for estimating child mortality, but they either require considerably more information than the ones descibed here or have proved to be less reliable.

The aim of this paper is to present estimates of infant and child mortality for Iran and its rural-urban areas separately, based on data on the number of children alive and surviving classified by age of mother available from the recent survey based on one percent population in Iran in 1989.

METHOD AND MATERIAL

Estimating infant and child mortality rate by the Brass method requires three pieces of information: the number of children ever born, the number of children ever born who died (children dead) and total female population.

In April 1989, a retrospective survey of fertility and mortality conducted in Iran included questions on children ever born and children dead. Table I shows the tabulation of data of children ever born (in this table we have one extra column for martyrs, which in calculation we assumed as children alive) and children surviving; from these data, it is possible to derive the proportion of children surviving to children ever born by ever

Table III. Results of the various steps of the application of the Trussell version of the Brass method to data for sexes from 1367 (1989) rural retrospective survey

Age groups of mothers	No. of women	Children born alive	Children surviving	Children born per woman Pi	Children surviving per woman Si	Proportion of children dead $\frac{1-Si}{Pi}$	Multiplier k(i)	Probaility of dying by age q(x)	Age x	Time reference t(i)	Reference date	Common index q'(5)
15-19	14487	3688	3301	0.2546	0.2279	0.1049	0.9434	0.0990	1	1.2	1365.8	0.1435
20-24	9828	14546	13318	1.4801	1.3551	0.04845	1.0469	0.0885	2	2.4	1364.6	0.1002
25-29	7822	26636	23934	3.4053	3.0598	0.1015	1.0325	0.1048	3	4.0	1363.0	0.1112
30-34	6555	34399	30202	5.2477	4.6075	0.1220	1.0407	0.1270	5	6.1	1360.9	0.1270
35-39	5688	38613	32822	6.7885	5.7704	0.1338	1.0588	0.1417	10	8.3	1358.7	0.1340
40-44	4323	31894	26159	7.3777	6.0511	0.1798	1.0363	0.1863	15	10.9	1356.1	0.1680
45-49	3675	27016	21282	7.3513	5.7910	0.2122	1.0216	0.2168	20	14.0	1353.0	0.1846

p(3)/p(2) = 0.1720 p(2)/p(3) = 0.4346 Multipliers based on South model Sex ratio at birth = 1.05

Table IV. Results of the various steps of the application of the Trussell version of the Brass method to data for hoth sexes from 1367 (1989) urban restrospective survey

Age groups of mothers	No. of women	Children born alive	Children surviving	Children born per woman Pi	Children surviving per woman Si	Proportion of children dead $\frac{1-Si}{Pi}$	Multiplier k(i)	Prohaility of dying by age q(x)	Age x	Time reference t(i)	Reference date	Common index $q^c(5)$
15-19	16032	2988	2855	0.1864	0.1781	0.0445	0.9757	0.0434	1	1.1	1365.9	0.0509
20-24	14136	15974	15339	1.1300	1.0851	0.0397	1.0473	0.0416	2	2.3	1364.7	0.0447
25-29	12452	31445	29980	2.5253	2.4076	0.0466	1.0258	0.0478	3	4.1	1362.9	0.0496
30-34	10448	40092	37688	3.8373	3.6072	0.0600	1.0331	0.0620	5	6.2	1360.8	0.0620
35-39	8376	40623	37575	4.8499	4.4860	0.0750	1.0511	10	8.6	1358.4	0.0758	
40-44	6023	32080	28896	5.3262	4.7976	0.0992	1.0291	0.1021	15	11.3	1355.7	0.0945
45-49	4441	25535	22269	5.7498	5.0144	0.1279	1.0152	0.1298	20	14.4	1352.6	0.1137

p(1)/p(2) = 0.1650 p(2)/p(3) = 0.4475 Multipliers based on South model Sex ratio at birth = 1.05

married women of different age groups. This information together with information on the parity for all women in the age groups (15-19), (20-24), permits the extraction of estimates of child mortality. The parity for all women can be obtained as product of the parity of ever married women and the proportion of ever married women in the age groups.

From these data, specifically, it is possible to estimate the proportion of children born alive who survive to age 1,2,3 and 5 by Brass method.

The Brass method derives estimates of q(x)-the probability of dying between birth and exact age x-from the proportion of children dead among those ever born by women in different age groups by allowing for the duration of exposure to the risk of dying. This duration of exposure is related to the ages of women and to the timing of their births since, on average, the older the women, the longer ago their children would have been born and, hence, the longer the children would have been exposed to the risk of dying.

The actual derivation of a Brass-type estimation procedure involves the use of simulation to generate proportions of children dead, the probabilities of dying that they are related to, and the p(1)/p(2) and p(2)/p(3) ratios, [p(1), p(2) and p(3) are used to denote the average parties of women in age groups 15-19, 20-24 and 25-29, respectively] that provide the linkage between them. By using regression analysis one derives then the estimation equation that make the application of the procedure straightforward.

It is worth noting that there are several versions of the Brass method. They differ mostly in the type of models used to simulate the quantities of interest. One of them is that proposed by Trussell (1975) which we have used.

The method originally developed by Brass assumed that mortality was constant, so that cohort and period probabilities of dying were identical. That assumption was later relaxed through the work of Feeney (1980), Coale and Trussell (1978), and others. These authors showed that if the rate of change of mortality over time was approximately constant, the reference data of each q(x) could be estimated by making allowance for the age pattern of fertility via the p(1)/p(2) and p(2)/p(3) ratios.

Since the measurement of child mortality trends is

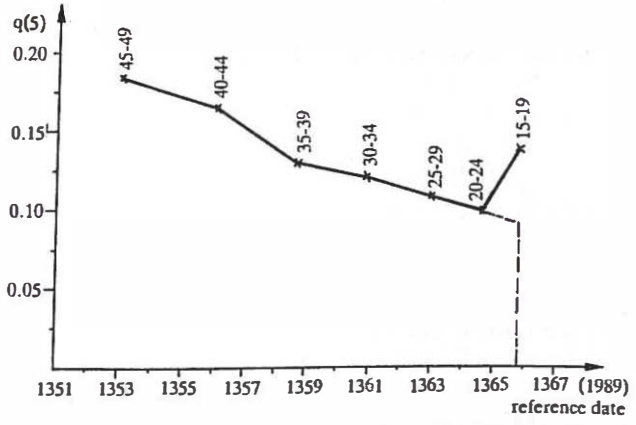

Fig. 1. Estimated under-five mortality, q(5), using South model and Trussell version of the Brass method, total of Iran.

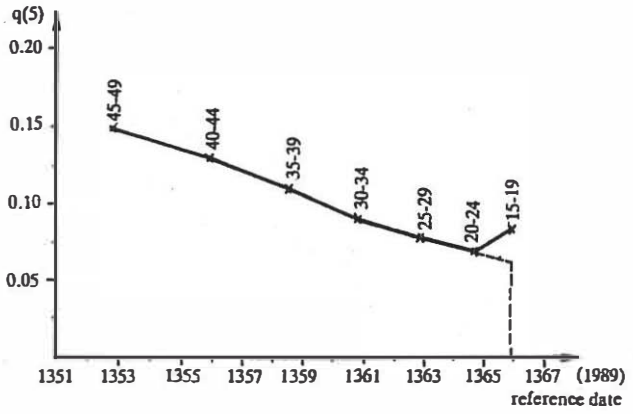

Fig. 2. Estimated under-five mortality, q(5), using South model and Trussell version of the Brass method, total of rural areas.

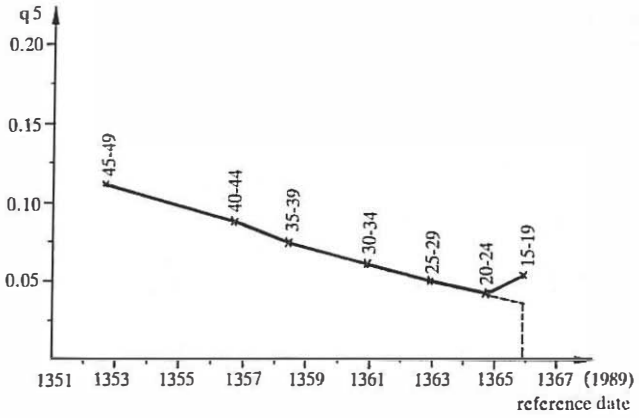

Fig.3. Estimated under-five mortality, q(5), using south model and Trussell version of the Brass method, total of urban areas.

an important objective in this paper, and also child mortality estimates based on reports of women aged 15-19 and, to a lesser extent, on those of women aged 20-24 are generally unreliable, often being higher than estimates based on reports of older women, we can use the trend to find child and infant mortality rates in recent years.

The Trussell version of the Brass method for multipliers employs regression mode of the form:

$$K(i) = a(i) + b(i)\frac{P(1)}{P(2)} + c(i)\frac{P(2)}{P(3)}$$

Where a(i), b(i) and c(i) are constants, i refers to the age groups, and for the calculation of the reference datesof q(x) can be estimated as:

$$t(i) = e(i) + f(i)\frac{P(1)}{P(2)} + g(i)\frac{P(2)}{P(3)}$$

Where e(i), f(i) and g(i) are constant.

RESULTS

Estimates of q(x) for Iran and its rural-urban areas separately based on Trussell version of the Brass method are summarized in Tables II to IV. Infant and child mortality for recent years estimated by trend of child mortality (Figures, 1,2,3) is compared with current data in Table V.

Table V. Estimated infant and child mortality by under-five mortality and infant mortality by current data, rural-urban and total of Iran

Regions	Infant* mortality	Child* mortality	infant mortality by current data
Total	0.0498	0.060	0448
Rural	0.0696	0.090	0.0579
Urban	0.0352	0.040	0.0310

* Estimated by under-five mortality trend

The infant and child mortality of current life table is lower than that implied by retrospective reports of the proportion of children dead. This is true for the rural and urban areas separately as well. The pattern of differentials between two sets of rates appear plausible because of the difference in the time interval to which the rates refer and the effect of change in mortality over time, though one might question whether the apparent differences are genuine features of mortality over time or partly caused by errors in two different data collection systems.

REFERENCES

1- Brass W: Uses of census and survey data for the estimation of vital rates. Paper Prepared for the African Seminar on Vital Statistics, Addis Ababa (14-19) December, 1964.
2- Coale A.J et al: Regional model life tables and Stable populations second Edition, Academic press, New York, 1983.
3- Coale AJ, Trussell TJ: Estimating the time to which Brass estimates apply. Population Bulletin of the United Nations, No. 10, 1977.
4- Feeney. G: Estimating infant mortality trends from child survivorship data. Population studies, Vol. 34, No. 1, 1980.
5- Trussell T J: a re-estimation of the multiplying factors for the Brass technique for determining childhood survivorship rates. Population Studies, Vol. 29, No. 1, 1975.
6- United nations, Manual X: Indirect Techniques for Demographic Estimation. New York, United Nations, 1983.