POPULATION PROJECTIONS FOR THE PHILIPPINES, 1960—1980

By

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1.   *Introduction.*   Population data is the bench mark for ascertaining the basic needs such as food, clothing, housing, health, education, employment, recreation and other social and cultural amenities of the present as well as the future generation. The future size structure and composition of the labour force, the school age population, the old age segments and other special groups offer different challenges to the planners. The magnitudes of these tasks can be rationally gauged only with due regard to the expected size, composition and distribution of the population.

The planning of physical facilities like schools, jobs etc. which take time are to be done well in advance so that there will be no bottleneck in the future.

This problem becomes all the more important when the population is growing rather very fast as in the Philippines. During the 12 years from 1948 to 1960 when the censuses were taken, the population of the Philippines has shown a natural growth rate of 3.01% per annum. The period 1918-1939 itself showed an annual increase of about 2%.

The rapid growth in the recent years may be due to a rapidly falling death rate from its high level to very low levels, the constancy of the birth rate which has also been quite large as also the relative efficiencies of the two census enumerations on which basis the rate of growth is calculated. The 1948

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census enumeration due to many reasons, has been suspected to be an under-count even though there are some who beleive it to be an over-count. The 1960 census which was well planned and was also conducted at a time when the economic, social and political climate was favourable could be taken to be quite accurate in terms of coverage. Moreover, even new areas which hitherto unenumerated could have been for the first time included in 1960.

Even though this be the case, the rate of growth of 3.01% does not seem to be abnormally large when we consider the fertility, mortality level of the country. Since migration is negligible, most of the growth must be due to natural growth. All indications there are that the crude birth rate in the country may be near about 50 and that the expectation of life at birth about 45-50, implying a death rate of 15-20 so that the growth rate could be even as high as 35.

2. *Scope of the study.* This study attempts to project the population of the Philippines by age and sex from 1960-1980 by the component method. An evaluation and adjustment of the available data is done as a necessary preliminary to the study. A comparison of the projection with other available projections is made to pin point similarities and differences in assumptions and results. The implications of these projections in terms of economic and social planning is indicated in broad outlines.

3. *Sources of data.* The usual sources of demographic data, viz. census, registration and survey are all available in the Philippines for our study even though each of them have their own limitations and scope. There have been in all five censuses in the country taken in 1903, 1918, 1939, 1948 and 1960 respectively. The latest census was taken on 15th February 1960. The data available from this census, pertaining to our study are the single year of age sex data. Table 1 gives the single year of age sex data, 1960.

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Even though the civil registry law (Act No. 3753) of 1930 really established the compulsory nature of the registration of births, deaths, divorces, annulments, legitimations, adoptions, change of names and nationalizations, even now the completeness of the registrations is still under question.

The Philippine Statistical Survey of Households which was formerly a counterpart project of the International Co-operation Administration was integrated with the Bureau of Census in 1958 primarily for the purpose of securing vitally needed data on the size, composition and distribution of the population, labour force etc. The survey in 1957 provided the age sex distribution in addition to some other relevant information on the fertility.

4.   *Data needed for the study* .   To project the population by the component method the following data are needed: (1) Age-sex structure of the population at the base period (2) Sex ratio at birth (3) Fertility and its probable future trend (4) Mortality level and its future trend and (5) Migration.

Quinquennial age group population by sex will suffice for most practical purposes. Single year of age values because they are usually defective will not be of much use unless they are properly evaluated and adjusted. Even if they acceptable, because single year of fertility, mortality rates are difficult to get by, it will not be possible to utilize them fully. The quinary age populations in conjunction with five year survival ratios and fertility rates will provide us with survivors and births during five year intervals. The sex ratio at birth will enable us to separate the total births into the sexes.

5.   *Data used in the study.*   In addition to quinary age group population by sex as thrown up by the 1960 census, the fertility, mortality rates also calculated on the basis of the census have been utilised to project the population. In the recent years, migration as a factor of population change in the Philippines had played only a very insignificant role. Even though direct estimates of the sex ratio at birth is not avail-

able, since it is known to be well within a narrow range of 105-107, we can safely assume a value of 107 as the ratio for the Philippines.

6. *Errors in data*. Demographic data whether collected through census, registration or survey are usually subject to several different types of errors due to many reasons. Errors due to definitions, incomplete coverage or duplication, mis-reporting of certain characteristics etc. are the usual ones. Since any error in the basic data if not evaluated and adjusted will be carried over and compounded and thus vitiate the projections, it is necessary to first of all look for the errors and then adjust the data for the specific errors to free the data from such errors.

As mentioned earlier, since the registration data seems to be too poor to be of any use in our study, we will not go into the evaluation and adjustment of this data. Mostly the evaluation and adjustment will be based on the 1960 census data. Some evaluation of the PSSH data will also be done whenever necessary.

TABLE 1

SINGLE YEAR OF AGE BY SEX — PHILIPPINES 1960

Age	Both sexes	Male	Female
Total	27087685	13662869	13424816
0	786464	404391	382073
1	888180	458772	429408
2	963230	495085	468145
3	969309	499801	469508
4	965232	495989	469243
5	957698	496723	460975
6	928673	480605	448068
7	938899	483716	455183
8	841636	434085	407551
9	702492	359437	343055

TABLE 1 (Continued)

Age	Both sexes	Male	Female
10	841356	436267	405089
11	581400	298417	282983
12	796786	417420	379366
13	619293	313336	305957
14	596592	300552	296040
15	565714	288338	277376
16	566942	275115	291827
17	538891	268047	270844
18	651318	318484	332834
19	491441	234775	256666
20	565801	262698	303103
21	494895	245129	249766
22	515823	256339	259484
23	456892	223823	233069
24	425212	206193	219019
25	522203	253455	268748
26	358549	174098	184460
27	376221	188224	187997
28	395766	191265	204501
29	300610	145335	155275
30	535924	258580	277344
31	222086	112209	109877
32	318481	157820	160661
33	246260	121778	124482
34	233700	114591	119109
35	401936	197546	204390
36	242659	117323	125336
37	242462	121948	120514
38	316210	152808	163402
39	225207	112943	112264
40	434156	211245	222911
41	126632	64525	62107
42	217881	110127	107754
43	169167	84441	84726
44	151142	76055	75087
45	319118	157849	161269
46	160329	81469	78860
47	160855	83123	77732
48	237287	120422	116865
49	155094	81775	73319
50	313636	155186	158450
51	78534	42336	36198
52	128935	68322	60613
53	93279	50116	43163
54	95715	49394	46321

TABLE 1 (Continued)

Age	Both sexes	Male	Female
55	163093	81086	82007
56	87754	46480	41274
57	71828	38297	33531
58	93049	46419	46630
59	72206	40112	32094
60	275436	147073	128363
61	31299	17837	13462
62	49634	26479	23155
63	40154	21648	18506
64	34381	18749	15632
65	102440	48458	53982
66	26445	14026	12429
67	35311	19209	16102
68	40711	20181	20530
69	20921	10838	10083
70	136771	67493	69278
71	13000	7369	5631
72	28017	15169	12848
73	16662	8921	7741
74	14490	7847	6643
75	50558	24102	26456
76	15010	7838	7172
77	11878	6540	5338
78	23353	12264	11089
79	9212	4987	4225
80	73741	35001	38740
81	5532	3009	2523
82	9331	4804	4527
83	5653	2968	2685
84	5089	2702	2387
85	18604	8591	10013
86	4803	2468	2335
87	5617	2997	2620
88	4388	2310	2078
89	4000	2104	1896
90	21040	9724	11316
91	1319	686	633
92	2070	978	1092
93	1363	656	707
94	955	465	490
95	5448	2466	2982
96	1536	762	774
97	1409	754	655
98	2751	1322	1429
99 +	19220	8854	10366

7. *Coverage of census.* The census of 1960 is the second census after the independence of the Philippines and can be considered as the one more reliable than the previous censuses as it has been conducted along modern lines of census taking. A post enumeration check was conducted after the census, but the results are unfortunately not yet available. It is presumed, however, that the error due to coverage is small.

8. *Age sex characteristics.* The age sex data collected in this census which is the most important one for the present study is available by single years of age. Even though there are bound to be some errors of age reporting, because of the practice of celebrating birth days even among the village people, the population with unknown age is nil.

Usually it is observed that young children are missed from the census enumerations even in the statistically advanced countries. The usual errors in the ages 10-69 are one of the digit preference, and small estimation and random errors. In the older ages again large errors creep in due to the tendency of the people to overreport age at this old ages for several reasons. We shall thus consider the age group 0-4, 5-9, 10-69 and 70+ separately and evaluate them and adjust them accordingly.

Before we go into the proper evaluation, we shall deduce some ideas about mortality and on the basis of this and the growth rate get the fertility rate.

To get an estimate of death rate we shall consider two separate though closely related methods. The first one is as follows: The 1948 age sex distribution is adjusted to the 1950 total population obtained by projecting by the growth rate method. (A growth rate of 2.25% in 1948-50, 2.75% in 1950-55 3.25% in 1955-60 which gives an average growth rate of about 3% in 1948-60 was used to get the 1950 population). The over all survival ratio of all persons aged 0 and above in 1950 for the year period 1950-60 was obtained. The overall survival ratio is:

$$10^S 0 = \frac{P^{60}_{10}}{P^{50}_{0}} = 0.9124 \quad \text{where}$$

$10^S 0$ = survival ratio of persons, 0 and above in 1950 to age 10 and above in 1960.

P^{60}_{10} = population aged 10 and above in 1960 and P^{50}_{0} = population aged 0 and above in 1950. This survival ratio is indicative of an expectation of life at birth of 45 years. The crude death rate on the stable population model analogy will be about 19-20.

Again the differencing method applied to the 1948 and 1960 census age sex data gave a crude death rate of 18.3.

This death rate coupled with observed growth of 30 is indicative of a birth rate of about 50. Now this estimate even though is quite high as compared with that for many other countries does not seem to be too far off the mark. For example, the high percentage of 47.58 of children aged 0-14 in the 1960 census is indicative of this high level. Again in the 1956 PSSH rounds ever married women past the age of 45 were asked how many children they had born during their life time. The average was found to be 7.1 children, which is consistent with a birth of 50. The 1957 PSSH round yielded an age distribution and the reverse survival ratio applied to the enumerated 5-9 population yielded a birth rate of 47-53 depending on the mortality assumption. The 1960 census enumerated 5-9 population also yielded a birth rate of 50-53. The relative stability of the age distribution, the high percentage of young children all point out that not only has the fertility been rather high, it has been quite constant also over time.

With these in mind we see that the reverse survival ratio method applied to the 0-4 population yields only a birth rate of 44.7 (the expectation of life at birth between 1955-60 is assumed to be 47.5) which implies that there is a slight omission of children in this age segment. The omission seems to

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be more at the very young ages as can be seen from the following: First of all the birth rate based on the population aged zero in 1960 is only 33 as compared with about 45 for the entire group which itself is below the actual value which may be more than 50. The percentages at each ages 0, 1, 2, 3, 4, as indicated below confirm this also.

Percentages and sex ratio of ages 0, 1, 2, 3, and 4 among population of 0-4

Age	0	1	2	3	4	0-4
M	17.2	19.5	21.0	21.2	21.1	100.0
F	17.2	19.4	21.1	21.2	21.1	100.0
S.R.	105.8	106.8	105.8	106.5	105.7	106.1

Perhaps the missings is more among the females than among the males as can be gauged by the sex ratios.

The 5-9 age group gives a birth rate of 51.6 when the reverse survival ratio method is applied to it (the e_0^o between 1950-55 is assumed to be 42.5). This birth rate is quite reasonable and since it is the experience of many countries that the enumeration of this segment is more or less correct, it is assumed that the enumeration here is quite complete.

In the age segment 10-69 the usual errors are one of digit preference, small estimation errors and some random errors. The Myer's index and the Preference pattern index both point to the fact that even though 0 and 5 are the preferred digits, the intensity of preference is not as high as that in India, for example where 20-25% persons reported ages with end digits 0 or 5.

Myers and Preference Pattern Index (PPI)

Digit	0	1	2	3	4	5	6	7	8	9	Index
M	17.3	6.4	9.6	8.0	7.9	13.3	8.3	8.9	11.3	8.6	24.4
Myers											
F	17.8	6.2	9.4	8.0	8.0	14.4	7.1	8.7	11.9	8.6	28.2
M	18.2	6.6	9.7	8.0	7.9	13.0	8.2	8.7	11.0	8.7	24.5
PPI											
F	18.7	6.2	9.2	7.8	7.8	13.5	8.3	8.4	11.5	8.5	27.5

As in the case of several countries 0, 5 and 8 are the preferred digits with 2 near about correctly enumerated. However, contrary to international experience digit 3 is almost egually preferred as 4 because in the Philippines 3 is considered a lucky number. The pattern of preference for males and females is similar even though the intensity is slightly higher for females.

There is also a systematic pattern of preference for the digit on either side of 0 and 5. For example, considering the two digits on either side of 0 and 5 we see that in the case of zero, 1 and 9 are less preferred than 2 and 8 and in the case of five, 4 and 6 are less preferred than 3 and 7. We shall utilize this specific pattern to adjust the digit preference errors.

In addition to the digit preference errors there may be estimation errors and differential enumeration of the sexes. One of the methods of locating these is by the age ratio, sex ratio methods. If migration could be assumed to be negligible, the population should show a continuous smooth decline as the age is increased in addition to the sex ratios being not too fluctuating at consecutive ages. If fluctuations do exist they may be due to genuine factors like war, migration etc. provided such be the case. Otherwise such undulations may be due to errors in the age data.

The populations by ages do show a slow but steady decline even though the heavy digit preference errors somewhat distort the picture. The sex ratios, however, indicate a peculiar

pattern. Whereas it is high at ages 10-14 and 45-64 at all other ages in the range 10-69 it is less than 100. The slightly low sex ratios at ages 15-44 may be due to one of the several reasons. The first one may be a slight shift in the age reporting of females and/or females. Secondly even small amounts of migrations (international) at the ages 20-34 which may have been there could effect the sex ratios to the extent noted here. Thirdly at ages 35-44 the low ratios may be due to excessive male mortality during World War II. The possibility of more missing of males than females in the enumerations at these ages seems to be very remote. The low ratios seem to be really due to slight out-migration of males at the young adult ages and due to excessive mortality during World War II at the older ages.

The age ratio scores based on single year of data are: 44.98 for males, 51.44 for females and the sex ratio score is 3.28. The join score is 106.26. These scores even though not large, are indicative of the somewhat large digit preference errors, the small estimation errors, and the slight migration and war effects.

Thus we see that in this segment the error is one of slight age estimation errors. The enumeration on the whole may be complete but only the age reporting may be in error.

Considering persons aged 70 and above we see that about 1.9% of both sexes reported themselves to be in these ages. Usually the error in this age segment is one of over-reporting of age. People because of ignorance, false prestige etc. report as being older than what they are at these ages. We see that on the basis of a stable population (BR = 51, e^o = 47.5) the expected percentage are only 1.1 and 1.2 respectively for males and females. Within the age group 70 and above quinquennial populations are:

Age group	Male Observed	Male Stable Population	Female Observed	Female Stable Population
70—74	0.782	0.579	0.761	0.631
75—79	0.408	0.314	0.404	0.342
80—84	0.355	0.137	0.379	0.149
85 +	0.330	0.050	0.368	0.055
70 +	1.875	1.080	1.912	1.177

From the above table we can easily see that both males and females to a certain extent have over-reported their ages, The error even though found at all ages in the range 70 and above seems to be very high at the older ages and as a matter of fact the error seems to be almost increasing with age.

9. *Adjustment of data.* In the last chapter we saw that the different segments 0-4, 5-9, 10-69 and 70 and above indicate errors of different types. Since these errors are to be eliminated before we utilise the base data for projections because if we do not remove these errors then they will not only be carried over but also will be compounded, we shall in this section indicate the several separate adjustments to the base data to remove the specific errors.

Adjustment of the 0-4 age group. From the comparison of the birth rate estimated by the reverse ratio method based on the 0-4 and 5-9 population we saw that the 0-4 group is under-reported to some extent. This being the case, the enumerated 0-4 population is bloated up. The sex ratio of the enumerated 0-4 group is 106.1. Since the sex ratio at birth has been observed to be well within the range of 104-108 and since especially at the very young ages male mortality is higher than female mortality, the sex ratio of the 0-4 age group could be between 103-197. It seems that the enumeration has been more incomplete among female babies than among male babies. To account for this the bloated 0-4 population is allocated to the two sexes to get a sex ratio of 105.

Adjustment of the 5-9 age group. The birth rate based on the 5-9 population even though rather high (51.6) seems to be reasonable when we consider the percentage of children under 14 years in the population, the average number of children even born to ever married women, the growth rate and so on. International experience is that some very young children (0-4 years old) are enumerated as in the 5-9 group and that some children aged 9 are enumerated in the 10-14 group. Thus the group 5-9 gains some persons from 0-4 group and loses a few to the 10-14 group. On the whole the 5-9 group is more or less complete and correct. This being the case and coupled with our observations we assume that the 5-9 as a group is more or less correctly enumerated. No adjustment as such has been done on it.

Adjustment of the 10-69 age group. It has already been observed that the predominant errors in this segment is one of digit preference. In addition, small estimation errors and perhaps slight random errors may also persist. Since 0 and 5 are the dominant digits and since the two digits on each side of these exhibit similar patterns, first of all the single year of age populations have been considered in quinary groups with end digits 3, 4, 5, 6, 7, and 8, 9, 0, 1, 2. The digit preference errors within these segments are first eliminated by fitting least square straight lines to the five points. After cutting down these large systematic errors, the small estimation errors which may be assumed to be one of 5 years on either side, is eliminated by applying a ten point moving average straight line fitted to 10 points at a time. This gives single year age values at mid points of age. To get the values at exact integral ages and to eliminate the still persistent small random errors, a moving average straigh line fitted to 2 points at a time is used.

Adjustment of the old age segment, 70 and over. In this segment, as already mentioned the error in one of over-estimating age. Even a few persons who are actually younger may have reported their ages as 70 and over. The adjustment done to this group is as follows. First of all it is assumed

that only 1.08% and 1.18% of males and females are respectively aged 70 and above instead of the observed 1.88 and 1.91%. With these adjusted values the distribution within the quinary groups also is done under the stable model assumption as indicated in Section 8.

Final base population. After all the adjustments mentioned above were carried out, the total population increased by 2-3%. The increment was more among females than among males. Since for comparative purposes and for other reasons, it was felt advantageous to keep the enumerated and adjusted populations by sex as equal, the adjusted populations were prorated to agree to enumerated populations by sex.

It is not contended that the enumerated population is completely free from ommissions of persons. Some small omissions are bound to be there due to many reasons. But because the omission is usually so small and the advantage of keeping the original enumerated and adjusted population figures equal so large that it was felt that the original figures be kept intact as a whole and only adjustments be done on the segments much affected. The final adjusted figures by quinary age groups are given in Table 2.

10. *Assumptions.* The future population estimated is intimately related to the future fertility, mortality, migration rates and the sex ratio at birth. Thus any projection should provide the assumption made regarding the levels and expected trends of these factors.

Sex ratio at birth. No direct estimate of the sex ratio at birth of the Philippine population is available. But all the same on international experience one can safely make an assumption which may not depart too much from reality. In this study a sex ratio of 107 males per 100 females is assumed to project the births in the future by sex.

Migration. In the recent years migration has played only a very insignificant role in population change in the country. Due to the restrictive immigration policy of the government and also due to similar restrictions placed by governments of other countries the migration in the future also may be reasonably assumed to be negligible.

TABLE 2

ADJUSTED AGE-SEX DATA OF THE 1960 CENSUS, PHILIPPINES (BASE POPULATION).

Age group	Males		Females	
	Population according to 1960 Census	Population adjusted	Population according to 1960 Census	Population adjusted
0— 4	2354038	2725894	2218377	2589428
5— 9	2254566	2156953	2114832	2068744
10—14	1765992	1710584	1669435	1636715
15—19	1384759	1377916	1429547	1400458
20—24	1194182	1173580	1264441	1218672
25—29	952368	964902	1000981	988411
30—34	764978	769484	791473	792094
35—39	702568	654817	725905	672395
40—44	546393	559621	552585	563798
45—49	524638	469621	508045	455975
50—54	365354	365772	344745	344419
55—59	252394	268358	235536	243411
60—64	221786	197370	199118	178634
65—69	112712	125579	113126	119047
70—74	106799	77603	102141	81819
75—79	55731	41542	54280	44345
80—84	48484	18125	50862	19320
85 +	45137	6616	49456	7131
Total	13662869	13662869	13424816	13424816

Fertility. The present situation in the country is not indicative of any decrease in the birth rate from its rather high levels. Surveys and studies done recently have indicated no pronounced urban-rural or other differentials in fertility which are the fore runners of fertility declines. Fertility decline can be brought about only by individual action. The predomi- nance of the Roman Catholic among the population may perhaps with its influence ensure a continued high birth rate in the country. However, the high literacy among the popu- lation, the modern individualistics way of life, the laws re- garding age at marriage etc. may tend to produce a retarding effect in the course of time. But usually these will take time to show their effects so that in the immediate future, i. e. 15-20 years from now, there does not seem to be much chance of a reduction in the fertility rate in the country. It is assumed that throughout the period of projection, the fertility as indi- cated by a birth rate of 51.6 observed in the past will continue. The projection of births has been done by converting the birth rate of 51.6 into a sex adjusted birth rate of 56 to take account of age sex differentials over time.

Mortality. The Philippines is one of the past declining mortality countries. The improvements in Public Health, avail- ability of cheap and efficient drugs, improved living condi- tions, increased literacy and so on have accelerated the lon- gevity of life of the people and may be expected to result in still further reductions in the death rate. We saw that between 1955 and 1960 the expectation of life at birth could be about 47.5. With this premise it is assumed that in 1960 the expecta- tions are assumed to be respectively 55, 60, 63, 75 and 66.25. This assumption is in tune with international experience where when the expectation of life at birth is moderate the improve- ments in the expectation can be about one year per year due to overall and individual measures to combat disease and health, but the improvements will be only moderate when it has already reached quite high levels. Thus when the level is about 60, the increments are assumed to be only 3/4 of a year per year for the first five years and then half year per year for the next five years.

TABLE 3

MALE PROJECTED POPULATION, 1960—1980

Age group	1960	1965	1970	1975	1980
0— 4	2725894	3347901	4061993	4974609	6132105
5— 9	2156953	2594506	3230055	3955163	4876112
10—14	1710584	2125893	2566745	3203246	3928663
15—19	1377916	1684583	2101233	2542874	3178901
20—24	1173580	1346500	1654934	2071816	2513885
25—29	964902	1141307	1318089	1627297	2043847
30—34	769484	937113	1116312	1295154	1604189
35—39	654817	745322	914622	1094767	1274561
40—44	559153	630458	723782	892946	1072762
45—49	469621	532481	606312	700404	867765
50—54	365772	439518	504206	578240	671337
55—59	268358	333621	406554	470475	542794
60—64	197376	235270	297557	366508	427285
65—69	125579	162712	198168	254054	315893
70—74	77603	94021	125256	155324	201668
75—79	41542	50201	63069	86013	108478
80—84	18125	21573	27355	35451	49440
85 +	6616	7647	9561	12511	16657
Total	13662869	16430627	19925803	24316852	29826342

TABLE 3

FEMALE PROJECTED POPULATION, 1960—1980

Age group	1960	1965	1970	1975	1980
0— 4	2589428	3195533	3864379	4714246	5794636
5— 9	2068744	2469537	3089761	3772020	4633161
10—14	1636715	2038127	2443607	3065970	3746748
15—19	1400458	1611019	2014892	2423081	3046348
20—24	1218672	1369368	1584921	1990310	2400546
25—29	988411	1186377	1342939	1561781	1968019
30—34	792094	960538	1161700	1321721	1542415
35—39	672395	768331	939118	1141603	1303217
40—44	563798	650139	749046	920242	1122538
45—49	455975	541584	630050	729796	899905
50—54	344419	432857	519325	607998	707172
55—59	243411	320930	408314	493670	581125
60—64	178634	219800	294453	378425	460841
65—69	119047	152893	192171	261003	338728
70—74	81819	93238	123217	157792	217128
75—79	44345	55670	65947	89419	116608
80—84	19320	24492	32394	39713	55181
85 +	7131	8763	11623	15908	20574
Total	13424816	16099196	19467857	23684698	28954890
Both Sexes	27087685	32529823	39393660	48001550	58781232

Due to the lack of a life table and other related information for the Philippines, the mortality experience as evinced by the model life tables is utilised to project the population into the future.

11. *Population projection.* Under the above assumptions the base population as adjusted is projected into the future by quinary ages at quinquennial intervals of time up to 1980 and are given by sex in Table 3.

12. *Implications.* Some broad implications of the projections are given below:

Total population, 1960-1980. From the following table giving the total population by sex in 1960, 1965, 1970, 1975 and 1980 we see that in the 20 years from 1960, the population has more than doubled. The growth is more among the males than among the females even in spite of the favourable mortality assumptions in the future. The sex ratio of the general population has increased steadily from 101.8 to 103.0. The deficits of males at the ages 20-44 in 1960 are slowly wiped off by 1980 and this may be one of the reasons for the steadily increasing sex ratio. The other one is that the differential mortality even though slightly favourable to females is not strong enough to cut down the strong influence of the sex ratio of 107 at birth as assumed by us. Since the younger cohorts are more numerous the effect of this is considerable in increasing the sex ratio of the population.

The population of the Philippines, 1960-1980

Year	1960	1965	1970	1975	1980
Male	13662869	16430627	19925803	24316852	29826342
Female	13424816	16099196	19467857	23684698	28954890
Total	27087685	32529823	39393660	48001550	58781232

Density of the population. Because of this high growth, the density of the population also has more than doubled in the 20 years. With an area of 297410 square kilometers the population does not look too big. The density even in 1980 is

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only less than 200. But of course, this has to be considered in junction with the availability of arable land and so on. Also even within the Philippines the density is not uniform so that there are comparatively large areas like Luzon which are very highly densely populated and very large areas like Mindanao which are very sparsely populated. The problem is one of population redistribution and development of these vast and relatively uninhabited areas. Of course, this should not be taken to mean that the Philippines has no population problem. Land area, cultivable land etc. are not the only criteria on which to base population figures. The problems of providing economic and social opportunities to a rapidly growing population should also be kept in mind.

Density of Population, 1960-1980

Year	1960	1965	1970	1975	1980
Density	91	109	132	161	198

Vital rates The crude birth (B. R.) and death rates (D. R.) and the rates of increase (G. R.) are given below:

Year	1960—65	1965—70	1970—75	1975—80
B.R.	50.78	49.23	48.06	47.35
D.R.	14.27	11.06	8.66	6.97
G.R.	36.51	38.17	39.40	40.38

Even though fertility has been assumed to be constant the C. B. R. has declined from 50.78 to 47.35 i. e. by 6-7%. This is due to the change in the age structure of the population over time. The death rate has declined to less than half its initial value in the 20 years due to improvements in the expectation of life as assumed earlier, even though the age structure could have hindered this decline to a little bit as the population in the younger and older ages increase under a constant fertility and rapidly declining mortality model and these are the ages where mortality is heaviest. From its observed value of 3% during 1948-60 the population is expected to grow at a rate slightly more than 4% during 1975-80.

The expectation of life at birth and the infant mortality rates under the assumptions are:

		Year	1960—65	1965—70	1970—75	1975—80
e^o_o	M		52.5	57.5	62.0	65.0
	F		52.5	57.5	62.0	65.0
IMR	M		131	102	76	56
	F		112	86	63	46

We see that the infant mortality has declined to less than half its value in 1960-65 during 1975-80.

Proportion of population by broad age groups and dependency rates.

Whereas the percentages in the very young and old groups have shown increments the young adult worker age group has shown a consistent decline of 3-4%. This implies that the dependency ratio will be increased by 6-8% over time. This has been brought about by the constant high fertility and the declining mortality. This has implications in terms of labour force and other economic development problems.

Percentage of Population by broad age groups, 1960-1980

Year	1960	1965	1970	1975	1980
Age 0—14	47.58	48.48	48.88	49.34	49.53
15—54	50.43	49.46	48.97	48.36	48.02
65 +	1.99	2.06	2.15	2.30	2.45
Dependency ratio	98.3	102.18	104.21	106.78	108.52

Elementary school age population. We see from the above table that the increment to the percentage of young children is quite high and consistent over time. The constant high fertility coupled with declining mortality has brought about this. This increase in the percentage of the child population has social implications like the need for providing facilities for schooling, recreation and so on. Considering that the 7-13 is the compulsory elementary school age, the

population aged 7-13 are calculated roughly from the formula:
$P_{7-13} = .448\ P_{5-9} + 1.064\ P_{10-14} - .112\ P_{15-19}$ and are given
below:

Year	1960	1965	1970	1975	1980
Male	2632050	3235616	3942744	4895365	6008558
Female	2511411	3094486	3758543	4680672	5721005
Total	5143461	6330102	7701287	9576037	11729563

The school age population has increased to about 2.3
times its value in 1960. This is but to be expected when we
consider that the total population itself has increased to about
2.2 times its value in 1960 and that because of high constant
fertility and declining mortality, the child population has
grown faster than the total population.

General conclusion. We see that under our assumptions
the total population more than doubles in the 20 years. Even
though this be the case, the density of population in the
country is not alarmingly high. If developmental programmes
are taken in hand and sparsely populated areas like Mindanao
become attractive, the rather huge additions to the population
can be taken care of in terms of land area and so on. But
from the social and economic point of view this high growth
is to be viewed with alarm. The number of teachers, schools
and other amenities for the rapidly growing school population,
the ever increasing need for creating more jobs to absorb the
labour force and so on will tax the meager resources of the
government. The population projections made by us will at
least open up the eyes of the administrators and planners of
the need for proper planning for the economic and social
development of the country.

13.   *Other available projections.* At least three projections
of the Philippine populations have come to our notice in the
recent years. They are all made or compiled by the United
Nations or their agencies. The first "Population of Asia and
the Far East, 1950-1980" published by the UN Department of
Economics and Social Affairs, in 1959 bases the projections

on the available 1948 census age sex data adjusted for plausible errors. The fertility, mortality and estimation are based on census age sex data for lack of other reliable vital statistics. The second one jointly by the United Nations and the Government of the Philippines, "Population Growth and Manpower in the Philippines" published in 1960 bases the projection on on the 1957 PSSH results coupled with information from the previous censuses. Still another one prepared by the Bureau of the Census, Philippines and compiled by the UN, "Population Projections: Abstracts of Recent National Projections by Age Groups for Forty Eight Areas" is as yet unpublished and seems to be a tentative one. The projection is based on the 1960 census preliminary total population, the age sex data being borrowed from the 1957 PSSH results. Mortality and fertility estimates are also based on past censuses and survey results modified by the known preliminary population count which incidentally was about 1.4% more than the final figure.

Discussion of these projections. Whereas the first one has become out-dated due to the new data available, the second one based on the PSSH results seems to have erred quite a bit. This was found out also while a study on the school population in the Philippines was being carried out at the Centre a few years ago. The projected population has come out much less than the enumerated population and the age sex structure also is much divergent. As such these 2 projections have only limited value in addition to being indication of pitfalls in the assumptions. The third projection, as already stated, has started with a higher population figure in 1960 based on the census preliminary estimate. In addition the age sex structure being borrowed from PSSH results may not be truly representative of facts.

The other major difference between our projection and these others is that whereas we assume a higher fertility and mortalitiy level, these projections assume a somewhat lower fertility and mortality levels. The fertility, for example, as measured by the sex adjusted birth rate in our study is 56 whereas it is only 50 in the third study. The expectation of

life in our study during 1960-65 is 52.5 whereas it is 57.6 in the third study. The enumerated population 10 and above in 1960 seems to indicate in comparison with a stable population that the fertility, mortality combination made by us is near about 50-52 and the death rate near 20-22 during 1948-60. by the difference method and the observed growth rate indicates that fertility as measured by the crude birth rate can be about 50-52 and the death rate near 20-22 during 1948-60. Since the average numger of children born as shown by surveys is more than 7 the CBR can be about 50-52 also. We shall see in the next section that our assumption is quite reasonable and the adjusted population on that basis comes near about the stable model.

Here it is worth mentioning that even though the rate of growth of the population in the third study does not differ much from our study at least in the short run; since the fertility, mortality assumptions are different, the age sex structure of the populations will differ in the future. The population as projected by us will be a younger one and as such its implications will be quite different from the one in the third study. The implications of third projection are spelled out below and they also indicate that the child population, the dependency burden, the school age population etc. are lower. Under the medium assumption (fertility as measured by the sex adjusted birth rate to remain constant at 50.27 and mortality as measured by the expectation of life at birht to increase by about half year per year from 57.6 in 1960-65 to 63.2 in 1970-75, the specific moriality rates being obtained from model life tables) the total population by sex in 1960, 1965, 1970 and 1975 are (in thousands):

	1960	1965	1970	1975
Male	13798	16305	19411	23283
Female	13658	16146	19212	23016
Total	27456	32451	38623	46299

The populations in the broad age groups and the dependency ratios are:

	1960	1965	1970	1975
0—14	46.0	45.6	45.9	47.3
15—64	51.6	51.7	51.1	50.3
65 +	2.4	2.7	3.0	2.4
Dependency ratio	93.8	93.4	95.7	98.8

The elementary school age populations are:

	1960	1965	1970	1975
Male	2716560	3090976	3656296	4499656
Female	2588096	2989224	3537240	4374664
Total	5304656	6080200	7193536	8874320

14   *Some observations on the projection.*   Here we shall make some observations on the base population after adjustment as also on the projected populations.

First of all the percentage age distribution of the 1960 adjusted population as given below can be compared with a stable population model with a CBR of 51.6 and e_0^o of 47.5.

Age	Stable population Male	Female		Adjusted population, 1960 Male	Female
0— 4	19.8			19.9	
5— 9	15.6	47.5		15.8	46.9
10—14	12.9			12.5	
15—19	10.7			10.1	
20—24	8.8			8.6	
25—29	7.2			7.1	
30—34	5.9	44.2		5.6	45.4
35—39	4.8			4.8	
40—44	3.8			4.1	
45—49	3.1			3.4	
50—54	2.4			2.7	
55—59	1.8	5.9		2.0	5.7
60—64	1.3			1.4	
65—69	0.9			0.9	
70—74	0.6	2.3		0.6	2.0
75—79	0.3			0.3	
80 +-	0.1			0.2	

We see that the agreement is quite good especially for the males. At the ages 10-34 the small difference between the adjusted and stable populations is mostly due to small migration and war casualty as already alluded to. In the case of females, since quinquennial age group percentages were not available for the stable model, only broad age groups have been compared. Even in these the differences are not much.

The projected population in 1970 can be compared with a stable model with CBR of 49.2 and e_o^o of 57.5. Here only comparison of the male figures have been carried out.

Age	Male		Age	Male	
	Stable model	Projected population 1970		Stable model	Projected population 1970
0— 4	20.5	20.5	45—49	2.9	3.0
5— 9	16.3	16.2	50—54	2.2	2.5
10—14	13.2	12.9	55—59	1.7	2.0
15—19	10.7	10.5	60—64	1.2	1.5
20—24	8.7	8.3	65—69	0.9	1.0
25—29	7.0	6.7	70—74	0.5	0.6
30—34	5.6	5.6	75—79	0.3	0.3
35—39	4.5	4.6	80 +	0.2	0.2
40—44	3.6	3.6	Total	100.0	100.0

We see that the divergence is very little indeed. Similar comparison of projected male population in 1980 with stable model with $e_o^o = 65$ and CBR $= 47.4$ can also be carried out as above. In this case we see that the concordance is quite much.

It looks that the adjustment carried out by us to the 1960 census age sex data is quite reasonable as the consistency in the age structure, the birth death rates etc. confirm.

The base population in 1960 as also the projected populations in 1965, 1970 and 1975 as given by the third projection in this respect do not indicate consistency. It looks that this gives a further indication that the adjustment of the age sex structure as of 1960 and the fertility mortality assumptions in the past, present and future are not consistent in the third study