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ESTIMATES OF THE LIFE TABLE FUNCTIONS OF THE PHILIPPINES: 1970[1]

By

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I. INTRODUCTION —

There are three determinants in the growth of population of a country, namely, fertility, mortality and migration. Since the end of the Second World War, however, migration has played an insignificant role in the growth of most nations. As Immigration Laws were enacted, the gains or losses of population through migration have been minimal. Hence, in the present time with the exception of a few cases, the growth of a nation is measured practically the balance between its births and deaths. Births increase the population; deaths bring it down. A country beset with a problem of population control tries to find the solution in terms of reductions in its birth rate. Indeed, it is noteworthy to mention the fact that, inspite of the mounting gravity of the problem of population control, mortality has not been advocated as a means of checking population growth. Of course, it will never be. The sanctity of human life is still uppermost in man's considerations toward the solution of his problem. He would rather try to bar the entrance into life than hasten the departure from it. Such is the line of action man has chosen as regards this ever pressing population dilemma.

The factor of mortality is an integral part of demographic analysis. In planning and policy making af-

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fecting human population, mortality must be duly considered since it alters not only the quantity but also the quality of the future population of a country. It is clear that in order to obtain a better forecast of a population, it is essential to make a close investigation of the mortality conditions, its prevailing rate as well as its possible future course.

This paper attempts to assess the mortality conditions of the Philippines during the recent times through the use of some quantitative measures. The crude death rate, which is the simplest and most common of the mortality measures, will be estimated. Unfortunately, the crude death rate is not a very efficient measure since it is strongly affected by the age-structure of the population. For this reason, other mortality indices, as defined by the functions of a life table, will be estimated. Because of limitations in the data, however, the life table functions that will be constructed herein will be at 5-year age interval. From this abridged life table, the more complete life table by single year of age will be derived by interpolation. A more detailed description of the life table and its construction will be given in a later chapter.

II. THE DATA: THEIR SOURCES, USES AND LIMITATIONS —

In the Philippines, as in other developing countries of the world, research studies pertaining to population are severely handicapped by the unavailability and/or inadequacy of required data. The vital registration in the country, which would have been the best source of data for mortality analysis, is still far from being adequate as regards completeness and coverage. There is still a long way to go before one can rely solely on it for obtaining acceptable estimates of death rates. One recourse would have been through sample surveys but, unfortunately, the few demographic surveys conducted in the Philippines put more emphasis on fertility than on mortality. Under these circumstances, the best data for an analysis of mortality conditions are those obtained from population censuses, particularly, the age and sex distribution of the population.

The Philippines is fortunate to have had several censuses in the past that provide us with a picture of how the population of the country has grown over the years. Table 1 shows the population of the country as enumerated during four (4) census periods as well as the observed intercenal growth rates, for each sex.

TABLE 1

Enumerated Population of the Philippines and the Annual Growth Rates, by Sex, for Four Census Years: 1939, 1948, 1960 and 1970

Year	Enumerated Population			Annual Growth Rate for the Period (In per cent)[b]	
	Male	Female	Sex Ratio[a]	Male	Female
1939	8,065,281	7,935,022	101.6		
				1.84	1.94
1948	9,651,195	9,582,987	100.7		
				3.06	2.96
1960	13,622,869	13,424,816	101.8		
				2.83	3.10
1970	18,250,351	18,434,135	99.0		

[a] Sex Ratio = $\frac{\text{Male}}{\text{Female}} \times 100$

[b] Exponential rate of growth computed as $r = \frac{\ln P_t - \ln P_o}{t}$

The table shows that the population of the country has continously grown at a very high rate during the last couple of decades. This has been brought about by conditions of constant and very high birth rates but moderately low and declining mortality rates. Relatively low growth rates, especially for males, were observed during the intercensal period 1939-1948 obviously because of the Second World War. Between 1948 and 1960, the male growth rate exceeded that of the female but, again, seemed to slacken during the last intercensal period. The sex ratios, on the other hand, indicate that during the earlier censuses, there was always an excess of males over females; in 1970, the situation reversed.

The above observations seem to point out that sex differentials in mortality has widened recently with a bias against the males. These are, however, only empirical observations. A more thorough investigation is necessary for a more solid conclusion.

The principal data to be used in this study are age-sex distribution of the population as obtained during the 1960 and 1970 censuses. In addition, data on the number of registered deaths by age and sex for a period of five years from 1968 to 1972 will be utilized to establish a trend and age-pattern of death occurrences.

A census, which is a massive operation of data collection is especially subject to errors on account of its voluminous nature. Since the principal data that will be used in this study are obtained from censuses, it is deemed necessary to make an evaluation of these data before deriving estimates and making conclusions out of them.

The age-sex distributions of the population and the sex ratios for 1960 and 1970 are shown in Table 2. A brief evaluation of these data reveals the following striking observations:

1. A low overall sex ratio in the 1970 Census data as compared to that of 1960. When mortality level is moderately low, a decline in the death rate is usually accompanied by an increase in the sex ratio of the population. This happens because at such level, reductions in the male death rate tend to be greater than the female death rates, thus, resulting to a greater proportion of male survivors. Since it is most natural to assume mortality decline in the Philippines during the last decade, the decrease of the sex ratio from 101.8 in 1960 to 99.0 in 1970 is quite beyond the expected. This creates a suspicion that in 1970, there must have been a serious undercount of males.

2. Sudden drop of sex ratios at the working age groups, particularly, from ages 15 to 35. It might be added that the previous censuses reveal almost similar pattern of sex ratios which lead us to believe that the observed behaviour of the sex ratios is not really due to inherent characteristic of the population but to

TABLE 2

Age-Sex Distribution and Sex Ratio for the Philippines: 1960 and 1970

Age Group	1960 Male	1960 Female	1960 Sex Ratio	1970 Male	1970 Female	1970 Sex Ratio
Total	13,622,869	13,424,816	101.8	18,250,351	18,434,135	99.0
0	404,391		105.8	517,882	499,304	103.7
1 — 4	1,949,647	1,836,304	106.2	2,447,138	2,372,299	103.2
5 — 9	2,254,566	2,114,832	106.6	3,001,138	2,893,678	103.7
10 — 14	1,765,992	1,669,435	105.7	2,547,453	2,478,421	102.8
15 — 19	1,384,759	1,429,547	96.9	1,982,775	2,096,954	94.6
20 — 24	1,194,182	1,264,441	94.4	1.526,518	1,624,124	94.0
25 — 29	952,368	1,100,981	95.1	1,188,980	1,271,248	93.6
30 — 34	764,978	791,473	96.6	1,007,755	1,063,781	94.7
35 — 39	702,568	725,906	96.8	940,630	958,014	98.2
40 — 44	546,393	552,585	98.9	931,954	752,921	97.2
45 — 49	524,638	508,045	103.3	625,864	656,328	95.4
50 — 54	365,354	344,745	106.0	501,964	513,632	97.7
55 — 59	252,394	235,536	107.2	402,892	404,715	99.5
60 — 64	231,786	199,118	116.4	311,285	302,336	103.0
65 — 69	112,702	113,126	99.6	191,463	196,717	97.3
70 — 74	106,799	102,141	104.6	150,574	141,690	106.3
75 — 79	55,731	54,280	102.7	62,660	67,912	92.3
80 — 84	48,484	50,862	95.3	52,052	61,547	84.6
85 & Over	45,137	49,386	91.4	49,032	59,216	82.8
Not Stated	—	—	—	10,342	19,298	53.6

some recurrent enumeration errors. The errors are of two possible types. The first is that there could have been an underenumeration of males in these age groups. This is not a remote possibility considering the fact that this particular group are very migratory so that during census taking, they could hardly be found in their usual places of residence. The second type of possible error is an overcount of females in the age group mentioned. However, the overcount does not necessarily mean double counting of females. It could be a case of misreporting of ages where women in the older ages could have reported themselves younger than they actually were.

3. A lower growth rate of males during the last decade. Although males do have a higher death rate, this should be upset by the fact that more male babies are born. Hence, the net addition of population by sex should be higher for males. This again supports the hypothesis of male underenumeration during the last census. It is not, however, presupposed that the 1960 count was devoid of errors. More likely, the same type of errors could be present in both sets of data although evidences seem to point that the error was more serious in the 1970 Census.

Unfortunately, for lack of other substantial proof, it is not quite possible to arrive at a relatively accurate estimate of the undercount. Therefore, it was decided not to adjust the data on the age-sex distributions as an effort to correct the alledged discrepancy . It is enough to realize the limitations of the data as a guide in interpreting the results.

III. SOME ESTIMATES OF THE CRUDE DEATH RATE IN THE PHILIPPINES —

In the absence of accurate mortality data, the crude death rate may be estimated using population data. The accuracy, of course, of the estimates will depend on the accuracy of the data to be used as well as on the methods of estimation to be followed. In this paper, three different methods were tried, each, of course, subject to its own limitations. The estimates derived herein should be regarded in the light of the assumptions formulated under each method.

A. *The Differencing Method.* —

The first such method is the so-called differencing method whereby the number of deaths during the intercensal period is obtained by getting the difference between the population of 1960 (to which are added the births of the period) and the population of 1970. In symbols:

$$D_A = P_{0+}^{60} - P_{10+}^{70}$$

represents the number of deaths among those who were already alive in 1960 while,

$$D_B = B^{60-70} - P_{0-9}^{70}$$

represents the deaths from the cohort born between the period 1960 and 1970. The total number of deaths between 1960 and 1970 is therefore:

$$TD = D_A + D_B \qquad (1)$$

Unfortunately, D_B cannot be directly measured since the number of births during the period, of which P_{0-9}^{70} are survivors, is not known. It can be estimated, however, as a fraction, R, of the number of deaths among those who were already alive at the earlier census, that is,

$$D_B = RD_A$$

It follows then that:

$$TD = D_A(1+R) \qquad (2)$$

Note that the value of R varies from year to year within the period 1960 to 1970. For example: R, in 1961, is $\frac{D_0}{D_1+}$; in 1962, $\frac{D_{0\ 1}}{D_2+}$; in 1963, $\frac{D_{0\ 2}}{D_3+}$ ...... etc., where

where D_0 represents the number of deaths at age O; $D_{1-|-}$; deaths at age 1 and above; D_{0-1}; deaths at age 0 and 1; and so on. For a single value of R, it was decided to use the value for 1965 which is the mid-point of the interval. Furthermore, R was estimated using the number of registered deaths, that is,

$$R = \frac{D_{0-4}}{D_{5-|-}} \qquad (3)$$

where: D_{0-4} = registered number of deaths at ages 0 to 4 1965, and

$D_{5-|-}$ = registered number of deaths at ages 5 and above in 1965.

One major drawback in the use of the differencing method is that vital registration, on which the estimate of R is based, is grossly deficient. If the degree of underregistration of deaths had been uniform for all ages, the estimated value of R would have been near the true value. However, it is well known that it is at the very young ages that deaths are very seriously underregistered so that R so obtained is on the lower side pulling down, as a result, the estimate of the total number of deaths for each sex.

Based on the estimate of the total number of deaths, as given by formula 2, the Crude Death Rate was computed as follows:

$$CDR = \frac{\text{annual number of deaths}}{\text{average population}} \times 1000$$

$$= \frac{\frac{1}{10}(TD)}{\frac{1}{2}(P_{60} + P_{70})} \times 1000$$

$$= \frac{TD}{5(P_{60} + P_{70})} \times 1000$$

Note that the value of the CDR obtained in this manner is for the middle year of the intercensal period, that is, around 1965.

The above procedure was applied to the data for each sex to give us estimates of male and female crude death rates separately. The details of the computation are shown in Table 3.

TABLE 3

The Differencing Method of Estimating the Crude Death Rate

	Both Sexes	Male	Female
1. $P_{0-|-}^{60a}$	27,307,966	13,791,199	13,516,767
2. $P_{10-|-}^{70}$	24,943,623	12,280,810	12,662,813
3. D_A [(1)—(2)]	2,364,343	1,510,389	853,954
4. R	.7907	.8130	.7644
5. TD [(3)x(1+(4))]	4,245,051	2,738,335	1,506,716
6. Annual Number of Deaths [(5)/10]	424,505	273,833	150,672
7. 1960 Population	27,307,966	13,791,199	13,516,767
8. 1970 Population	36,684,486	18,250,351	18,434,135
9. 1965 Population [(7)+(8)/2]	31,996,226	16,020,775	15,975,451
10. Crude Death Rate [(6)/(9) x 1000]	13.27	17.09	9.43

B. *The Stable Population Approach.*—

The second set of estimates of the crude death rate utilizes the concept of a stable population. A stable population, as conceived, is one which is characterized by an unchanging age structure and a constant annual rate of increase as a result of the following necessary conditions:[1]

[a] The Population of 1960, which was obtained as of February 15, 1960 was adjusted to May 6, 1960 in order to make the interval between 1960 and 1970 exactly 10 years.

[1] United Nations, Methods of Estimating Basic Demographic Measures from Incomplete Data, Manual IV, Population Studies No. 42, New York 1967, p. 12.

1. the population is closed to migration

2. fertility and mortality schedules have remained

Under this theory, the age structure of a stable population is said to be independent of the initial age distribution and is determined solely by the unchanging levels of fertility and mortality. Hence, the age distribution of a stable population is constant. However, since a moderate decline in mortality rates does not seriously alter the stability of the age distribution of a population, the methods of estimating vital rates through the stable population approach may also allow for a steady and gradual decline in mortality. In this particular case, the population is said to be quasi-stable.

In applying the stable population concept to the population of the Philippines, there is one great objection and, that is, the constancy of fertility rates. In the absence of more reliable data, it cannot be precisely stated whether fertility level has remained constant or not. Based on the age structure observed during the last several censuses, the proportions of children have remained fairly constant which implies that fertility, too, has been constant for several decades. But, again, this fact should be taken lightly inasmuch as census figures may have been distorted by errors. The reader is therefore warned that the estimates of the vital rates that will be derived herein should be weighed against the validity of the assumption that fertility is constant.

In the stable population, the constant age distribution is described by the following basic relationship:

$$C(x) = be^{-rx}p(x) \quad (4)$$

where: $c(x)$ = proportion of the population aged x to the total population.

b = constant birth rate of the population.

e = base of the system of natural logarithms.

r = annual rate of growth.

$p(x)$ = the probability at birth that a person will live up to age x.

We know that in a life table of radix 1,

$$1_x = p(x)$$

Therefore, equation 4 may be written in the form:

$$c(x) = be^{-rx} l_x$$

Extending this formula to quinquennial age groups, we obtain:

$$C(x,\ x+5) = be^{-r(x+2.5)}\,{}_5L_x \qquad (5)$$

where: $C(x,x+5)$ = proportion of the population in the age group x to x+5 to the total population.

b.r = as defined.

$x+2.5$ = the mean age at the age group to x+5

${}_5L_x$ = the life table stationary population at age x to x+5

Equation 5 may be written as:

$$1m \frac{c(x,x+5)}{{}_5L_x} = 1n\ b - r(x+2.5)$$

If we let, $y = 1n \dfrac{C(x,x+5)}{{}_5L_x}$, and $a = 1n\ b$

then equation (5) becomes:

$$y = a - r\ (x+2.5)$$

This is actually the equation of a straight line in which the slope r, is the annual rate of growth of the population.

The object then is to find the set of ${}_5L_x$ values (from the Model Life Tables)[2] which when fitted to equation 5, together with the observed values of C(x,x+5), gives value of r which is very close to the observed annual rate of growth of the population.[3] The level of mortality of the selected Model Life Table is then said to be ascribable to the actual population and the corresponding stable population may then be used as estimates of the vital rates of our population.

Detailed steps of fitting equation (5) by least squares methods are shown in tables 4A and 4B. With observed growth rates of 2.832%, for males and 3.102% for females, their respective estimated levels of mortality based on the Model "West" of the Princeton Model Life Tables, are 12.45 and 13.48. These levels give us the following estimates of the vital rates, by sex, as of 1970:

	Death Rate	Birth Rate
Male	18.19	46.52
Female	14.78	45.81

C. *The Use of the Crude Birth Rate and the Vital Index.*—

A third method was devised that would not be very sensitive to the errors observed in the census count. It calls first for an estimation of the crude birth rate and, on the basis of that, plus other known characteristics of the population, a derivation of the crude death rate.

The total number of births is estimated by the Reverse Survival Method[4] in which the approximate number of births is determined on the basis of the reported number of children 1970. The results are shown in Table 5. Consequently the estimated crude birth rates are 43.30,

[2] The appropriate set of ${}_5L_x$ values is chosen from among the different levels of the Model Life Tables in a spirit of trial and error.

[3] Arriaga, Edwards, *New Life Tables for Latin American Population in the Nineteenth and Twentieth Centuries, Population Monograph,* Series No. 3 University of California, Berkeley, California, 1968.

[4] For a detailed description of the method of estimating births by Reverse Survival, the reader is referred to the United Nations Manual III, *Methods for Population Projections, by Sex and Age,* Population Studies No. 25, New York, p. 45-46.

TABLE 4-A

The stable population approach of estimating mortality level applied to the male population of the Philippines: 1970

Age Group	C(x.x+5) [a]/	Model West $_5L_x$ [b]/	C(x,x+5) / $_5L_x$	Level 13 Y=ln C(x,x+5) / $_5L_x$	Model West $_5L_x$ [b]/	C(x,x+5) / $_5L_x$	Level 12 Y=ln C(x,x+5) / $_5L_x$	X
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10 — 14	13.9962	388654.5	.000035934	—10.233806	374710.6	.000037271	—10.197269	—5
15 — 19	10.9804	381507.4	.000009185	—11.597839	221093.7	.000029622	—10.426967	—4
20 — 24	8.3681	371407.3	.000028493	—10.465842	366960.7	.000023495	—10.658700	—3
25 — 29	6.5185	359298.8	.000021936	—10.727339	355199.5	.000018986	—10.871795	—2
30 — 34	5,5250	346160.1	.000018142	—10.917265	343327.1	.000016773	—10.995682	—1
35 — 39	5.1570	331379.3	.000015960	—11.045373	329379.2	.000016435	—11.016065	0
40 — 44	4.0129	314197.1	.000015562	—11.070664	313771.5	.000013567	—11.207867	1
45 — 49	3.4313	394037.5	.000012771	—11.268262	295782.8	.000012479	—11.291460	2
50 — 54	2.7520	269814.2	.000011669	—11.358523	274965.1	.000010992	—11.418293	3
55 — 59	2.2088	240455.0	.000010199	—11.493161	250351.5	.000009990	—11.513892	4

[a]/ Proportion of the population aged x to x+5 to the total population in 1970

[b]/ Obtained from the Princeton Model Life Tables

The straight line equations of Y fitted by the Least Squares Method are:

Level 13: $Y = -10.003905 - .0289920\ (x+2.5);\ r_1 = .0288920$

Level 12: $Y = -9.984835 - .0278561\ (x+2.5);\ r_2 = .0278561$

Interpolating linearly between r_1 and r_2 for $r = .0283270$ (the observed male growth rate) we obtain the mortality level of 12.45 which gives a value of the Crude Death Rate of 18.19 per thousand.

TABLE 4-B

The stable population approach of estimating mortality level applied to the female population of the Philippines: 1970

Age Group	C(x,x+5) [a]/	Model West $_5L_x$ [b]/	C(x,x+5) / $_5L_x$	Level 14 Y=ln C(x,x+5) / $_5L_x$	Model West $_5L_x$ [b]/	C(x,x+5) / $_5L_x$	Level 13 Y=ln C(x,x+5) / $_5L_x$	X
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10 — 14	13.4588	409865.0	.000032837	—10.323950	397177.9	.000033886	—10.292506	—5
15 — 19	11.3873	402839.9	.000028268	—10.473796	389403.2	.000029243	—10.439872	—4
20 — 24	8.8196	393537.9	.000022411	—10.705956	379397.2	.000023246	—10.669362	—3
25 — 29	6.9034	382571.3	.000018045	—10.922656	367737.6	.000018773	—10.883111	—2
30 — 34	5.7768	370506.2	.000015592	—11.068776	354934.0	.000016276	—11.025837	—1
35 — 39	5.2024	357360.9	.000014558	—11.137381	341008.5	.000015256	—11.090543	0
40 — 44	4.0887	343105.4	.000011917	—11.337566	326030.5	.000012541	—11.286519	1
45 — 49	3.5641	327342.8	.000010888	—11.427852	309723.9	.000011507	—11.372525	2
50 — 54	2.7892	308361.8	.000009045	—11.613274	290374.1	.000009606	—11.553171	3
55 — 59	2.1978	284400.3	.000007728	—11.770681	206258.8	.000010656	—11.704767	4

[a]/ Proportion of the population aged x to x+5 to the total population in 1970.

[b]/ Obtained from the Princeton Model Life Tables.

The straight line equations of Y fitted by the Least Squares Method are:

Level 14: $Y = -9.97857 - .0314179\ (x+2.5);\ r_1 = .0314179$

Level 13: $Y = -9.958735 - .0306596\ (x+2.5);\ r_2 = .0306596$

Interpolating linearly between r_1 and r_2 for $r = .0310273$ (the observe female growth rate), we obtain the mortality level of 13.48 which gives a value of the Crude Death Rate of 14.78 per thousand.

40.34 and 41.82 per thousand for males, females and both sexes, respectively.

The crude death rates are then derived from the above estimates of the crude birth rates and the observed vital index. It might be recalled that the vital index (VI) measures the ratio of the number of births to the number of deaths for any given year, that is:

$$VI = \frac{\text{number of births in a year}}{\text{number of deaths in the same year}}$$

or

$$VI = \frac{\text{crude birth rate}}{\text{crude death rate}}$$

The vital index may be computed on the basis of the registered vital events. Even if birth and death registrations are incomplete, if they are so by the same degree, the vital index so computed will still be accurate. Unfortunately, this does not seem to hold true in the Philippines' Vital Registration System. Possibly because of the requirement to secure a burial permit, death registration has achieved a higher degree of completeness than has birth registration. In 1963, a study[5] was made which showed that the number of births in a year that were actually registered represented only about 60% of the total births while the corresponding proportion of deaths was 70% and it appears that the level of registration has not increased at least until 1970.

This level is then used to adjust the computed vital index for the effect of the difference in the degree of completeness of birth and death registration. The average yearly value of vital indexes computed for the 5-year period from 1968 to 1972 is used to represent the vital index for 1970. This is done in order to minimize the effect of possible fluctuations in the number of vital events that were registered. The average value of VI

[5] Bureau of the Census and Statistics, Birth and Death Registration, Release No. 13, Series of 1965.

TABLE 5
Estimates of the Number of Births in the Philippines Between 1960 and 1970 by the Reverse Survival Method

	Male	Female
A. Cohort born from May 1965 to May 1970 (aged 0-4 in 1970)		
1. Survivors enumerated in May 1970	2,966,701	2,874,612
2. Mortality level, 1965-1970	16	17
3. Survival ration P_b	.88750	.91708
4. Estimated Births 1965-1970 (1 ÷ 3)	3,342,762	3,134,527
B. Cohort born from May 1960 to May 1965 (aged 5-9 in 1970)		
1. Survivors enumerated in May 1970	3,002,840	2,896,710
2. Mortality level 1965-1970	16	17
3. Survival ratio P_{0-4}	.96562	.97441
4. Estimated children 0-4 in May 1965 (1 ÷ 3)	3,109,753	2,972,784
5. Mortality level 1960-1965	15	16
6. Survival ratio P_b	.87196	.90332
7. Estimated birth room 1960-1965 (4 ÷ 6)	3,566,394	3,290,953
C. Total Estimated Births from 1960-1970	6,909,156	6,425,480

is substituted in the following relationship to obtain an estimate of the crude death rates:

$$CDR = CBR \div VI \quad (6)$$

The results are shown in Table 6 below:

TABLE 6

Estimate of the Vital Rates and Vital Index for the Philippines: 1970

Sex	Crude Birth Rate	Vital Index	Crude Death Rate
(1)	(2)	(3)	(4) = 2÷3
Both Sexes	41.82	4.032194	10.37
Male	43.30	3.734531	11.54
Female	40.37	4.420776	9.12

A summary of the results obtained by using the three methods to estimate the crude death rate in the Philippines is given in Table 7.

The interpretation of the results should consider the fact that Method A applies for the year 1965 whereas Methods B and C, for 1970. There is quite a close agreement between the results of Methods A and C while the estimates by the use of Method B prove to be very high perhaps because the population of the Philippines does not really meet the conditions of stability.

Very wide differences in the estimates of male and female death rates are observed in the use of Methods A and B. This large discrepancy, however, can be attributed not so much to the prevailing sex differential[6] in mortality as to faulty data. It has been observed earlier that, in 1970, the male population was more underenumerated than the female and that underenumeration was more serious at ages 15-29. P_{10+}^{70} for males was well

[6] Based on the registered number of deaths for the period 1960 to 1970, male deaths exceed female deaths by a margin of only 22%. The results of methods A and B indicate much wider difference which is contrary to observed conditions.

TABLE 7

Summary of Results on the Estimation of the Crude Death Rates, by Sex, in the Philippines

	Both Sexes	Male	Female
Method A — Differencing Method[a]	13.27	17.09	9.43
Method B — Stable Population Approach[b]	16.43	18.19	14.78
Method C — Use of the CBR and VI[b]	10.37	11.59	9.12

[a] Estimates apply for year 1965
[b] Estimates apply for year 1970

on the low side yielding a high estimate of the number of deaths on the basis of the equation:

$$D_A = P^{60}_{O+} - P^{70}_{10+}$$

Hence, by the Differencing Method, a high crude death rate for males was obtained. Similarly, the Stable Population Approach yielded a much higher death rate for males on account of its low growth rate observed in the last intercensal decade.

Of the three sets of estimates, it appears that the one obtained by the use of Method C gives the nearest estimates of the true values. This statement necessarily follows because this method made use of the population data such that the most serious error in the population count did not gravely affect the estimates as it did in the other two methods. For practical purposes, this set of estimates are adopted as the crude death rates for the country as of 1970; that is, 10.37 per thousand is the overall crude death rate, 11.59 per thousand for males, and 9.12 per thousand for females.

IV. CONSTRUCTION OF A LIFE TABLE —

A. *The Abridged Life Table.* —

A life table may be constructed in a number of ways depending upon the information available in each situation. For example, in an extreme situation where only a count of the population at one point of time is available, the recourse may be an indirect estimation of life table functions using Model Life Tables. On the other hand, where data are complete and adequate for all purposes, more sophisticated methods of life table construction may be employed. Naturally, it goes without saying that where information are as detailed as possible, more precise results can be expected. It does not, however, preclude the fact that an acceptable level of accuracy is also achievable in cases where data are scanty. In fact, the accuracy of a constructed life table depends not only upon the amount and reliability of data used but also on the method by which these data are utilized.

In the conventional way of constructing a life table, the main problem is that of getting accurate measures of the central death rates (the ${}_{n}m_{x}$ column of the Life Table) and translating them into probabilities of surviving from one age group to the next higher group. In the Philippines, in as much as the data on the number of deaths by age group are seriously deficient, direct measurement of age-specific death rates using Vital Registration records is not at all desirable. Estimates of the number of deaths at each age group have to be obtained somehow.

By multiplying the estimated crude death rate of each sex by the corresponding total population of 1970, we would get an estimate of the aggregate number of deaths for that year. These aggregates can then be distributed into the different age groups for each sex, utilizing the age-sex distribution of deaths observed from Death Registration Data. The proportion of deaths at a particular age group was the average proportion observed for the 5-year period from 1968-1972. Again, this was done in order to minimize the possible effects of yearly variations in vital event registration.

It is of course realized that this distribution is most probably distorted by the underregistration of deaths among infants and children, which has the effect of understanding the proportion of deaths in the younger groups and overstating the proportions in the older age groups. To what extent this will affect the life table functions will be treated in the succeeding discussions.

The columns or the functions of the abridged Life Table are explained in the following discussions. The derivations are herein described too.

1. *The 1000 $_nm_x$ column or the Central Death Rates or the Age Specific Death Rates.*

   1000 $_nm_x$ gives the number of persons from a group of 1000 all aged x to x+n who will die before reaching the last age of that age bracket. In other words, it is the death rate specific for each age group as observed in the actual population.

   This column is obtained as follows:

$$1000\ _nm_x = \frac{D_{x,x+n}}{P_{x,x+n}} \times 1000 \qquad (7)$$

   where:

   $D_{x,x+n}$ = the estimated number of deaths aged x to x+n at year t

   $P_{x,x+n}$ = the mid-year population of persons aged x to x+n at year t

   If both the number of deaths and the population are under or overreported by the same percent, the mortality rates so computed will be accurate. At the very young ages, it is doubtless that the number of deaths and population count are understated. For the rest of the age groups, it can only be assumed that the type of underreporting and misstatement errors in death registration and population census are the same. Unfortunately, data are very scanty to allow precise measurements of the extent of underreporting for each type of data. Hence, no effort is made to correct any error of understatement in the data used. Suffice it to say that the mortality risks derived using these data will be in error proportional to the difference in the percentage of reporting of deaths and population.

2. *The $_nq_x$ or the Probability of Death.*

$_nq_x$ expresses the amount of risks that a person, whose exact age is x at the beginning of the period, will die before the end of an n-year period. In other words, it is the probability that a person at his x^{th} birthday will not live to celebrate his $x+n^{th}$ birthday.

The fundamental significance in the construction of a life table is the measurement of these probabilities on the basis of the observed death rates of the population.

In this paper, the formulae developed by Reed and Merrell[7] were adopted to express the relationship between $_nq_x$ and $_nm_x$. They are as follows:

$$q_0 = 1 - e^{-m_0(.0539\, m_0)} \qquad (8)$$

$$_4q_1 = 1 - e^{-4\,{}_4m_1\ (.9806 - 2.079\,{}_4m_1)} \qquad (9)$$

$$_5q_x = 1 - e^{-5\,{}_5m_x - .008(5)^3\,{}_5m_x} \qquad x=5,10...,80 \quad (10)$$

3. *The $_np_x$ or the Probability of Surviving.*

$_np_x$ refers to the probality that a person at exact age x will live to exact age x+n. This is obtained as follows:

$$_np_x = 1 - {}_nq_x \qquad (11)$$

[7] Reed, Lowell J. and Merrell Margaret, "A Short Method for Constructing an Abridged Life Table". Reproduced in the U.S. Bureau of the Census, Handbook of Statistical Methods for Demographers, 1951, pp. 12-27.

4. *The l_x or the Number of Survivors.*

l_x refers to the number of persons alive at exact age x. Actually, in a life table, l_x represents the survivors, at age x, of an original cohort, the number of which is represented by the radix[8] of the life table. To get l_x, the following formula is used:

$$l_x = {}_np_{x-n}\ l_{x-n} \qquad (12)$$

5. *The ${}_nL_x$ or the Stationary Population of the Life Table.*

${}_nL_x$ represents approximately the average number of persons in the life table who are aged x to x+n. Putting it in another way, ${}_nL_x$ is the number of person-years lived by the cohort from the beginning to the end of the age interval x to x+n. Usually, this is obtained by getting the average of l_x and l_{x+n} under the assumption that deaths are uniformly distributed within the age interval. In this particular abridged life table, however, the stationary population is derived from the corresponding L_x column of the complete life table. (Please see discussion in the next section.)

6. *The T_x Column.*

T_x represents the remaining total number of person-years that would be lived by the survivors at age x.

In symbols, this is:

$$T_x = \sum_{i=x} {}_nL_i \qquad (13)$$

where summation is taken over all age grouping from x onwards.

[8] The radix, symbolized by l_o, is an arbitrary value used to designate the number of living persons at age O.

7. *The $_nS_x$ or the Survival Ratios.*

Survival ratios, denoted by $_nS_x$, is the proportion of the number of persons in the stationary population aged x to x+n to the number who are still alive n year later. For x=5 and over, it is obtained by the following formula:

$$_nS_x = \frac{_nL_{x-|-n}}{_5L_x} \tag{14}$$

At birth and at ages 0-4, the survival ratios are computed as follows:

$$S(\text{birth}) = \frac{_5L_0}{51_0} \; ; \quad {_5S_0} = \frac{_5L_5}{L_0 + {_4L_1}} \qquad (15)\text{-}(16)$$

whereas for the highest age group, it is given by:

$$S_{75} = \frac{T_{80}}{T_{75}} \tag{17}$$

8. *The e^o_x or the Expectation of Life.*

The Life expectancy or expectation of life is perhaps the most significant of the life table functions. It represents the average number of remaining years a person who reaches age x can still expect to live, given the mortality schedule expressed by $_nq_x$. When x=o, the function is popularly known as the expectation of life at birth. It is the average lifetime of a newly born baby who will be subjected to the mortality risks given by $_nq_x$. The measure of life expectancy is obtained as follows:

$$e^0_x = \frac{T_x}{l_x} \tag{18}$$

B. *The Complete Life Table.* —

In the complete life table, the l_x column for ages between x and x+5 is derived by interpolating the given value in the abridged life table. For values of x between 10 and 80, the Karup-King[9] multipliers for osculatory interpolation are used. For $x < 10$, l_x is obtained simply by free-hand interpolation since the Karup-King multipliers do not produce smooth interpolated values with fixed points at x=0, 1, 5 and 10. On the other hand, beyond age 80, the l_x column is extrapolated by fitting a curve of the form:

$$Y = KA^{-B^x} \qquad (19)$$

The L_x column is obtained using the assumption that deaths are evenly distributed within a given year of age, that is:

$$L_x = \frac{l_x + l_{x+1}}{2} \qquad (20)$$

However, since this assumption does not hold true at the every early years of life, L_0 and L_1 are obtained by the following formula:

$$L_0 = .276\ l_0 + .724\ l_1 \qquad (21)$$

$$L_1 = .410\ l_1 + .590\ l_2 \qquad (22)$$

From these computed L_x values, the ${}_nL_x$ column of the abridged life table is obtained by adding the L_x values between ages x to x+n.

The rest of the columns of the complete life table are derived similarly as those of the abridged life table.

The estimated life table functions, abridged and complete, are shown in Table 8 (A and B); and 9 (A and B).

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[9] Shryock, Henry and Siegel, Jacob, The Methods and Materials of Demography, U.S. Bureau of the Census and Statistics, Washington, D.C.: 1971, p. 875.

TABLE 8A
1970 LIFE TABLE OF THE PHILIPPINES: MALE

Age	$1000_n m_x$	$_n q_x$	$_n p_x$	l_x	$_n L_x$	T_x	S_x	e_x^o
0	103.824	0.088897	0.911103	100000	93564	5,524,429	.893422*	55.24
1	12.910	0.048057	0.951943	91110	353147	5,430,865	.962837**	59.61
5	3.012	0.014954	0.985046	86732	430110	5,077,718	.988905	58.54
10	1.678	0.008359	0.991641	85435	425338	4,647,608	.990309	54.40
15	2.466	0.012260	0.987740	84721	421216	4,222,270	.983403	49.84
20	4.259	0.021088	0.978912	83682	414225	3,801,054	.976056	45.42
25	5.365	0.026498	0.973502	81917	404307	3,386,829	.971116	41.34
30	6.350	0.031290	0.968710	79747	392630	2,982,522	.966103	37.40
35	7.488	0.036800	0.963200	77251	379321	2,589,892	.959341	33.53
40	9.193	0.045003	0.954997	74409	363898	2,210,571	.949983	29.71
45	11.481	0.055911	0.944089	71060	345697	1,846,673	.935542	25.99
50	15.433	0.074481	0.925519	67087	323415	1,500,976	.912472	22.37
55	21.436	0.102048	0.897952	62090	295107	1,177,561	.882696	18.97
60	28.646	0.134155	0.865845	55754	260489	882,454	.847552	15.83
65	38.095	0.174631	0.825369	48274	220778	621,965	.792697	12.88
70	56.444	0.248290	0.751710	39844	175010	401,183	.700229	10.07
75	90,355	0.368677	0.631323	29951	122547	226,173	.458171	7.55
80	190.809	0.628591	0.371409	18909	103626	103.626	—	5.48

* Survival ratio at birth.
** Survival ratio at age 0-5.

TABLE 8B
1970 LIFE TABLE OF THE PHILIPPINES: FEMALE

Age	$1000_n m_x$	$_n q_x$	$_n p_x$	l_x	$_n L_x$	T_x	S_x	e_x^o
0	79.752	0.070000	0.930000	100000	94932	6088846	.912674	60.89
1	11.745	0.043926	0.956074	93000	361405	5993914	.967347	64.45
5	2.454	0.012203	0.987797	88915	447136	5632509	.991550	63.35
10	1.240	0.006185	0.993815	87830	437706	5191073	.993502	59.10
15	1,526	0.007605	0.992395	87287	434862	4753367	.990613	54.46
20	2.281	0.011346	0.988654	86623	430780	4318505	.986875	49.85
25	3.021	0.014999	0.985001	85640	425126	3887725	.982697	45.40
30	3.998	0.019806	0.980194	84355	417770	3462599	.977191	41.05
35	5.228	0.025827	0.974173	82685	408241	3044829	.971879	36.82
40	6.190	0.030512	0.969488	80549	396761	2636588	.966337	32.73
45	7.625	0.037462	0.962538	78092	383405	2239827	.956730	28.68
50	10.262	0.050116	0.949884	75166	366815	1856422	.941355	24.70
55	14.286	0.069131	0.930869	71399	345303	1489607	.914125	20.86
60	22.163	0.105335	0.894665	66463	315650	1144304	.872346	17.22
65	33.114	0.153157	0.846483	59462	275356	828654	.813670	13.94
70	50.526	0.225225	0.774775	50334	224049	553298	.729354	10.99
75	77.789	0.326318	0.673682	38998	163411	329248	.503684	8.44
80	193.151	0.633246	0.366754	26272	165837	165837	—	6.39

TABLE 9A
1970 LIFE TABLE OF THE PHILIPPINES: MALE

Age	l_x	q_x	L_x	T_x	e_x^o
0	100000	.088900	93564	5524429	55.24
1	91110	.021139	89974	5430865	59.61
2	89184	.013744	88571	5340891	59.89
3	87958	.007970	87608	5252320	59.71
4	87257	.006017	86994	5164712	59.19
5	86732	.003597	86576	5077718	58.54
6	86420	.003402	86273	4991142	57.75
7	86126	.003088	85993	4904869	56.95
8	85860	.002784	85740	4818876	56.12
9	85621	.002172	85528	4733136	55.28
10	85435	.002048	85348	4647608	54.40
11	85260	.001607	85192	4562260	53.51
12	85123	.001421	85062	4477068	52.60
13	85002	.001494	84938	4392006	51.67
14	84875	.001814	84798	4307068	50.75
15	84721	.002077	84633	4222270	49.84
16	84545	.002153	84454	4137637	48.94
17	84363	.002347	84264	4053183	48.04
18	84165	.002661	84053	3968919	47.16
19	83941	.003086	83812	3884866	46.28
20	83682	.003585	83532	3801054	45.42
21	83382	.004006	83215	3717522	44.58
22	83048	.004347	82868	3634307	43.76
23	82687	.004584	82498	3551439	42.95
24	82308	.004750	82112	3468941	42.15
25	81917	.004920	81716	3386829	41.34
26	81514	.005152	81304	3305113	40.55
27	81094	.005376	80876	3223809	39.75
28	80658	.005579	80433	3142933	38.97
29	80208	.005748	79978	3062500	38.18
30	79747	.005931	79510	2982522	37.40
31	79274	.006118	79032	2903012	36.62
32	78789	.006333	78540	2823980	35.84
33	78290	.006540	78034	2745440	35.07
34	77778	.006776	77514	2667406	34.30
35	77251	.006964	76982	2589892	33.53
36	76713	.007157	76438	2512910	32.76
37	76164	.007418	75882	2436472	31.99
38	75599	.007725	75307	2360590	31.23
39	75015	.008078	74712	2285283	30.46
40	74409	.008440	74095	2210571	29.71
41	73781	.008756	73458	2136476	28.96
42	73135	.009106	72802	2063018	28.21
43	72469	.009535	72124	1990216	27.46
44	71778	.010003	71419	1918092	26.42
45	71060	.010386	70691	1846673	25.99
46	70322	.010765	69944	1775982	25.25
47	69565	.011284	69172	1706038	24.52
48	68780	.011966	68368	1636866	23.80
49	67957	.012802	67522	1568498	23.08
50	67087	.013594	66631	1500976	22.37

Age	l_x	q_x	L_x	T_x	e_x^o
51	66175	0.014341	65700	1434345	21.68
52	65220	0.015209	64730	1368645	20.98
53	64234	0.016222	63713	1303915	20.30
54	63192	0.017439	62641	1240202	19.63
55	62090	0.018731	61508	1177561	18.97
56	60927	0.020024	60317	1116053	18.32
57	59707	0.021304	59071	1055736	17.68
58	58435	0.022572	57776	996665	17.06
59	57116	0.023846	56435	938889	16.44
60	55754	0.024752	55050	882454	15.83
61	54346	0.025908	53618	827404	15.22
62	52890	0.027604	52140	773786	14.63
63	51389	0.029209	50619	721646	14.04
64	49849	0.031595	49062	671027	13.46
65	48274	0.033186	47473	621965	12.88
66	46672	0.034946	45856	574448	12.31
67	45041	0.037166	44204	528632	11.74
68	43367	0.039846	42503	484429	11.17
69	41639	0.043109	40742	441925	10.61
70	39844	0.046858	38911	401183	10.07
71	37977	0.050820	37012	362272	9.54
72	36047	0.054956	35054	325060	9.02
73	34061	0.059716	33044	290206	8.52
74	32027	0.064820	30989	257163	8.03
75	29951	0.070849	28890	226173	7.55
76	27829	0.078048	26743	197283	7.09
77	25657	0.086370	24549	170540	6.65
78	23441	0.096071	22315	145992	6.23
79	21189	0.107603	20049	123676	5.84
80	18909	0.114284	17829	103626	5.48
81	16748	0.127120	15684	85797	5.12
82	14619	0.134483	13636	70113	4.80
83	12653	0.149214	11709	56477	4.50
84	10765	0.162935	9888	44768	4.16
85	9011	0.177561	8211	34880	3.87
86	7411	0.193631	6694	26669	3.60
87	5976	0.210676	5347	19975	3.34
88	4717	0.229383	4176	14628	3.10
89	3635	0.248968	3183	10452	2.88
90	2730	0.270330	2361	7269	2.66
91	1992	0.293173	1700	4908	2.46
92	1408	0.316761	1185	3208	2.22
93	962	0.343035	797	3032	2.10
94	632	0.370253	515	1226	1.94
95	398	0.396985	319	711	1.78
96	240	0.429167	189	392	1.63
97	137	0.459854	106	203	1.48
98	74	0.486486	56	97	1.31
99	38	0.526318	28	41	1.08
100	18	0.555556	13	13	.72

TABLE 9B
1970 LIFE TABLE OF THE PHILIPPINES: FEMALE

Age	l_x	q_x	L_x	T_x	e_x^o
0	100000	0.070000	94932	6088846	60.89
1	93000	0.019505	91930	5993914	64.45
2	91186	0.012535	90614	5901984	64.72
3	90043	0.007341	89712	5811370	64.54
4	89382	0.005225	89149	5721658	64.01
5	88915	0.003430	88762	5632509	63.35
6	88610	0.002720	88490	5543747	62.56
7	88369	0.002309	88267	5455257	61.73
8	88165	0.002019	88076	5366990	60.87
9	87987	0.001784	87908	5278914	60.00
10	87830	0.001617	87759	5191073	59.10
11	87688	0.001243	87634	5103314	58.00
12	87579	0.001050	87533	5015680	57.00
13	87487	0.001063	87440	4928147	56.33
14	87394	0.001224	87340	4840707	55.39
15	87287	0.001375	87227	4753367	54.46
16	87167	0.001400	87106	4666140	53.53
17	87045	0.001471	86981	4579034	52.61
18	86917	0.001599	86848	4492053	51.68
19	86778	0.001786	86700	4405205	50.68
20	86623	0.001986	86537	4318505	49.85
21	86451	0.002128	86359	4231968	48.95
22	86267	0.002284	86168	4145609	47.95
23	86070	0.002428	85966	4059441	47.16
24	85861	0.002574	85750	3973475	46.28
25	85640	0.002697	85524	3887725	45.40
26	85409	0.002845	85288	3802200	44.52
27	85166	0.002982	85039	3716913	43.64
28	84912	0.003180	84777	3631874	42.77
29	84642	0.003391	84498	3547097	41.92
30	84355	0.003580	84204	3462599	41.05
31	84053	0.003760	83895	3378395	40.19
32	83737	0.003965	83571	3294500	39.34
33	83405	0.004196	83230	3210929	38.50
34	83055	0.004741	82870	3127699	37.66
35	82685	0.004741	82489	3044829	36.82
36	82293	0.005031	82086	2962340	36.00
37	81879	0.005252	81664	2880254	35.18
38	81449	0.005464	81226	2798590	34.36
39	81004	0.005617	80776	2717364	33.55
40	80549	0.005748	80318	2636588	32.73
41	80086	0.005919	79849	2556270	31.92
42	79612	0.006130	79368	2476421	31.11
43	79124	0.006395	78871	2397053	30.29
44	78618	0.006691	78355	2318182	29.49
45	78092	0.006941	77821	2239827	28.68
46	77550	0.007157	77272	2162006	27.88
47	76995	0.007481	76707	2084734	27.08
48	76419	0.007943	76116	2008027	26.28
49	75812	0.008521	75489	1931911	25.48
50	75166	0.009060	74826	1856422	24.70

Age	l_x	q_x	L_x	T_x	e_x^o
51	74485	0.009519	74130	1781596	23.92
52	73776	0.010112	73403	1707466	23.14
53	73030	0.010804	72636	1634063	22.38
54	72241	0.011655	71820	1561427	21.61
55	71399	0.012311	70960	1489607	20.86
56	70520	0.012933	70064	1418647	20.12
57	69608	0.013878	69125	1348583	19.37
58	68642	0.015166	68122	1279458	18.64
59	67601	0.016834	67032	1211336	17.92
60	66463	0.018416	65846	1144304	17.22
61	65229	0.020175	64571	1078458	16.53
62	63913	0.021873	63214	1013887	15.86
63	62515	0.023738	61773	950673	15.21
64	61031	0.025708	60246	888900	14.56
65	59462	0.027833	58635	828654	13.94
66	57808	0.030065	56939	770019	13.32
67	56070	0.032531	55158	713080	12.72
68	54246	0.035228	55290	657922	12.13
69	52335	0.038234	51334	604632	11.55
70	50334	0.041801	49282	553298	10.99
71	48230	0.045718	47128	504016	10.45
72	46025	0.049690	44882	456888	9.93
73	43738	0.053706	42564	412006	9.42
74	41389	0.057769	40194	369442	8.93
75	38998	0.068835	37774	329248	8.44
76	36551	0.068835	35293	291474	7.97
77	34035	0.075364	32752	256781	7.53
78	31470	0.082428	30173	223429	7.10
79	28876	0.090179	27419	193256	6.69
80	26272	0.096871	24844	165837	6.39
81	23727	0.105281	22478	140993	5.94
82	21229	0.114278	20016	118515	5.58
83	18803	0.124023	17637	98499	5.24
84	16471	0.134600	15362	80862	4.90
85	14254	0.145924	13214	65500	4.60
86	12174	0.158206	11211	52286	4.29
87	10248	0.171253	9370	41075	4.01
88	8493	0.185329	7700	31705	3.73
89	6919	0.200462	6226	23999	3.47
90	5532	0.216739	4932	17773	3.21
91	4333	0.234018	3826	12841	2.96
92	3319	0.252184	2900	9015	2.72
93	2482	0.271958	1784	6115	2.46
94	1807	0.292750	1542	4331	2.40
95	1278	0.314554	1077	2789	2.18
96	876	0.337900	728	1712	1.95
97	580	0.363793	474	984	1.70
98	369	0.387534	298	510	1.38
99	226	0.415929	179	212	.94
100	132	0.439394	103	103	.78

V. SUMMARY AND CONCLUSIONS —

Indications are clear that the level of mortality in the Philippines during the last decade has indeed continued to decline. Although, the crude death rate has been estimated only on the basis of fragmentary data, it is highly probable that the true value could not be far from the estimate of about 10 or 11 per thousand. A glance at Table 10 would reveal that the present mortality level of the Philippines is relatively below the level of the other developing countries but definitely, it has not yet achieved the level already attained by the developed countries.

TABLE 10
Crude Death Rates for Some Countries in the World

Countries	Year	Crude Death Rate (per Thousand)
Developing Countries		
Philippines	1970	10.4
India	1966-1970	16.7
Thailand	1966-1970	10.4
Turkey	1967	14.6
Libya	1967	15.8
Peru	1966-1970	11.1
Developed Countries		
U.S.A.	1970	9.4
Israel	1970	7.0
Japan	1970	6.9
Switzerland	1970	9.0
New Zealand	1970	8.8
U.S.S.R.	1969	8.1

Source: United Nations, Demographic Year Book, 1970

Concomitant with a decrease in the crude death rate is, of course, an increase in the expectation of life at birth. Table 11 shows the expectation of life at birth of Filipinos for several years as obtained from earlier life tables.

Table 11 also indicates that under the present mortality conditions, a Filipino, at the time of his birth, can look forward to live for about 58 years. His countryman who was born in 1960 then had only about 53 years[10] to expect which means that in a span of 10 years, life expectation at the moment of birth has increased by about 5 years or an overage gain of .5 year per annum during the last decade. In the previous decade, the average annual gain in expectation of life was less than .2 year per year only. This goes to show that during the 1960's there has been an accelerated progress in the improvement of mortality conditions in the Philippines. This is possibly due to the intensified public health programmes undertaken by the government not only by extending health facilities and services to the people but also by educating them on the proper sanitation and nutrition practices.

TABLE 11
Expectation of Life at Birth in the Philippines: 1902-1970

Year	Life Expectancy at Birth (in years)	
	Male	Female
1902	11.54	13.92
1918	25.17	26.07
1938	44.80	47.72
1948	48.81	53.36
1960	51.17	55.00
1970	55.24	60.89

[a] Reproduced from the article, "Philippine Population Growth and Health Development", by Wilfredo L. Reyes, published in the *First Conference on Population,* 1965, University of the Philippines Press, Quezon City, 1966, p. 426.

The mortality rate by age, as indicated in the present life table, follows the universal pattern. It "starts at a high peak immediately after birth, falls to a minimum

[10] Hizon, Manuel and de Castro, Isagani, 1960 *Population Mortality From Census Figures,* Paper submitted to the 1965 Annual Conference of the Actuarial Society of the Philippines, Baguio City.

in the early teens, and then rises, gradually at first and more and more rapidly as age increases until the last survivors of the generation are extinguished."[11]

As regards sex differential in mortality, there is no question that males are really subject to higher mortality risks than are the females. Whereas an infant girl has about 61 years of life expectation at birth, the male infant has only about 55 years or an advantage of more or less 6 years on the part of the female. This does not indicate, however, that the female will outlive the male by 6 years on the average. As figure A depicts, this sex difference in life expectation tends to narrow down as the population grows older.

As should be expected, the age-specific death rates of the males are greater than those of the females. See Figure B. An exception nevertheless occurs at the highest age group where about 191 out of 1000 males die in contrast to 193 for females. This, however, should not be given much credit because this could have been due only to faulty data. Anyway, this being the highest age group, it does not have so much effect on the overall picture of the mortality levels. The pattern of mortality rates by age are the same for both sexes. As indicated in Table 8A and 8B, the mortality rates at infancy are high, about 104 per thousand for males and 80 per thousand for females. When they complete their first year of life, the risks of dying are considerably reduced for both sexes and this continues to decrease until they reach their adolescene. After that their chances of survival consistently decrease up to the highest ages when death becomes inevitable. In terms of life expectancy, there is a marked increase in the number of years expectation of life from birth to the first year of life. The highest expectation of life, under the given mortality conditions, is achieved at about the age of 3 after which it starts to decrease gradually.

Finally, although the country should be happy about its achievement or success in bringing down the level of mortality, it should be aware that this has a very im-

[11] United Nations, *The Situation and Recent Trends of Mortality in the World*, Population Bulletin No. 6, 1962, p. 51.

portant implication on its growth rate. Low death rate necessarily causes a higher rate of increase. Therefore, if it should be the aim of the government to keep down its population growth, it should heighten its effort to reduce the fertility level of the country. Otherwise, since mortality is expected to decrease further, the future of the country is unthinkable with its population growing by leaps and bounds.

FIGURE A
Age-Specific Death Rates in the Philippines, by Sex, 1970

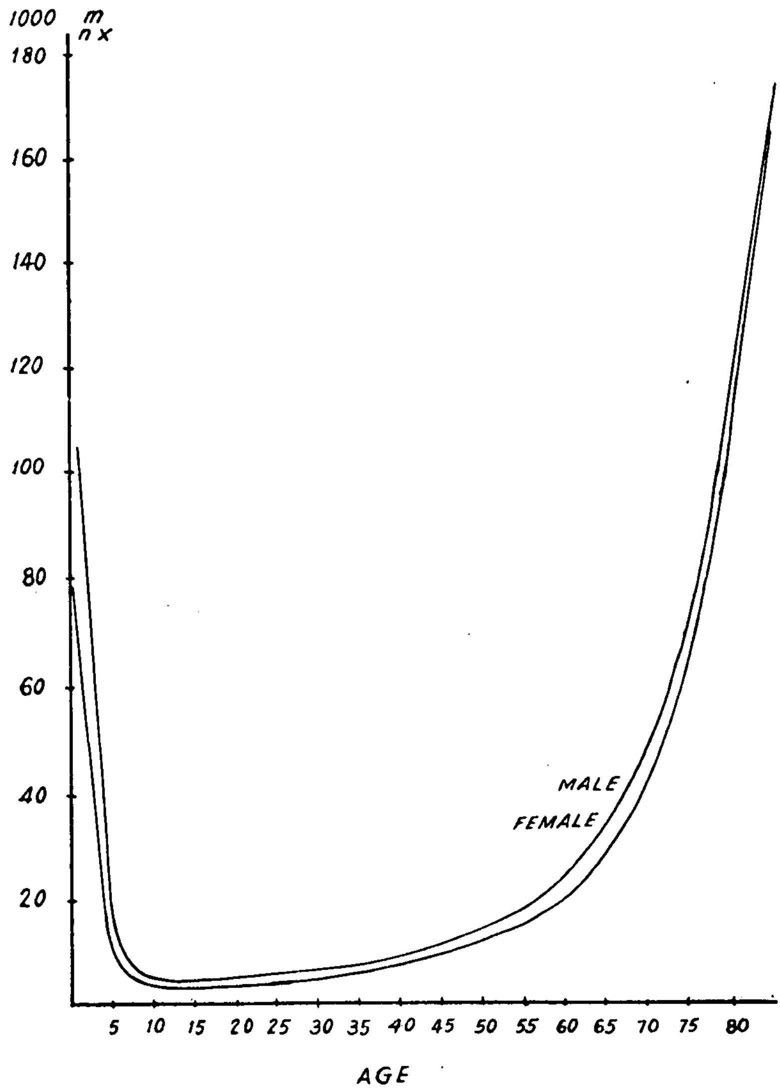

Figure B.
The Life Expectancy Curve for the Philippines, By Sex; 1970