

23 JUL. 1974 ✓

15733.00  
(039916)

# Mortality in Latin America: Present Level and Projections†

Jorge L. Somoza

## Introduction

In a document submitted to the World Population Conference held in Belgrade 2/, some selected indices of mortality derived from life tables were presented, corresponding to a few countries in Latin America -only those for which the basic information had permitted the construction of reasonably reliable mortality tables. In this document, instead, a set of estimates, referring to some life tables values, are presented for each of the 20 Latin American countries for the period 1960-1965. There has not been, of course, a sudden improvement of the deaths registration and the census taking throughout the region. The indices presently available are only estimates, sometimes very rough ones, though they have a remarkable characteristic: they reflect the level of mortality assumed in the most general and recent revision of the population projections by countries undertaken by the United Nations. This work has been conducted in 1968 and its results just published 3/.

Estimates of the level of mortality for the total population of Latin America, obtained by grouping together all countries, are also worked out in this document covering the five years periods extending from 1960-1965 to 1980-1985. It has been considered of interest to compute indices derived from regional life tables, since they may be of value for those interested in analyzing, at that level, the demographic, social or economic situation of Latin America.

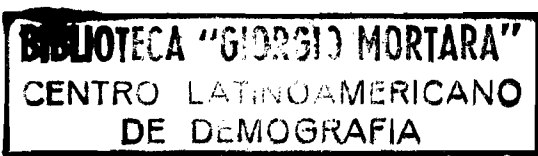
The document is divided in two parts: the former is concerned with the estimation of mortality by countries for the period 1960-1965, the latter deals with the life tables values computed for the region as a whole.

## The mortality in Latin American countries in 1960-1965

The purpose of this section is to elaborate a set of mortality indices, derived from life tables, for each Latin American country, by sex, corresponding to the period 1960-1965.

The set of mortality indices includes the expectation of life at birth ( $e_0$ ) and the probability of dying within the five-year period following the attainment of age  $x$  ( $5q_x$ ), for two selected values of  $x$ , namely, 0 and 40. It is expected that this set of indices provides a clear, yet synthetic, picture of the mortality level of a population.

As mentioned above, the level of mortality for each country has been estimated recently when the United Nations undertook the revision of all



1974

population projections. In Latin America, this task was divided among different demographers working at the Latin American Demographic Centre (CELADE) Headquarters in Santiago and its Central American Sub-Centre in San José. Also some national statistical offices were involved in the work, mainly those of Argentina and Chile. A consequence of this arrangement is that the criteria utilized to derive the mortality estimates and assumptions are not uniform in all countries. Moreover the estimates of mortality for the period 1960-1965 are not presented in a similar way, not even covering this five year period in all cases.

Our task begins, then, by computing for all countries the same life table function for the period 1960-1965. Starting with the results of the projections, when other more appropriate information was not available, the survival ratio for five years and quinquennial age groups was computed, i.e., the  ${}_5P(x, x+4) = \frac{{}_5L_{x+5}}{{}_5L_x$  that we write, for simplicity:  ${}_5P(x)$ . Suitable interpolations were made in order to obtain estimates for 1960-65 based on the available information related to overlapping periods. For example, with the values known for 1958-63 and 1963-68, the corresponding to 1960-1965 were interpolated. A complete set of the  ${}_5P(x)$  function was obtained for each country and therefrom the expectation of life at birth,  $e_0$  was derived.

A technical problem was now faced: How to determine the probability of dying ( ${}_5q_x$ ) from the survival ratios ( ${}_5P(x)$ ). This problem was expediently solved resorting to the United Nations model life tables 4/. According to this set of tables to each P value corresponds just one value of q.

Another technical problem was that there are two values of  ${}_5P(x)$  covering one five-year age interval. For example,  ${}_5q_{40}$  is implied in  ${}_5P(35)$  and  ${}_5P(40)$ . Consequently, two estimates of  ${}_5q_{35}$  could generally be obtained from the Ps values. This problem was also simply solved: an average of the two resulting values was adopted.

The computations were made for each country by sex. The basic information was taken from a CELADE publication 5/. The results appear in Table 1.

As mentioned above, the accuracy of the estimates is not the same for all countries. In most cases the basic information on which they are based are deficient and, consequently, the resulting estimates are subject to large margin of errors. This consideration must be borne in mind when examining the figures appearing in Table 1.

Some interesting conclusions can be drawn from the examination of the indices shown in Table 1:

- (a) In 1960-1965 there was a wide margin of variation in the estimated level of mortality by countries. Expressed in terms of the expectation of life at birth it ranged from 41-43 years for males and females, respectively, to 65-71 years. The former reflecting a very high mortality level for the present time; the latter a relatively low one. In between these extreme values, corresponding to Haiti and Uruguay, are naturally those belonging to the other countries.

Table 1

LATIN AMERICAN COUNTRIES. EXPECTATION OF LIFE AT BIRTH AND PROBABILITIES OF DYING AT SELECTED AGE INTERVALS BY SEXES. PERIOD 1960-1965

Country	Expectation of life at birth		Probability of a person of exactly x years of age dying within the period x, x+5			
	Males	Females	x = 0		x = 40	
	$e_0^o$		$5q_0$		$5q_{40}$	
			(per thousand)			
<u>Southern Latin America</u>						
Argentina	62.6	69.3	68.26	57.72	26.40	15.36
Bolivia	42.8	44.8	247.56	229.08	61.50	54.44
Brazil	55.9	60.6	140.96	118.04	39.55	32.69
Chile	55.6	61.4	125.16	108.08	41.29	26.21
Colombia	54.8	57.9	132.02	114.92	38.62	33.22
Ecuador	52.9	55.7	157.57	138.54	47.65	42.98
Paraguay	55.4	59.3	144.23	120.38	33.54	26.96
Peru	52.6	55.4	167.21	148.22	38.41	35.16
Uruguay	65.1	70.7	50.19	42.59	21.89	13.54
Venezuela	59.4	62.6	112.87	96.72	27.86	23.07
<u>Northern Latin America</u>						
Costa Rica	62.0	64.9	112.44	99.10	23.50	19.30
El Salvador	49.3	52.5	196.10	167.53	56.60	50.40
Guatemala	48.0	49.4	226.02	217.65	52.52	43.51
Honduras	44.9	48.7	228.12	202.80	66.24	57.01
Nicaragua	44.3	46.6	246.56	228.15	58.96	54.63
Panama	60.4	62.5	99.71	87.21	38.10	38.01
Mexico	58.8	61.6	115.48	111.92	38.92	28.91
Cuba	62.6	66.0	83.05	70.34	23.80	19.36
Dominican Republic	48.4	50.9	200.97	181.66	47.26	40.78
Haiti	41.0	43.0	268.65	247.10	67.21	58.97

If ordered, they constitute a series of values increasing uniformly from the low limit to the high. There are not big gaps dividing groups of countries. See Figure 1.

- (b) It is observed that without any exception, female mortality was lower than male's. It is of interest to point out that this differential is quite dissimilar between countries. There are some, the most outstanding example is Panama, with almost no difference in mortality by sex in the age interval 40-45. In contrast, in other cases, the differential is remarkably important -the most conspicuous example being Chile for the same age group:
- (c) The estimated probability of dying within the first five years of life is, in the region as a whole, consistent, according to the United Nations model sex and age patterns of mortality, with the probability of death in the interval 40-45. Although for some countries this is simply due to the fact that model life tables have been utilized to estimate the mortality level, in others this is not the case since it has been derived from their own experiences. There are, of course, striking deviations from this general trend. Two remarkable examples are Panama (both sexes) and Mexico (males). In these two countries the mortality in adult life (40-45) is much higher than it would have been anticipated, in the light of the level in the first years of life or, the general mortality level, as estimated by the expectation of life at birth.
- (d) Another characteristic worth commenting is that the estimates of the probability of dying between 0 and 5 ( ${}_5q_0$ ) from two known values of the survival ratios ( ${}_5P(x)$ ) covering the same age interval were in some cases, quite different. This means that the set of model life tables utilized to estimate  ${}_5q_0$  from the  $P_s$  values was not reflecting properly the mortality in those countries. Guatemala is a conspicuous example: the survival rate from 0-4 to 5-9 corresponded to a level of mortality much higher, in the United Nations repertory, than the one that could be estimated on the basis of the survival ratio from birth to the age group 0-4. Mortality of children in this country seems to be relatively too high.

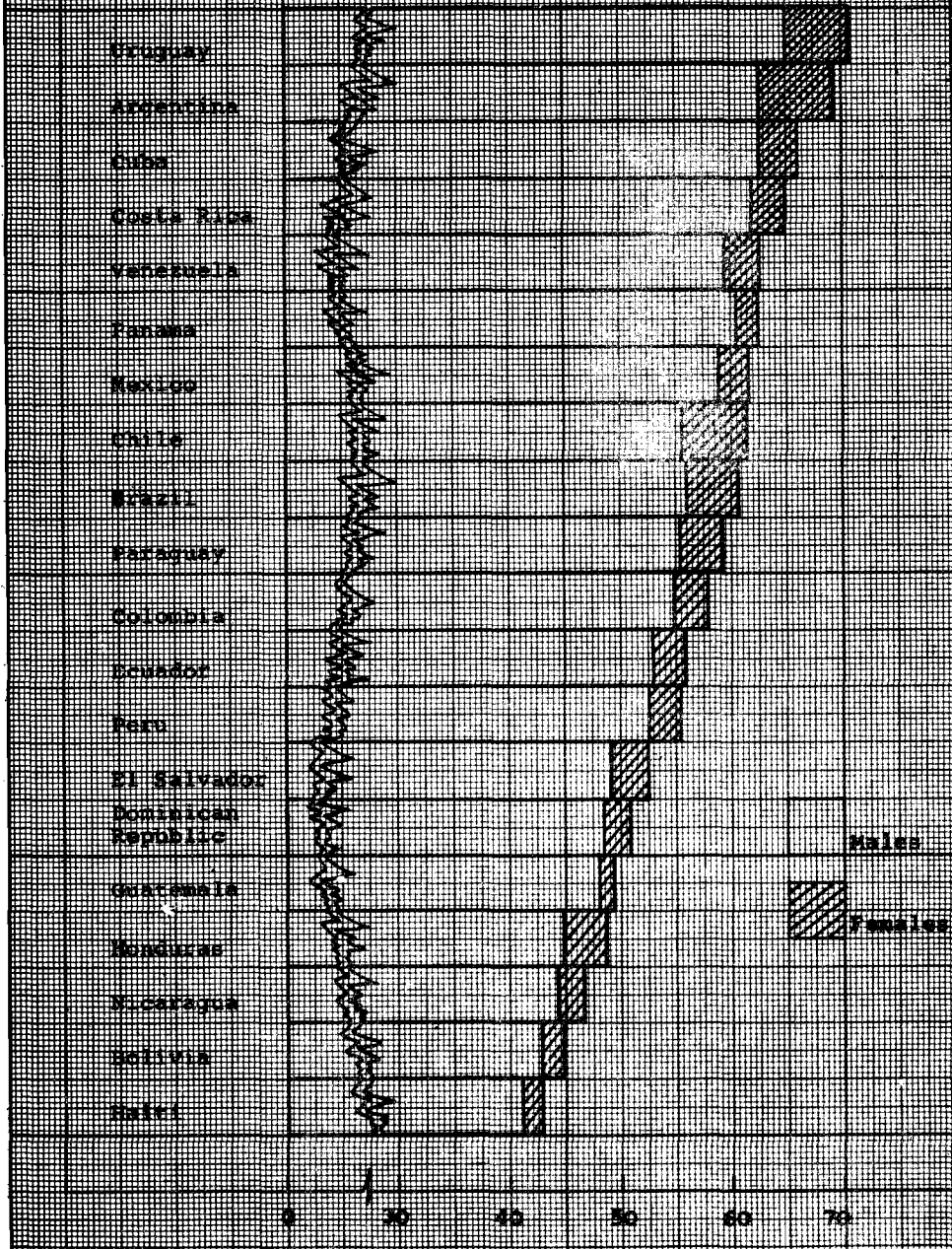
#### The level of mortality for the region 1960-1985

Before describing the steps followed in order to construct regional life tables, it is of interest to show some crude rates for Latin America as a whole, resulting from the projections prepared for countries. The rates and the estimated absolute numbers involved in their computation, are presented in Table 2.

The Table shows that, according to the projections, it is anticipated that the birth rate will decline in the region. This modification of the level of fertility will determine a change in the age structure more favourable to a low death rate than the present one. In the projections it has also been assumed that the reduction in age specific mortality rates observed in the past will continue in the future. Both hypotheses, reduction of fertility and fall of mortality, determine a sharp reduction

Figure 1

CENTR AMERICAN COUNTRIES. EXPECTATION OF LIFE AT BIRTH BY SEXES, 1960-1965



of the crude death rate that will probably reach a level as low as 7 per thousand per annum in twenty years from now. The annual rate of growth as a consequence of the balance of the simultaneous reduction of the birth and the death rates, will likely be almost constant at a very high level: 29 per thousand. It is of interest to investigate what the assumptions are with regard to the assumed trend in mortality when expressed by means of indices not affected by the age structure, such as those derived from life tables that are considered in what follows.

The basic information for computing the regional life tables was obtained from two recent CELADE publications. One of them presented the population, in five year age groups up to 70, and a final group of persons over 70, at mid-year from 1960 to 1985, every five years 6/. The other provided the annual birth rate for the whole region for each five year period starting in 1965 7/. The birth rate for 1960-1965, that was also needed, was computed after summing the estimated number of births in each country. This information was obtained directly from the, generally unpublished, reports on population projections for countries available at CELADE.

The life tables were constructed for the total population, i.e. both sexes. For each five year period between 1960 and 1985 it was possible, first, to elaborate a set of annual death rates that was taken, without any adjustment, as representing the central death rates of the life tables ( ${}_n m_x$ ). From these values it was possible, then, to derive the probability of dying in age intervals ( ${}_n q_x$ ) and therefrom the remaining functions of an abridged mortality table.

Table 2

LATIN AMERICA. TOTAL POPULATION AND ESTIMATED ANNUAL NUMBER OF BIRTHS, DEATHS AND INCREASE BY FIVE YEAR PERIODS BETWEEN 1960 AND 1985. CORRESPONDING ANNUAL BIRTH, DEATH AND GROWTH RATES

Period	Mean population	Mean annual number of:			Annual crude rates of:		
		(a) births	(b) deaths	(c) increase	(a) birth	(b) death	(c) growth
		----- (in thousands) -----			---- (per thousand) ----		
1960-1965	222.576	8.823	2.560	6.263	39.64	11.50	28.14
1965-1970	256.582	9.917	2.578	7.339	38.65	10.05	28.60
1970-1975	296.451	11.246	2.637	8.609	37.93	8.89	29.04
1975-1980	342.904	12.677	2.705	9.972	36.97	7.89	29.08
1980-1985	396.320	14.172	2.778	11.394	35.76	7.01	28.75

Source: CELADE, Boletín Demográfico Año 2, Vol. III, Santiago, Chile, January 1969.

The successive steps of the first part were:

- (a) to compute the number of deaths in each cohort (we define a cohort as the group of persons born in the same five year period) for every quinquennium, differencing the number of individuals at the beginning of the period, aged  $x, x+4$ , and the estimated number of survivals, five years later with ages  $x+5, x+9$ . The number of births -estimated on the basis of the known annual birth rate and the mean population- of the period, minus the number of children aged 0-4 at the end of it were also taken into account. A final group was formed with deaths from persons with ages 65 and over at the beginning of the period -70 and over at the end.
- (b) to separate the number of deaths of each cohort with ages  $x, x+4$  at the beginning of the period, into two subgroups according to age:  $x, x+4$  and  $x+5, x+9$ . To do this it was assumed that the importance of the two subgroups was equal. Deaths originated in the cohort of births were assigned naturally, to the age-group 0-4. Deaths corresponding to persons over 65, at the beginning, were also separated into two subgroups, namely: 65-69 and 70 and over. It was assumed, for this purpose, that the number of deaths in the former age group were equal to one half of the deaths in the cohort aged 60-64 at the beginning of the period considered.
- (c) to obtain the total number of deaths by age-groups, in each five year period. To this aim, the appropriate subgroups of deaths, obtained in (b), were summed up. The mean annual number of deaths, by five year age groups up to 70 and a final group of deaths over 70, was calculated dividing by five the number of deaths in the five year period.
- (d) to calculate the mean population for each age group, computing an average between the number of persons estimated at the beginning and at the end of each quinquennium, in each age group.
- (e) to divide the annual number of deaths by the mean population, in each age group, to get the annual death rate by ages.

The annual death rates by five year age-groups for each period were represented in a figure (See Figure 2 for those corresponding to three periods). They showed the typical variation of the rates with age, without any serious irregularity. This result could have been anticipated since the rates resulted from grouping together information obtained for countries which, in turn, had been smoothed. Consequently, it was decided to assimilate the observed annual rates by ages without any adjustment, to the central death rates of a life table ( ${}_5m_x$ ).

To derive the probability of dying within the five year period following the attainment of age  $x$  ( ${}_5q_x$ ) from the central death rates ( ${}_5m_x$ )

it was resorted to the function relating  ${}_5q_x$  to  ${}_5m_x$  developed by Reed and Merrell 8/. With the resulting set of q-values, and following well-known paths, the remaining life table functions were obtained. Table 3 shows some results, namely, the expectation of life at birth and the central death rates for five year age-groups. The values are given for each quinquennium between 1960-1965 and 1980-1985.

The results shown in Table 3 and Figure 2 furnish the bases for the following comments:

- (a) the level of mortality in Latin America, in the period 1960-1965 can be represented summarily by an expectation of life at birth equal to 57.61 years. This value is, of course, an average of those appearing in Table 1 weighed by the size of the population by sex of each country. Mortality in the region is moderately high, if compared with the level prevailing in Europe and North America, though lower than the mortality of underdeveloped areas of Africa and Asia.
- (b) it is expected, according to the projections, that mortality will decline in the future. The reduction, measured in terms of the expectation of life at birth, will be sustained, though slowing down: it is assumed that this index will increase in 2.88 years between 1960-1965 and 1965-1970, but only in 2.09 between the periods 1975-1980 and 1980-1985. The hypothesis is rather optimistic, yet reasonable. It must be borne in mind that it is the resultant of twenty different mortality projections made for individual countries.
- (c) the fall in the mortality rates by ages is expected to be very sharp in the young age groups and only moderate after ages 45 or 50. In relative terms the age intervals between ages 10 and 20 are the ones with the most remarkable reduction as can be easily seen in Figure 2 representing the logarithm of the rates. For ages over 45 or 50 the reduction of the rates, in relative terms, is unimportant. These hypotheses assume, in broad terms, that the characteristics of the decline in mortality observed in the past will continue in the future.
- (d) the projected level of mortality for the period 1980-1985, expectation of life at birth equal to 67.45, is equivalent to the one prevailing presently in the Latin American countries with relatively low mortality and higher, consequently, than the present level of the socially more advanced countries.

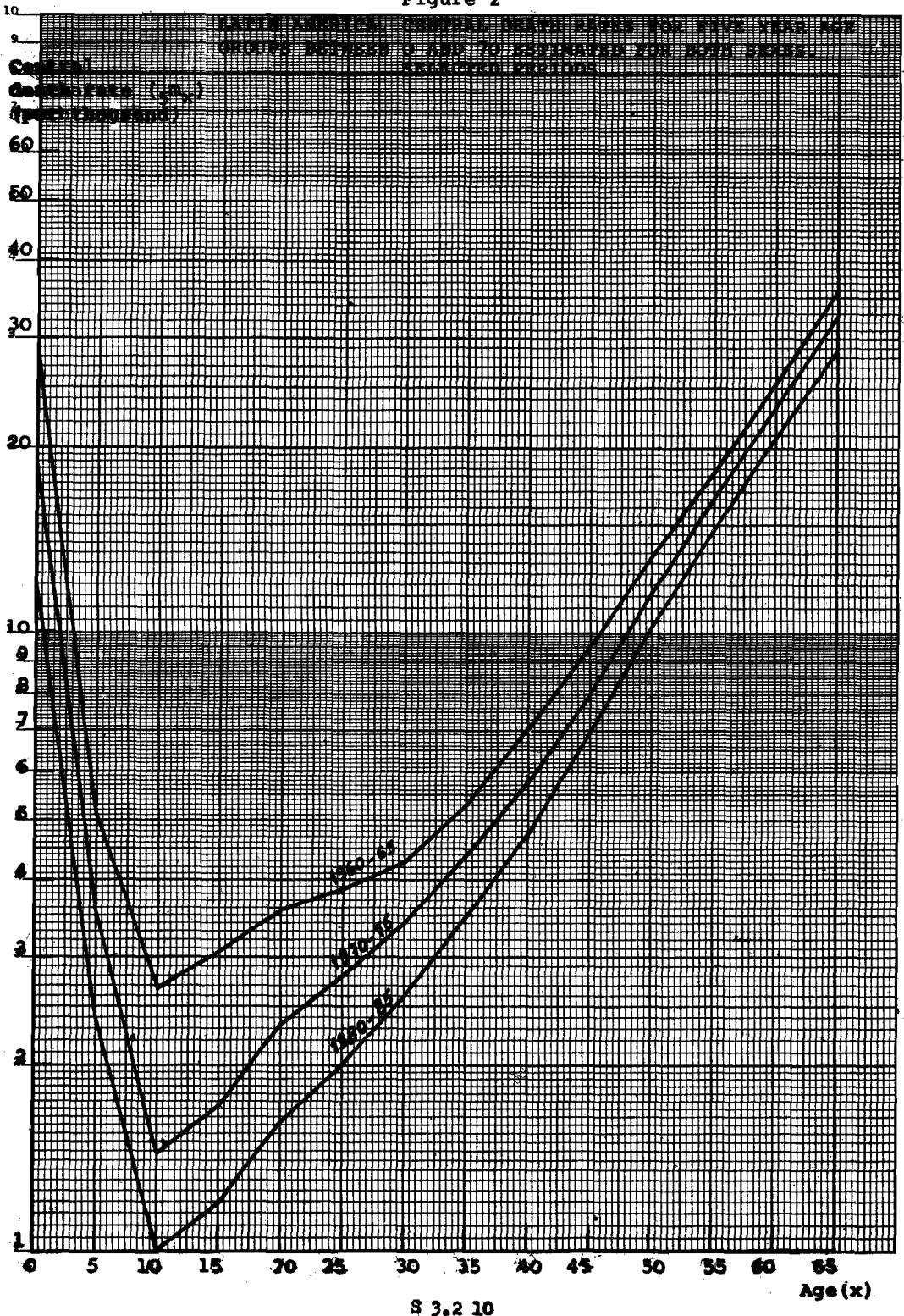


Table 3

LATIN AMERICA. EXPECTATION OF LIFE AT BIRTH AND CENTRAL DEATH RATES FOR FIVE YEAR AGE GROUPS BETWEEN 0 AND 70 ESTIMATED FOR BOTH SEXES FROM 1960 TO 1985 BY PERIODS

Age group	Periods				
	1960-1965	1965-1970	1970-1975	1975-1980	1980-1985
		<u>Expectation of life (<math>e_0^o</math>)</u>			
At birth	57.61	60.49	63.02	65.36	67.45
		<u>Central death rate (<math>{}_5m_x</math>)</u>			
		(per thousand)			
0- 4	28.45	23.16	18.97	15.24	12.06
5- 9	5.10	4.26	3.56	2.92	2.79
10-14	2.67	1.71	1.44	1.19	1.00
15-19	3.06	2.02	1.72	1.42	1.19
20-24	3.55	2.78	2.33	1.92	1.61
25-29	3.87	3.32	2.79	2.38	2.02
30-34	4.27	3.97	3.39	3.01	2.58
35-39	5.28	4.93	4.36	3.94	3.46
40-44	7.02	6.35	5.72	5.23	4.74
45-49	9.50	8.70	8.00	7.42	6.92
50-54	13.23	12.32	11.51	10.84	10.21
55-59	18.21	17.29	16.43	15.55	14.67
60-64	25.17	24.39	23.16	22.14	20.85
65-69	35.89	34.64	32.38	30.50	28.86

Figure 2



NOTES AND REFERENCES

- 1/ This document refers to some aspects of a general research on mortality in Latin America presently undertaken by the United Nations Latin American Demographic Centre.
- 2/ Somoza, Jorge L., Levels and trends of mortality in Latin America in terms of age, World Population Conference, 1965, Vol.II, E/CONF.41/3, United Nations, New York, 1967, page 370.
- 3/ Centro Latinoamericano de Demografía (CELADE), Boletín Demográfico Año 1, Vol. II, Santiago de Chile, October 1968.
- 4/ United Nations, Manual III, Methods for Population Projections by Sex and Age, ST/SOA/Series A/25, New York, 1956.
- 5/ Centro Latinoamericano de Demografía (CELADE), Boletín Demográfico Año 2, Vol.III, Santiago de Chile, January 1969.
- 6/ See note 3.
- 7/ See note 5.
- 8/ Reed, L.J. and Merrell, M., A Short Method for Constructing an Abridged Life Table, American Journal of Hygiene, Vol. 30, page 33, September 1939.

