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THE ASSOCIATION

THE ECONOMIC CONSEQUENCES OF PUBLIC HEALTH ACTION*

by

*Yves Biraud***

I am most grateful to you for giving me the opportunity and the privilege of meeting here a number of fellow statisticians, members of the Philippine Statistical Association and, amongst them, several colleagues of the Bureau of the Census and Statistics, the Disease Intelligence Centre, Office of Statistical Coordination and Standards, the U.P. Statistical Center and the Manila Vital Registration Office, who have actually participated in the teaching of the present International Course in Vital and Health Statistics, and in the technical demonstrations, and for the hospitality given to its participants. May I take advantage of this gathering to express our thanks to them all.

When, a few weeks ago, we renewed here, Mr. President, our acquaintance which began in Geneva Headquarters of the World Health Organization and you asked me to address this Association, I felt I should choose not only a subject which could be of interest to the demographers and economists who normally constitute a majority amongst statisticians, but also one which my own public health specialty would allow me to deal with without impertinence. My choice was made when I realized that there existed among thinkers in the Philippines, preoccupations which I had encountered in some other countries, particularly among members of the UN Statistical and Population Commissions, when I represented WHO in their midst concerning the population growth observed and expected in the world at large — in Asian countries especially— and the possible effect of health work as a stimulant of this growth.

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* Paper delivered in the monthly meeting of the Philippine Statistical Association, November 1960.

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Let us be quite clear, I did not encounter so far anyone who dared to say — and I hope also to think — that one should combat disease and death in order to leave to the survivors a larger share of the world's food.

But I have met quite a few who were no only genuinely anxious to reduce the pain and misery engendered by disease and death, but also afraid that doing so now might result in excessive growth of the human race in the future and the consequent shortage of its food supply would lead to starvation and famine and therefore cause greater and more widespread suffering that disease now entails.

There is no doubt, that in spite of the opinions expressed by leading experts in food production and food policies, the sentimental appeals made by well-meaning protagonists of the movement to fight the so-called "hunger of the world" have given to many the impression that the world's food supply is limited to its present production and that any increase in the number of consumers is going to create shortage.

It is not for me as a public health man to tell the economists amongst you, that food production like any other production is intentionally kept by the producers within the order of magnitude of the market, rather than of the actual needs, and that the present problems are problems of distribution, of social and economic structure and machinery, rather than of agricultural techniques. This does not make things any easier because social progress is more difficult to achieve than technological advances; but this helps to dispel fallacious notions and prejudices.

But let us come back to health activities and see how they influence the demographic situation and in consequence, the economic situation.

If we look back, half a century or so in the so-called developed countries to appreciate the effect of public health activities, we immediately realize that we cannot evaluate them (or rather most of them) independently of the effect of social progress, both education and economic which have accompanied these public health activities. If, however, we consider the present time and what is happening underdeveloped countries in which public health action precedes other form of social progress, we can actually observe now what has taken place in advanced countries several decades ago.

The Impact of Health Action on Diseases by Age.

The first effect of public health action is usually a sharp decline of infant mortality and of child mortality. Obstetrical care, health education of the mothers as to feeding their babies, immunization against the infectious diseases of childhood, and cleaner potable water, all play their parts.

The age group 20 to 40 is the next to benefit from the gradual elimination of communicable and parasitic diseases: malaria and tuberculosis, the scourge of the young adult. At higher ages, the gain is far less; antibiotics have cut down pneumonia mortality of the elderly, but the cardio-vascular diseases and cancer have gone on unaffected, indeed causing a greater number of deaths as more people reached the ages of their maximum freguency.

Demographic Consequences.

This is one of the most obvious consequences of the change in the age composition of the population.

The effects of the health activities — increased in places by social progress — have been:

1. An increase in the number of children (who have escaped the perils of infancy). This means obviously an immediate burden to the community; but also a capital investment, because at the cost of say 15 years of bringing up, they will constitute the labor force for more than 3 times as long.

2. Not only do more adolescents enter the economically active age, but fewer young adults leave it by premature death

so that the numerical importance of the active age increases. But older adults continue to die so that the number of them who enter the less active or inactive ages does not increase in the same proportion.

During the last half century, the expectation of life at age 15 has increased by 8 to 10 years, but at age 60, by 1-1/2 to 3-1/2, and at age 70 by a few months only (0, 7 to 2 years). This means that a greater proportion of people cease to die from premature death and are able to reach the normal "biological span of life." This means also, that the number of very old people who can no more support themselves does not increase to anything like the number of active young adults.

[Let it be said in parenthesis that much of the social burden of "old age" in industrial communities is artificial, and due to arbitrary age limits for work and lack of consideration of, and adaptation to, the working capacities of the aged.]

Morbidity and Fitness for Work.

We have so far considered only the quantitative aspects of population in the "economically active" and "dependent" age groups. Judging from the debates of the United Nations Statiscal and Population Commissions, this is as far as most demographers and economists will go. They seem to ignore the "qualitative aspect of health in those same populations. And that is where, as a public health man, I feel I have a message to deliver, in revealing the importance of this aspect.

Let us consider our personal, individual experiences. There are days when we feel fit and are able to accomplish a lot, and do it with joy; there are other days when we have to drag ourselves to do our work and its results are poor in quality or quantity. This may be the result of a passing or a chronic illness, physical or psychic or both, which is however discreet enough to let us lead normal lives and careers.

But many diseases are more serious drags on human activity and economic output. Chronic tuberculosis and malaria are perhaps the best known to all of you. I should also mention schistosomiasis (or bilharziasis), a scourge on several of these islands. These may kill and will, also for long keep their victims unfit for work. There are other diseases which do not kill, or nearly so, but will invalidate people for life or at least many years. You have heard of trachoma, an eye disease of early childhood which produces blindness or such impairment of vision in adults that their victims are barred from many occupations. You all know leprosy and its crippling effect by destruction and deformation of hands and feet. You have heard of yaws which ulcerate the skin, and destroy bones, and during many years make life a misery to the victims. You know of paralysis following the acute attack of polio.

Now these diseases are amongst those which large scale campaigns are now waged in many countries with the assistance of WHO and of UNICEF. Each of the campaigns affects tens or hundreds of million cases.

Now, whether by prevention or cure, this mass public health action tends to remove men from the sick or crippled and place them among the active population. It, therefore, increases the number of producers without increasing the number of consumers and the economic benefit is obvious. The world eradication campaigns against malaria undertaken in 1955 or the tuberculosis campaigns carried out by vaccination and ambulatory drug treatments, even though they tend to reduce mortality, have an even further reaching effect on morbidity.

Take, for instance, malaria. It is estimated that there are 100 active cases for one annual death. Suppresion of the disease by a well conducted eradication campaign, such as has been conducted in many countries, tends therefore to improve the health of some 60 producers (people at the active economic age) for one death prevented, adding to the number of consumers. For such a chronic and relapsing condition as malaria, it would seem that the gain would be of the order of 10 to 20 full-time producers gained for 1 additional consumers, a definite economic gain. Actually this gain has manifested itself by a considerable increase in agricultural production in many areas in which DDT malaria eradications were waged with success, for instance, in India and in Ceylon.

In tuberculosis, the proportion of active cases to annual deaths is not as high, but is estimated to range between 5 and 10. Even at five, supression of 5 invalids, i.e. non-producing consumers, at the cost of maintaining alive one consumer, is a definite economic advantage. It is bigger than the figure suggests if one realises that only too often the tuberculosis patient is a young adult with a young family to support.

I have not mentioned, but I know you will, as myself, appreciate the significance of disease and death prevention, which cannot be measured in financial terms. It is true that there are some diseases, like cholera, which kill swiftly and the control of which will add to the number of consumers a well a producers. But there are also many diseases which I have not mentioned (filariasis, onchocerciasis causive blindness), sleeping sickness in tropical Africa, etc.) which are causes of crippling and of disease as well as death.

I think that the picture, as I have drawn it, is true. I might add that prevention of disease improves the health of people and their fitness of work for years.

Once upon a time it was thought that protection of life of "weak infants caused survival of unfits and weakened the race." Exposure of infants in Sparta and other Greek cities was partly due to this belief.

It has now been proved that there is a more or less constant relation between morbidity and mortality and that fewer infant deaths also means fewer infants with lasting damage in their liver, their lungs or other organs. So that one cohort, one generation, giving fewer infant deaths will also give fewer children's deaths and young adult deaths. Also if more adults enter old age, more healthy and fit adults do so, and they are, according to recent studies, longer able to support themselves than people of the same age of the previous generations.

My conclusion, therefore, is that we need not be torn by doubt and indecision, when considering health programmes and health expenditure, and that we may give our whole-hearted support to health campaigns, with the confident belief that we are contributing to the economic welfare of the nation as well as to the health of its members.

I thank you for your patience, gentlemen, listening to me, and I thank you, Mr. President, for the opportunity that you have given me to express my beliefs, I may say, my deep convictions, in this matter.

like the Philippines which has a backlog in terms of non-school going children of the compulsory age due to lack of facilities or interest will need to plan ahead and estimate how many persons of school age there will be in order that an expansion programme can be carried through efficiently. In addition, it is necessary to estimate the number of teachers that will be needed at some future date, since several years may be required to train them. Also the construction of buildings and the provision of other physical facilities take considerable time so that planning need to be done well ahead of time.

Moreover, since the coverage in the compulsory age group is not yet complete, it is not enough and not correct to consider only the size of the school age population; it is necessary also to take account of the extent to which persons of school age attend school. In countries without fully developed school systems the enrolment ratios (participation rates) are usually low. Plans for improvement of the enrolment ratio, etc., should be based on a statistical appraisal of the existing educational situation from these points of view. Or, alternately improvement in the enrolment ratios may be envisaged such that at a future date these ratios will approach the correponding ratios for the present time for some of the advanced countries.

This paper attempts to provide background statistics pertinent to the ever-growing needs of planners and educators currently engaged in planning future facilities for already over-burdened school system throughout the country.

The high birth rate, the lagging school building programme, coupled with declining death rates especially infant and early childhood mortality, the strict enforcement of the compulsory elementary education and an awakening among the masses of the people for elementary education programme may imply heavy demands on the education head of the expenditure. The magnitude of the problem involved is the subject of the present study.

2. Estimation of the Elementary School Age Population (7-13 years) for the Philippines, 1960-1980:

The elementary school age population (aged 7-13 years) for 1960, 1965, 1970, 1975 and 1980 is obtained by splitting the availble 5-year age group populations for the country prepared by the U.N. [5] by the application of the Karup-King interpolation formula. (See Appendix Tables 1, 2, 3 & 4).

The estimated populations of each age-sex group is given for these periods in tables 1, 2, & 3 under three headings, (a) the conservative, (b) the low mortality and (c) the moderate fertility decline projections. This has been done not only to take care of the future possible course of mortality and fertility but also to illustrate the effect of a fertility decline on the educational needs of the country.

Under the conservative assumptions, fertility is assumed to remain constant at the estimated 1950 level whereas mortality declines at a rate which from average observations for the world as a whole appears normal. Under the low mortality assumptions, mortality rates are assumed to decline very rapidly as observed in the case of some of the Asian countries like Ceylon, Malaya, Singapore and Taiwan. Fertility is assumed to remain constant at the 1950 level. Under the **moderate fertility decline** assumptions, mortality declines at the normal rates based on average world experience and fertility is assumed to remain constant at its 1950 level up to 1960 and then decline 5 per cent quinquennium [5].

The above method gives the populations aged 7-13 years by single years of age by sex for 1960, 1965, 1970, 1975 & 1980, so that by adding them up we would get the elementary school age population for the different periods.

If the aim is only to obtain the total of the populations aged 7-13 years by sex for the periods, then the following simpler formula * may be used.

$$U_{7\text{-}13} = .448U_{5\text{-}9} + 1.064\,U_{10\text{-}14} - .112\,U_{15\text{-}19} \quad ....(1)$$

where $U_{x\text{-}y}$ = population aged x to y. This formula is much simpler to use but in many circumstances we may need the single year values themselves for getting the participants in the school programme so that we have to do the elaborate procedure using the Karup-King interpolation formula.

Another point which should be borne in mind is that even though both the methods, the one based on the Karup-King interpolation formula and the other based on equation (1) estimate the same quantity, i.e. the population aged 7-13 years, since they are derived on different premises, they may not give identical results. But for all practical purposes, the indication of either will be good enough.

TABLE I.

School Age Populations (7-13 years) by Single Years of Age by Sex for the Philippines.

1960-80 (Conservative assumptions) (in thousands)

Age	Sex	1960	1965	Year 1970	1975	1980
7	M	388.2	465.4	549.9	651.1	777.3
	F	381.7	454.3	536.8	635.5	758.2
8	M	377.5	447.7	529.6	627.0	747.9
	F	367.6	437.0	517.0	612.1	729.7
9	M	374.8	434.4	514.4	609.0	725.5
	F	358.2	423.8	502.0	594.4	707.8
10	M	374.7	417.7	498.2	589.6	701.1
	F	348.4	409.2	485.9	575.2	683.9
11	M	369.4	398.2	478.6	466.1	671.9
	F	335.5	391.8	466.6	552.3	655.6
12	M	360.1	383.6	460.5	544.8	645.9
	F	323.2	376.6	448.9	531.5	630.2
13	M	346.6	374.0	443.9	525.7	623.0
	F	311.5	363.6	432.7	512.8	607.9
Total	M	2591.3	2921.0	3475.1	4113.3	4892.6
	F	2426.1	2856.3	3389.9	4013.8	4773.3

* derived from Newton's forward interpolation formula.

TABLE 2.

School Age Populations (7-13 years) by Single Years of Age by Sex for the Philippines, 1960-80 (low mortality assumptions)

(in thousands)

Age	Sex	1960	1965	1970	1975	1980
7	M	404.3	499.2	607.6	746.2	905.9
	F	397.5	487.4	592.5	723.4	876.5
8	M	391.7	478.7	583.1	716.2	870.2
	F	381.4	467.4	569.0	695.1	842.6
9	M	386.6	461.9	563.6	690.6	841.4
	F	369.7	450.9	549.8	670.9	815.0
10	M	383.5	441.5	542.6	662.7	810.7
	F	356.9	432.7	529.4	644.7	785.5
11	M	375.5	418.5	518.3	631.9	775.2
	F	341.3	412.1	506.0	615.8	751.7
12	M	364.3	401.1	496.2	604.5	742.8
	F	327.2	394.2	484.6	589.8	720.8
13	M	350.0	389.2	476.3	580.6	713.4
	F	314.7	378.9	465.2	566.8	692.9
Total	M	2655.0	3090.1	3787.7	4632.7	5659.6
	F	2488.7	3023.6	3696.5	4506.5	5485.0

TABLE 3.

School age populations (7-13 years) by single years of age by sex for the Philippines, 1960-61 (Moderate fertility decline assumptions)

(in thousand)

Age	Sex	1960	1965	1970	1975	1980
7	M	388.2	465.4	539.0	603.7	682.2
	F	381.7	454.3	526.0	589.6	665.4
8	M	377.5	447.7	522.4	587.5	663.6
	F	367.6	437.0	509.9	573.8	647.4
9	M	374.8	434.4	508.0	575.3	649.1
	F	358.2	423.8	495.6	561.6	633.3
10	M	374.7	417.7	498.2	563.5	633.7
	F	348.4	409.2	485.9	549.7	618.3
11	m	369.4	398.2	478.6	548.9	615.5
	F	335.5	391.8	446.6	535.4	600.8
12	M	360.1	383.6	460.5	533.9	598.7
	F	323.2	376.6	448.9	520.7	584.5
13	M	346.6	374.0	443.9	518.4	583.5
	F	311.5	363.6	432.7	505.4	569.6
Total	M	2591.3	2921.0	3450.6	3931.2	4426.3
	F	2426.1	2856.3	3365.6	3836.2	4319.3

TABLE 4.

School age populations (7-13 years) by sex for the Philippines, 1960-80 (under conservative, low mortality and fertility decline assumptions)*

(in thousands)

Assumptions	Sex	1960	1965	Year 1970	1975	1980
Conservative	M	2591.3	2921.0	3175.1	4113.3	4892.6
	F	2426.1	2856.3	3389.9	4013.8	4773.3
	M	2622.9	2924.3	3487.2	4127.4	4907.4
	F	2438.9	2864.4	3401.1	4026.7	4787.0
Low Mortality	M	2655.9	3090.1	3787.7	4632.7	5659.6
	F	2488.7	3023.6	3696.5	4506.5	5485.0
	M	2684.7	3090.2	3798.3	4639.1	5674.8
	F	2498.6	3028.7	3705.5	4513.0	5498.6
Fertility Decline.	M	2591.3	2921.0	3450.6	3931.2	4426.3
	F	2426.1	2856.3	3365.6	3836.2	4319.3
	M	2622.9	2924.3	3456.3	3944.4	4435.3
	F	2438.9	2864.4	3370.6	3847.9	4328.1

* The first set of figures under the three assumptions is based on tables 1, 2 and 3 respectively. The second set is based on equation (1).

3. Estimation of the Elementary School Population (7-13 years of age) for the Philippines, 1960-1980:

The results of the previous section provides the school age population for the country for the 20 year period, 1960-1980. But as already mentioned, in the case of Philippines as in the case of several other countries not all children of school age go to school. The following table (Table 5) gives the enrolment rate by single year of age and sex for the country as obtained during the 1948 census.

Table 5.

Participation rates (per capita) for children aged 7-13 years in school programme, Philippines, 1948 and U.S.A. 1950*

Age	7		8		9		10		11		12		13	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Philippines	.346	.366	.516	.542	.636	.664	.705	.723	.789	.799	.753	.759	.785	.779
U. S. A.	.947	.949	.957	.959	.963	.964	.961	.964	.964	.965	.958	.965	.960	.962

*Source: Census of the Philippines, 1948, [2] and census of population, Vol. II, Part I, U.S., 1950, [6].

As can easily be noticed the highest participation rate is .799, whereas a low a value as .346 also occurs. At least one point which is evident from the table is that the participation rates are rather low thereby reducing the problem of providing for large numbers of school children. But due to governmental and other individual measures it can be expected that the participation rates will improve and reach the levels obtaining in some of the advanced countries of the world, say, by 1980. It is assumed that the Philippine rates for 1980 will be those obtained in the 1950 census of the U.S. [6]. The transition from the 1948 low rates to the expected high rates in 1980 based on U.S. experience (given in Table 5) is assumed to follow the logistic growth curve pattern. Since only two points are known, the logistic curve is fitted with the condition that the maximum value of the participation rate is 1.000 (which is what it should be) and that this value will be attained in the infinite future. The logistic curve thus has the advantage over other simpler curves like the straigth line etc. in that not only is the absolute participation rate attained in the infinite future, it also takes care of the usual pattern of diffusion of social and economic revolutions where the rates are low and the growth is fast followed by high rates and slow growth and does not give absurd values of participation rates greater than 1.000 or less than zero, at any point of time.

The actual projection of the participation rates for any given age and sex was done as follows:

$$\text{Let} \quad z = \frac{d - y}{y - l}$$

where y is the participation rate of any given age and sex and d and l are respectively the maximum and minimum participation rates possible.

$$\text{Put} \quad \log_e z = a + bt,$$

where t is the time variable.

Therefore,

$$y - l = \frac{d - l}{1 + e^{a + bt}}$$

is a logistic curve.

Here d = 1, l = 0, so that

$$y = \frac{1}{1 + e^{a + bt}}$$

will give the participation rate for any given t. a and b can be obtained from the two equations:

$$\log_e Z_1 = a + bt_1$$

$$\log_e Z_2 = a + bt_2$$

where Z_1 and Z_2 are respectively based on y_1 and y_2, the rates for 1948 and 1980 and t_1 and t_2 may be taken respectively as zero and one.

The projected participation rates for 1960 (1), 1965, 1970, 1975 & 1980 are given in Table 6 below.

Table.6.

Participation rates for children aged 7-13 years by single years of age and sex for the Philippines, 1960 (1), 1965, 1970, 1975, 1980 (based on logistic growth curve).

Age	7		8		9		10		11		12		13	
Year	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1960	.664	.680	.769	.784	.828	.840	.864	.862	.887	.892	.866	.877	.881	.881
1961	.688	.703	.786	.800	.840	.851	.874	.871	.894	.898	.874	.885	.888	.887
1962	.711	.725	.802	.814	.851	.861	.883	.879	.899	.903	.880	.891	.893	.893
1963	.734	.746	.816	.827	.861	.870	.890	.886	.904	.908	.887	.897	.898	.899
1964	.755	.766	.830	.840	.871	.879	.898	.893	.909	.913	.893	.903	.903	.905
1965	.774	.785	.843	.852	.880	.888	.905	.900	.914	.918	.899	.909	.909	.910
1970	.856	.863	.896	.902	.918	.922	.935	.928	.935	.938	.924	933	.930	.932
1975	.912	.915	.933	.936	.945	.946	.956	.949	.952	.953	.943	.951	.947	.949
1980	.947	.949	.957	.959	.963	.964	.961	.964.	.964	.965	.958	.965	.960	.962

The school populations (7-13 years of age) by single year of age and sex for the country for the period 1960-1980 are given in Table 7 below:

Table 7.

School populations (7-13 years) by single year of age and sex. Philippines, 1960-1980 (C=conservation, LM=low mortality and F D = fertility decline assumptions).
(In thousands)

Year	Age	7 M	7 F	8 M	8 F	9 M	9 F	10 M	10 F	11 M	11 F	12 M	12 F	13 M	13 F	Total M	Total F
1960	C	257.8	259.6	290.3	288.2	310.3	300.9	323.7	300.3	327.7	299.3	311.8	283.4	305.4	274.4	2127 0	2006.1
	LM	268.5	270.3	301.2	299.0	320.1	310.5	331.3	307.6	333.1	304.4	315.5	287.0	308.4	277.3	2178.1	2056.2
	FD	257.8	259.6	290.3	288.2	310.3	300.9	323.7	300.3	327.7	299.3	311.8	283.4	305.4	274.4	2127.0	2006.1
1965	C	360.2	356.6	377.4	372.3	382.3	376.3	378.0	368.3	364.0	359.7	344.9	342.3	340.0	330.9	2546.8	2506.4
	LM	386.4	382.6	403.5	398.2	406.5	400.4	399.6	389.4	382.5	378.3	360.6	358.3	353.8	344.8	2692.9	3652.0
	FD	361 6	358.0	379.4	374.3	383.3	377.4	378.0	368.3	364.0	359.7	344.9	342.3	340.0	330.9	2551.2	2510 9

TABLE 7. (Continued)

Year	Age	7 M	7 F	8 M	8 F	9 M	9 F	10 M	10 F	11 M	11 F	12 M	12 F	13 M	13 F	Total M	Total F
1970	C	470.7	463.3	474.5	466.3	472.2	462.8	465.8	450.9	447.5	437.7	425.5	418.8	412.8	403.3	3169.0	3103.1
	LM	520.1	511.3	522.5	513.2	517.4	506.9	507.3	491.3	484.6	474.6	458.5	452.1	443.0	433.6	3453.4	3383.0
	FD	461.4	453.9	468.1	459.9	466.3	456.9	461.7	446.8	446.9	437.2	427.0	420.3	414.9	405.2	3146.3	3080 2
1975	C	593 8	581.5	585.0	572.9	575.5	562.3	563.7	545.9	538.9	526.3	513.7	505.5	497.8	486.6	3868.4	3781.0
	LM	680.5	661.9	668.2	650.6	652.6	634.7	633.5	611.8	601.6	586.9	570.0	560.9	549.8	537.9	4356.2	4244.7
	FD	550.6	539.5	548.1	537.1	543.7	531.3	538.7	521.7	522.6	510.2	503.5	495.2	490.9	479.6	3698.1	3614.6
1980	C	736.1	719.5	715.7	699.8	698.7	682.3	673.8	659.3	647.7	632.7	618.8	608.1	598.1	584.8	4688.9	4586.5
	LM	857.9	831.8	832.8	808.0	810.3	785.7	779.1	757.2	747.2	725.4	711.6	695.6	684.9	666.6	5423.9	5270.3
	FD	646.0	631.5	635.1	620.9	625.1	610.5	609.0	596.0	593.3	679.8	573.6	564.0	560.2	548.0	4242.3	4150.7

4. Estimation of Elementary School Age and School Populations (aged 7-13 years) by Single Calendar Years.

In the sections 3 and 4 we considered the school age and school populations only at intervals of five calendar years. But in planning for the short term like the Five Year Plan, etc., the data is required for each calendar year.

The exact method is to project the populations by single years of age and sex by using single year survival ratios and to calculate the births, etc. in the future by single years of age and sex. This method even though exact requires data in very great details which may not be available for many countries and especially so for underdeveloped countries like the Philippines. As a matter of fact, for many of these countries even the less detailed survival ratios for five year age groups and sex and the specific birth rate for females by five year age group in the reproductive age group may not be available and the U.N. model life table and the sex adjusted birth rate etc. may have to be used.

If only populations aged 4 years and over are required for each calendar year, i.e., if there is no problem of estimating births by single calendar year, then an approximate method which may be used is the following. The five year survival ratios on the basis of which the projection is made at intervals of five calendar years may be split into single year survival ratios by the use of any of the usual splitting formulas like the Karu-King formula applied to the logarithm of the five year survival ratios. But this method is not only much time consuming, it also involves the question of the applicability of the usual interpolation formula where the function doe not satisfy the usual conditions for the application of interpolation formula.

Another simple method which will give the population aged 4 years and over by single calendar year is the following. The population aged O at time t will become aged 5 in time $t + 5$ and 10 in time $t + 10$. Thus we have three values of a decreasing function (assuming no migration in the period).

Similarly, population aged one at time t will be aged 6 in [time t + 5 and 11 in time t + 10 and so on. Using these 3 values of the function and applying Newton's three point formula for data given in five year intervals for the first group (appendix table 5), we could get the single year age distribution for ages 1 and above, for time t + 1, for ages 2 and above for time t + 2, and for ages 4 and above for time t + 4. If the single calendar year values are required when there are available one value 5 years ago and another value 5 years after, we shall use Newton's three point formula for the second to the last but one group (appendix table 6.)

The elementary school age populations (aged 7-13 years) by single year of age and sex for the single calendar years 1961, 1962, 1963 and 1964 under the low mortality assumptions are given in Table 8.

TABLE 8.

School age populations (7-13 years) by single years of age by sex for the Philippines, 1961, 1962, 1963 and 1964. (low mortality assumptions) (based on diagonal three point interpolation formula for data given at five year intervals).

(In thousands)

Age	Sex	Year 1961	1962	1963	1964
7	M F	423.1 416.5	447.0 437.9	464.4 454.2	480.8 469.7
8	M F	403.7 396.9	421.8 415.3	444.9 435.9	463.1 452.4
9	M F	391.3 381.0	403.1 396.2	420.6 414.1	443.1 434.2
10	M F	385.9 369.0	390.9 380.6	402.4 395.6	419.5 413.1
11	M F	382.6 356.0	385.1 368.3	390.4 380.1	401.8 394.9
12	M F	374.7 340.4	381.6 355.1	384.4 367.6	389.8 379.5
13	M F	363.5 326.4	373.8 339.6	380.6 354.2	383.6 366.8
Total	M F	2724.8 2586.2	2803.3 2693.0	2887.7 2801.7	2981.7 2910.6

The corresponding elementary school populations (aged 7-13 years) by single years of age and sex are given in Table 9.

TABLE 9.

School population (7-13 years) by single years of age by sex for the Philippines, 1961, 1962, 1963 and 1964 (low mortality assumptions) (based on Table 8 and 6).

(In thousands)

Age	Sex	Year 1961	1962	1963	1964
7	M	291.1	317.8	340.9	363.0
	F	292.8	317.5	338.8	359.8
8	M	317.3	338.3	363.0	384.4
	F	317.5	338.1	360.5	380.0
9	M	328.7	343.0	362.1	385.9
	F	324.2	341.1	360.3	381.7
10	M	337.3	345.2	358.1	376.7
	F	321.4	334.5	350.5	368.9
11	M	342.0	346.2	352.9	365.2
	F	319.7	334.4	345.1	360.5
12	M	327.5	335.8	341.0	348 1
	F	301.2	316.4	329.7	342.7
13	M	322.8	333.8	341.8	346.4
	F	289.5	303.3	318.4	331.9
Total	M	2266.7	2360.1	2459.8	2569.7
	F	2166.3	2360.3	2403.4	2525.5

5. Some Implications of the Projections:

The number of children of school age and the number actually attending school in the future are very important from the view point of the planner. The number and type of teachers required, the classroom and other facilities to be constructed etc., are based on these estimates. Also the discrepancy between the numbers of children of school age and those actually attending school in the future may pin point the magnitude of the problem in education planning. Juvenile problems and other social evils may increase in the future if industrialization and the consequent economic development and urbanization are accelerated without taking care of the magnitude of the elementary education needs.

Rough estimates of the number of teachers needed in the future may be worked out by basing it on available statistics for the country or by assuming a teacher to student ratio of say 1 : 35 or 1 : 40 [3, 4]. Also some idea of the needs for school, classroom and other physical facilities may be worked out on the basis of the existing conditions or may be based on experience of some other countries. Better estimates of the types and numbers of teachers, classrooms, schools and other facilities could have been worked out if more abundant data had been available. Some such data which could have helped us would be the age sex distribution of school children by grade and also the distribution of the children by provinces, subprovinces, poblaciones and if possible by barrios. But since we didn't have these data with us, the estimates worked out by us could be taken only as the rough indication of the magnitude and enormity of such a vital problem as elementary education for the whole country. Rough estimates of the expected regional distribution of school age and school population for the period 1960-1980 have been worked out by one of us and is given in [1].

Coming to the conclusion of the present paper, it can be seen that the school age and more so the school populations are growing at an alarmingly high rate. Under the conservative assumptions the school age population increases from 5,017,400 in 1960 to 9,665,900 in 1980 i.e. almost double in the 20-year period. But the problem would be much more difficult if as is expected Philippine death rates decline very fast as observed in the case of some of its neighbors — Taiwan, Ceylon, Malaya & Singapore. This situation will correspond to the indications of the low mortality projections. This seems to indicate that the school age population will increase from 5,144,600 in 1960 to 11,144,600 in 1980, i.e. more than double in 1980. The figures given by the fertility decline model are included only to show the effect of a decline in fertility on the problem. There will be a difference of about 2.4 million children in 1980 between the fertility decline and the low mortality projections and this is more than 20% of the number involved at that time.

The above paragraph gives the magnitude of the problem involved in terms of the number of children of school age. But not all children of school age attend school. The participation rate which was rather very low in 1948 is expected to reach the rather high level observed in the U.S. in 1950 by 1980. The implication of this in terms of number of children who are expected to attend school in the future is given in Table 7. Under the conservative assumption, whereas only 4,133,100 children of school age are expected to attend schools in 1960, this number would be 9,475,400 in 1980. Under the low mortality assumptions, the corresponding numbers are 4,234,300 and 10,694,200 and the figures under the fertility decline model, the numbers would be 4,133.100 and 8,393,000. It can be seen that under all the three assumptions the school population has more than doubled in the 20-year period. But under the low mortality projections, which seems to be the pattern for the future for Philippines, the school population in 1980 is more than 2.5 times that in 1960.

6. Conclusion:

The future school age populations of the country by sex as also the future school populations by sex bring out the fact clearly that the country will be faced with tremendous problems with respect to elementary education in the next 20 years.

With the social and economic atmosphere in the country existing at present, there is no very high probability of a decline in fertility. But with possibilities for mortality declines in the future due to improved sanitation and public health facilities, raised standards of living and a general awakening of the masses, the possibilities seem to be for increased numbers of elementary school age population in the immediate future. This problem will be more difficult with the education consciousness of the population and the incumbent heavier participations in the school programmes.

The projections of populations (conservative, low mortality and fertility decline) are based on some knowledge of the demographic situation of the country. But as already mentioned the figures given for the low mortality projections seem to be the ones which may be expected in the future to agree more or less with reality.

The projection of the participation rates try to take care of the usual pattern of social development.

Even with all the niceties of calculations etc., the estimates provided may not in any case whatever give the exact values in the future due to the inherent limitations of the data, assumptions and method. But with the limited data at our disposal, our aim has been to provide the educational planner with relevant statistics for the future and we hope that in the immediate future the figures given here may be take as guiding factors in education planning.

References.

(1) Legamon, L.J., "Future School Population of the Philippines by regions, 1960-1980", unpublished thesis submitted to the Demographic Training and Research Centre, Bombay, as part of the training programme, 1959-1960.

(2) Philippines, **Bureau of the Census and** Statistics. Census of the Philippines, 1948". Vol. III, Part I, Manila 1957.

(3) **Roldan, Rector Gutierrez,** "Projection of the School Age Population in Chile, 1957-1982", unpublished thesis submmitted to the Regional Centre for Demographic Training and Research in Latin America, as part of the training programme, 1959.

(4) **United Nations** Report on the World Social Situation. Sales No. 1957. IV 3. New York. 1957.

(5) United Nations, "The Population of South East Asia, 1950-1980", Report III, New York, 1958.

(6) **United States,** "Census of Population-Characteristics of the Population." Part I, United States Summary, 1950.

Appendix Table 1.*

Composition of Population by sex and age, 1960-80 as projected with conservative assumptions.

(in thousand)

Age group	1960		1965		1970		1975		1980	
	M	F	M	F	M	F	M	F	M	F
0— 4	2507	2442	2938	2862	3453	3362	4092	3980	4893	4756
5— 9	1980	1932	2349	2292	2775	2708	3286	3206	3922	3824
10—14	1780	1619	1943	1894	2310	2252	2735	2668	3245	3166
15—19	1411	1333	1745	1586	1909	1859	2275	2217	2699	2632
20—24	1157	1181	1371	1294	1700	1545	1865	1818	2229	2175

* **Source**: The Population of S.E. Asia [5].

Appendix Table 2 **

Composition of Population by sex and age, 1960-80 as projected with low mortality assumptions.

(in thousand)

Age group	1960		1965		1970		1975		1980	
	M	F	M	F	M	F	M	F	M	F
0— 4	2624	2555	3155	3067	3843	3716	4650	4485	5695	5480
5— 9	2059	2009	2515	2454	3063	2984	3753	3638	4565	4415
10—14	1806	1644	2033	1984	2492	2423	3040	2964	3729	3619
15—19	1422	1345	1782	1622	2013	1965	2471	2415	3018	2946
20—24	1167	1193	1393	1319	1755	1600	1987	1944	2444	2394

*** Source: The Population of S.E. Asia [5].

Appendix Table 3 ***

Composition of Population by sex and age, 1960-80 as projected with normal mortality decline and moderate fertility decline.

Age group	1960		1965		1970		1975		1980	
	M	F	M	F	M	F	M	F	M	F
0— 4	2507	2442	2865	2790	3194	3110	3581	3482	4037	3923
5— 9	1980	1932	2349	2292	2706	2640	3039	2966	3432	3346
10—14	1780	1619	1943	1894	2310	2252	2667	2601	3001	2929
15—19	1411	1333	1745	1586	1909	1859	2275	2217	2632	2566
20—24	1157	1181	1371	1294	1700	1545	1865	1818	2229	2175

** Source: The Population of S.E. Asia [5].

Appendix Table 4.

Karup-King formula for obtaining single year values for the first group for data given in 5 year groups (Newtons formula).

	W_{5x}	W_{5x+5}	W_{5x+10}
P_{5x}	.328	− .176	.048
P_{5x+1}	.256	− .072	.016
P_{5x+2}	.192	.016	− .008
P_{5x+3}	.136	.088	− .024
P_{5x+4}	.088	.144	− .032

Karup-King formula for obtaining single year values for the second to the last but one group for data given in five year groups.

	W_{5x-5}	W_{5x}	W_{5x+5}
P_{5x}	.064	.152	− .016
P_{5x+1}	.088	.224	− .032
P_{5x+2}	.024	.248	− .024
P_{5x+3}	− .032	.224	.008
P_{5x+4}	− .016	.152	.064

Karup-King formula for obtaining single year values for the last group for data given in 5 year groups. (Newtons formula).

	W_{5x+10}	W_{5x-5}	W_{5x}
P_{5x}	− .032	.144	.088
P_{5x+1}	− .024	.088	.136
P_{5x+2}	− .008	.016	.192
P_{5x+3}	.016	− .072	.256
P_{5x+4}	.048	− .176	.328

Appendix Table 5

3 point (second difference) formula for data given in five year intervals for getting single year interval data for the first group.

	U_x	U_{x+5}	U_{x+10}
U_{x+1}	.72	.36	−.08
U_{x+2}	.48	.64	−.12
U_{x+3}	.28	.84	−.12
U_{x+4}	.12	.96	−.08

Appendix Table 6

3 point (second difference) formula for data given in five year intervals for getting single year interval data for the second to the last but one group.

	U_{x-5}	U_x	U_{x+5}
U_{x+1}	−.08	.96	.12
U_{x+2}	—.12	.84	.28
U_{x+3}	—.12	.64	.48
U_{x+4}	−.08	.36	.72

In appendix table 4

W_{5x} = Population aged 5x to 5x + 4 and

P_x = Population aged x.

In appendix tables 5 & 6

U_x = Value of the function for x.

ON THE USE OF AREA (PLOT) SAMPLING IN OBJECTIVE YIELD ESTIMATION OF PALAY

by Jose S. Gutierrez[a]

It is now becoming a universal procedure to estimate the yield of rice objectively by area or plot sampling. The size and shape of plot used vary from country to country. Plots similar to those used in rice are likewise applied in the objective yield survey of other crops. A crop cutting plot of 1/80 acre or 33 feet by 16-1/2 feet have been widely used in India and Ceylon for cotton, rice and wheat; Thailand adopted a 5 meters by 10 meters plot for paddy rice; Japan used a circular plot of 3 square meters in size; Basutoland employed a plot of 1/100 acre or 7 yards by 7 yards in the objective survey of yield of maize, sorphum, peas, Oats and beans; the United Stated Stated used a U-shaped rigid steel frame with the length of each arm placed at 24 inches and the distance between the two, 26.136 inches yielding an area of 1/10,000 acre for wheat and the crop cutting in West Germany on wheat, rye and potatoes employed one square meter plot.

In the Philippines, the Agricultural Economics Division of the Department of Agriculture and Natural Resources adopted 5 square meters plot in determining objectively the yield of rice and corn together with row or line sampling. It was observed however, that there is a tendency for the area or plot method to over-estimate the true yield hence this **study.**

Theoretical Considerations

Preliminary survey results of the Agricultural Economics Division on the objective yield determination of palay indicate that the percentage error is affected by the spacings between plants or hills (distance of planting) and the length of the

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sides of the crop-cutting plot. It seemed that as the plants are planted together there is a larger percentage of error committed as shown in the following table.

Table 1. Percentage of Error by Spacing and Shape of Plots[a/]

Sample Number	Spacing	Percentage Error
A. Square Plot (per meter square)		
1	15.33 x 14.66	3.95
2	10.60 x 10.10	12.50
3	6.51 x 5.10	21.83
4	13.23 x 12.70	13.17
B. Triangular Plot (Equivalent Triangle s = 1.519 m.)		
1	16.33 x 16.00	3.95
2	13.70 x 12.20	31.25
3	6.20 x 7.20	21.83
4	6.06 x 4.11	13.17
C. Circular Plot (Diameter = 1.128 m.)		
1	19.00 x 17.67	26.15
2	13.90 x 12.60	1.25
3	6.50 x 5.40	41.82
4	4.72 x 3.78	38.62

a/ Average of 5 trials each.
Source: A report on the experimental crop-cutting survey conducted in Santa Rosa, Laguna.
AED, DANR 1955 1st Quarter Progress Report

This tendency was observed to be true with square, triangular and square plots.

If those observations are true it could be hypothesized that the number of hills enclosed by the plot may be related to or a function of sides or diameter of the plot used and the spacing or distance of planting of the crops. It is therefore logical to state that the following expectations holds on area sampling applied to the objective yield estimation of palay if the sides of the plots are in the direction of the spacing of the crops.

For square plots

1. E (Minimum number of hills cut) = $\left(\frac{s}{d}\right)^2$

2. E (Maximum number of hills cut) = $\left(\frac{s}{d} + 1\right)^2$

where s is the length of the side of the square and d, the distance of planting. The lengthwise (d_l) and crosswise (d_c) spacings are equal, or square planting is used. If the lengthwise and crosswise spacings are not equal the following expectations will apply:

3. E (Minimum number of hills cut) = $\left(\frac{s}{d_1} \times \frac{s}{d_c}\right)$

4. E (Maximum number of hills cut) = $\left(\frac{s}{d_1} + 1\right)\left(\frac{s}{d_c} + 1\right)$

For rectangular plots, square planting

1. E (Minimum number of hills cut) = $\frac{l}{d} \times \frac{w}{d}$

2. E (Maximum number of hills cut) = $\left(\frac{l}{d} + 1\right)\left(\frac{w}{d} + 1\right)$

If however rectangular planting is used, the expectations on the number of hills cut are as follows:

3. E (Minimum number of hills cut) $= \frac{1}{d_1} \times \frac{w}{d_c} = \frac{1}{d_c} \times \frac{w}{d_1}$

4. E (Maximum number of hills cut) $= (\frac{1}{d_1} + 1)(\frac{w}{d_c} + 1)$

or $(\frac{1}{d_c} + 1)(\frac{w}{d_1} + 1)$.

Which of these will yield the minimum depends upon the relationships of the spacing and sides of the plot.

For circular plots, the concept of the spacings which will yield exact multiples of the diameter is expected to give the maximum number of hills. These expectations will be somewhat similar to those of a square plot whose side is equal to the diameter of the circle.

If the sides of the plots are not in the direction of the spacing of crops the computation of the expectation becomes more complicated. If the sides of the plots are in the direction of the diagonal of the spacing of the crops, the expected number of hills cut are as follows:

Square plots, square planting:

1. E(Maximum number of hills cut) $= [\frac{s}{\sqrt{2d^2}} + 1]^2 + [\frac{s}{\sqrt{2d^2}}]^2$

2. E (Minumum number of hills cut) = E (Maximum number of hills cut) minus one.

Square plots, rectangular plantings:

1. E(Maximum number of hills cut) $= [\frac{s}{\sqrt{d_2^2 + d_c^2}} + 1]^2 + [\frac{s}{\sqrt{d_1^2 + d_c^2}}]^2$

2. E Minimum number of hills cut) = E (Maximum number of hills cut) minus one.

Rectangular plots, square planting:

1. E(Maximum number of hills cut) = $[\frac{1}{\sqrt{2d^2}} + 1][\frac{w}{\sqrt{2d^2}} + 1] + [\frac{1}{\sqrt{2d^2}}][\frac{1}{\sqrt{2d^2}}]$.

2. E (Minumum number of hills cut) = E (Maximum number of hills cut) minus one.

Rectangular plots, **rectangular plantings:**

1. E(Maximum number of hills cut) = $[\frac{1}{\sqrt{d_1^2 + d_c^2}} + 1][\frac{w}{\sqrt{d_1^2 + d_c^2}} + 1] + [\frac{1}{\sqrt{d_1^2 + d_c^2}}][\frac{w}{\sqrt{d_1^2 + d_c^2}}]$

2. E (Minimum number of hills cut) = E (Maximum number of hills cut) minus one.

Methods and Materials

To test the theoretical considerations discussed in the preceeding section various distances of planting were drawn to scale on a 20 centemeters by 20 centemeters square. The scale used was 1/2 centimeter equals 20 centimeters. The distances studied were as follows:

A. Square plantings (centimeters)

1. 20 x 20
2. 25 x 25
3. 30 x 30
4. 35 x 35
5. 40 x 40
6. 45 x 45
7. 50 x 50

B. Rectangular planting (centimeters)

1. 20 x 25
2. 25 x 30
3. 30 x 35
4. 35 x 40
5. 40 x 45
6. 45 x 50

Rectangular plantings have been included in this study due to the fact that although the common practice is a square planting the spacing is seldom maintained due to the irregular tillering of the individual plants.

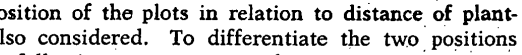
The sizes and shapes of plot studied were as follows:

1. 5 square meters square ($s = \sqrt{5}$)
2. 5 square meters circular ($d = 2\sqrt{5/\pi}$)
3. 10 square meters square ($s = \sqrt{10}$)
4. 10 square meters circular ($d = 2\sqrt{10/\pi}$)
5. 10 square meters rectangular (2 x 5)

Drawn to scale facimiles of these plots were prepared and used in this study.

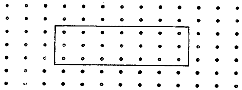
The position of the plots in relation to distance of planting was also considered. To differentiate the two positions studied the following terms were used:

1. Parallel or perpendicular position refers to the sides of the plot following the same direction as the spacing as shown in the following illustration.

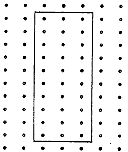


For rectangular plots and rectangular plantings there are two positions which could be considered parallel or perpendicular as shown:

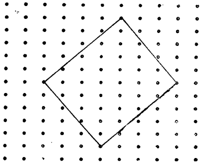
(1)



(2)



In a non-parallel or non-perpendicular position the sides of the plot do not follow the direction of the spacing as shown:



This aspect of the study is applicable only to square and rectangular plots.

Discussion of Results

On the Expectation and Actual Number of Hills Cut by Position of Square and Rectangular Plots. As shown on table 2, there is a close agreement between the expectations and actual counts of the number of hills cut by position of square and rectangular plots.

(See also figures 1 and 2)

Table 2. Comparison of Expected and Actual Number of Hills Cut by Position of Square and Rectangular plots.

Distance of Planting	Expected Maximum	Expected Minimum	Actual Maximum	Actual Minimum
A. 5 Square **meters**				
20 x 20	12 x 12	11 x 11	12 x 12	11 x 11
25 x 25	10 x 10	9 x 9	10 x 10	9 x 9
30 x 30	8 x 8	7 x 7	8 x 8	7 x 7
35 x 35	7 x 7	6 x 6	7 x 7	6 x 6
40 x 40	6 x 6	5 x 5	6 x 6	5 x 5
45 x 45	6 x 6	5 x 5	5 x 5	5 x 5
50 x 50	5 x 5	4 x 4	5 x 5	4 x 4
B. 10 Square meters (square)				
20 x 20	16 x 16	15 x 15	16 x 16	15 x 15
25 x 25	13 x 13	12 x 12	13 x 13	12 x 12
30 x 30	11 x 11	10 x 10	11 x 11	10 x 10
35 x 35	10 x 10	9 x 9	10 x 10	9 x 9
40 x 40	9 x 9	8 x 8	8 x 8	8 x 8
45 x 45	7 x 7	6 x 6	7 x 7	6 x 6
50 x 50	7 x 7	6 x 6	7 x 7	6 x 6

C. 10 Square meters (Rectangular)

20 x 20	26 x 11	25 x 10	26 x 11	25 x 10
25 x 25	21 x 9	20 x 8	21 x 9	20 x 8
30 x 30	18 x 8	17 x 7	18 x 8	17 x 7
35 x 35	15 x 6	14 x 6	15 x 6	14 x 6
40 x 40	13 x 6	12 x 5	13 x 6	12 x 5
45 x 45	12 x 5	11 x 4	12 x 5	11 x 4
50 x 50	11 x 5	10 x 4	11 x 5	10 x 4

D. 10 Square meters (Lengthwise parallel rectangular plots)

20 x 25	21 x 11	20 x 10	21 x 11	20 x 10
25 x 30	17 x 9	16 x 8	17 x 9	17 x 8
30 x 35	15 x 7	14 x 6	15 x 7	14 x 7
35 x 40	13 x 6	12 x 5	13 x 6	12 x 6
40 x 45	12 x 6	11 x 5	11 x 6	11 x 5
45 x 50	11 x 5	10 x 4	11 x 5	10 x 4

E. 10 Square meters (crosswise parallel rectangular plots)

20 x 25	26 x 9	25 x 8	26 x 9	25 x 8
25 x 30	21 x 7	20 x 6	21 x 7	20 x 7
30 x 35	17 x 6	16 x 5	17 x 6	17 x 6
35 x 40	15 x 6	14 x 5	15 x 6	14 x 5
40 x 45	13 x 5	12 x 4	13 x 5	12 x 4
45 x 50	12 x 5	11 x 4	11 x 5	11 x 4

F. 5 Square meters (Parallel square plots)

20 x 25	12 x 10	11 x 9	12 x 10	11 x 9
25 x 30	10 x 8	9 x 7	10 x 8	9 x 7
30 x 35	8 x 7	7 x 6	8 x 7	7 x 6
35 x 40	7 x 6	6 x 5	7 x 6	6 x 6
40 x 45	6 x 6	5 x 5	5 x 5	5 x 5
45 x 50	6 x 5	5 x 4	5 x 5	4 x 4

G. 10 Square meters (Parallel, square plots)

20 x 25	16 x 13	15 x 12	16 x 13	15 x 12
25 x 30	13 x 11	12 x 10	13 x 11	12 x 10
30 x 35	11 x 10	10 x 9	11 x 10	10 x 9
35 x 40	10 x 9	9 x 8	9 x 8	9 x 8
40 x 45	9 x 7	8 x 6	8 x 7	7 x 7
45 x 50	7 x 7	6 x 6	7 x 7	6 x 6

5 Square meters (Non-parallel)

20 x 20	145	144	145	143
25 x 25	85	84	85	84
30 x 30	61	60	61	60
35 x 35	41	40	41	40
40 x 40	41	40	41	40
45 x 45	21	20	25	24
50 x 50	21	20	25	24

Distance of Planting	Expected Max.	Expected Min.	Actual Max.	Actual Min.
10 Square meters (Non-parallel square plots)				
20 x 20	265	264	264	264
25 x 25	181	180	145	144
30 x 30	113	112	113	112
35 x 35	85	84	85	84
40 x 40	61	60	61	60
45 x 45	61	60	41	40
50 x 50	41	40	41	40
10 Square meters (Non-parallel rectangular plots)				
20 x 20	283	282	270	270
25 x 25	175	174	174	160
30 x 30	125	124	124	124
35 x 35	90	89	95	94
40 x 40	86	85	72	63
45 x 45	60	59	56	56
50 x 50	53	52	53	52

On the Range of the Number of Hills Cut. As shown on Table 3, the following could be observed:

1. There is a tendency for the range to be wider for smaller spacings.

2. The range tends to be wider for parallel position of the plots in relation to spacings.

3. Square and rectangular plot give wider ranges than the corresponding circular plots.

TABLE 3: Range and Difference of Maximum and Minimum Expectation from The True number of Hills.

Distance of Planting	Range Parallel	Range Non-parallel	Diference from True Number of Hills Parallel Max.	Parallel Min.	Non-parallel Max.	Non-parallel Min.
10 Square meters (rectangular):						
20 x 20	36	0	36	0	20	20
25 x 25	29	74	29	0	14	0
30 x 30	25	0	33	8	13	13
35 x 35	6	1	9	3	14	13
40 x 40	18	9	12	2*	10	1
45 x 45	11	0	6	5*	7	7
50 x 50	15	1	15	0	13	12
10 Square meters (square):						
20 x 20	31	0	6	25*	14	14
25 x 25	25	1	9	16*	15*	16*
30 x 30	21	1	10	11*	2	1
35 x 35	19	1	19	0	4	3
40 x 40	0	1	2	2	1*	2*
45 x 45	13	1	6	13*	8*	9*
50 x 50	13	1	9	4*	1	0
5 Square meters (square):						
20 x 20	23	2	19	4*	24	22
25 x 25	19	1	20	1	5	4
30 x 30	15	1	9	6*	6	5
35 x 35	4	1	9	4*	1	0

Distance of Planting	Range		Diference from True Number of Hills			
			Parallel		Non-parallel	
	Parallel	Non-parallel	Max.	Min.	Max.	Min.
40 x 40	6	1	5	6*	10	9
45 x 45	1	1	1	1	1	0
50 x 50	6	1	5	4*	5	1*
10 Square meters (circular):						
20 x 20	31		6	25*		
25 x 25	25		9	16*		
30 x 30	21		10	11*		
35 x 35	19		19	0		
40 x 40	0		2	2		
45 x 45	13		6	13*		
50 x 50	13		9	4*		
5 Square meters (circular):						
20 x 20	11		12	1		
25 x 25	1		9	8		
30 x 30	1		6	5		
35 x 35	1		5	4		
40 x 40	5		6	1		
45 x 45	3		0	3*		
50 x 50	3		1*	3*		

Distance of Planting	Diference from True Number of Hills: Range Parallel	Non-parallel	Parallel Max.	Parallel Min.	Non-parallel Max.	Non-parallel Min.
5 square meters: square						
20 x 25	21	3	20	1*	3	0
25 x 30	17	3	14	3*	5	3
30 x 35	14	3	8	5*	7	5
35 x 40	6	1	7	1	6	4
40 x 45	0	3	2*	2*	4	1
45 x 50	9	1	3	6*	3	2
10 square meters: square						
20 x 25	28	5	8	20*	3*	8*
25 x 30	23	3	10	13*	2	1*
30 x 35	20	3	15	5*	4	1
35 x 40	0	3	1	1	0	3*
40 x 45	7	3	1	6*	0	3*
45 x 50	13	1	5	8*	3*	4*
10 Square meters: rectangular (Lengthwise)						
20 x 25	31	0	31	0	15	15
25 x 30	17	0	20	3	14	14
30 x 35	7	2	10	3	13	11
35 x 40	6	1	7	1	10	9
40 x 45	11	1	11	0	3	2
45 x 50	15	1	11	4	9	8

Distance of Planting	Diference from True Number of Hills — Range — Parallel	Range — Non-Parallel	Parallel — Max.	Parallel — Min.	Non-Parallel — Max.	Non-Parallel — Min.
10 square meters (rectangular) (Crosswise)						
20 x 25	34		34	0		
25 x 30	7		14	7		
30 x 35	0		7	7		
35 x 40	20		19	1*		
40 x 45	17		15	7*		
45 x 50	11		11	0		
5 Square meters (circular):						
20 x 25	3		7	4		
25 x 30	3		5	2		
30 x 35	3		4	1	1	
35 x 40	1		2	1		
40 x 45	3		4	1		
45 x 50	3		2	1*		
10 Square meters (circular):						
20 x 25	5		13	8		
25 x 30	3		10	7		
30 x 35	7		8	1		
35 x 40	3		4	1		
40 x 45	3		1	3*		
45 x 50	1		1	0		

* Less than the true number of hills

On the Tendency to Overestimate the True Number of Hills.

It could be also seen in Table 3 that the following are true:

1. There is a greater tendency to overestimate the true number of hills with non-parallel plots than the corresponding parallel plots. Although non-parallel minimum expectations tended to overestimate the true value the differences from the true value are not as large as those in the corresponding plots.

2. The tendency to overestimate with circular plots is larger than those of the square and rectangular plots. The minimum expectations for circular plots tended to overestimate the true number of hills.

3. The true numbers of hills are included in more number of cases in larger plots expectations of maximum and minimum number of hills.

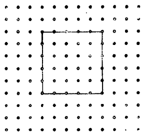
Summary and Conclusion

There seens to be strong indications for area sampling to overestimate the number of hills in the objective yield determination of palay. Before any size and shape of plots be adopted for objective yield determination and the most commonly used distance of planting should be determined and the appropriate size and plots including the position in locating the plots in the field be in order to be as close as possible to the true value.

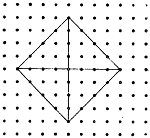
Although it may appear that area samples in crop-cutting survey of palay tend to be biased upward it could still be used. A biased estimator could still be adopted if the degree of bias is small in relation to the standard diviation of the estimator (Anderson and Bancroft 1952). The average error obtained by the Division of Agricultural Economic Division for area samples is about 3 percent more than the true yield.

Figure 1. Positions of plot with expected maximum number of hills cut.

a. Square or rectangular plots, square or rectangular plantings, parallel position.



b. Square or rectangular plots, square or rectangular plantings, non-parallel position.



c. Circular plots, square or rectangular plantings

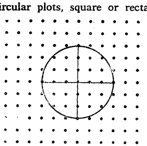
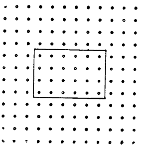
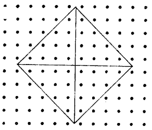


Figure 2. Positions of plots with expected minimum number of hills cut.

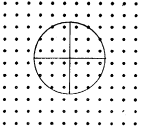
a. Square or rectangular plots, square or rectangular plantings, parallel position.



b. Square or rectangular plots, square or rectangular plantings, non-parallel position.



c. Circular plots, square or rectangular plantings.



Literature Cited

1. Anderson, R. C. and T. G. Bancroft, 1952
Statistical Theory in Research. New York: McGraw-Hill Book Company, Inc. p.93

2. Gutierrez, Jose S. 1960
Objective Yield Estimation Studies and Surveys in the Philippines. The Statistical Reporter Vol. IV No. 1 pp. 1-9

3. Progress Report of the Agricultural Economics Division for the First Quarter, July 1 to September 30, 1955.

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1958 **SAMSON, Jr., Pablo Q.**; Planning and Coordination Branch, Office of Statistical Coordination and Standards, National Economic Council, Padre Faura, Manila.

1951 ***SANTIAGO, Ceferino**; College of Commerce, University of the East, Manila.

1958 **SARMIENTO, Serafin T.**; Trade and Commerce Branch, Office of National Planning, National Economic Council, Padre Faura, Manila.

1957 **SARREAL, Roberto** — Pfizer Laboratories (Phil.) Inc., 141 Ayala Avenue, Makati, Rizal.

1951 ***SEVILLA, Exequiel S.**; President, National Life Insurance Co. of the Philippines, Regina Building, Escolta, Manila.

1953 **SIMBULAN, Cesar G.**; Philippine American Life Insurance Company, Wilson Building, Juan Luna, Manila.

1957 **SMITH, H. Fairfield**; c/o The Statistical Center, University of the Philippines, P. O. Box 479, Manila.

1953 **SORONGON, Arturo P.**; Filipinas Consultants and Management Corporation, Suite 211, Ayala Building, Manila.

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1960 **STO. DOMINGO, Ramon**; FMF, Trade Center Building Intramuros, Manila.

1959 **SUGUITAN, Miss Lourdes**; Research and Special Studies Division, Bureau of the Census and Statistics, Aviles Street, Manila.

1952 **SUMAGUI, Juan O.**; Planning and Coordination Branch, Office of Statistical Coordination and Standards, National Economic Council, Padre Faura, Manila.

1952 **SYCIP, Washington**; Partner, SyCip, Gorres, Velayo & Co., CPAs, 490 San Luis, Manila.

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1954 **TALAG, Lt. Col. Mariano R.**; c/o OEC, Camp Murphy, Quezon City.

1961 **TAN, Ricardo M.**; Department of Economic Research, Central Bank of the Philippines, Intramuros, Manila.

1958 **TAYCO, Gregorio V.**; Budget & Fiscal Division, Bureau of Lands, Manila.

1957 **TAYCO, Mrs. HERMINIA J.**; Tariff Commission, Manila.

1953 **TEODORO, Pedro E.**; Philippine Promotion Bureau, Inc., Regina Building, Escolta, Manila.

1960 **TIAOGUI, Miss Erlinda V.**; FMF, Trade Center Bldg., Intramuros, Manila.

1957 **TIENZO, Benjamin**; Division of Surveys, Bureau of the Census and Statistics, Aviles St., Manila.

1960 **TING, Miss Anna L.**; 943 Magdalena, Binondo, Manila.

1952 **TIOJANCO, Mrs. Rosita**; College of Commerce, University of the East, Manila.

1958 **TRINIDAD, Ruben F.**; Joint Legislative-Executive Tax Commission, Phoenix Building, Intramuros, Manila.

—U—

1957 **UY, Alfredo S.**; Manuel Uy Enterprises, 365 Plaza Sta. Cruz, Manila.

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1960 **VALBUENA,** Justo B.; Forecasting Center, Weather Bureau, Manila.

1952 **VALENZUELA, Dr. Victor C.;** Department of Biostatistics, Institute of Hygiene, University of the Philippines, Herran, Manila.

1958 **VENTURA, Simeon;** c/o The Statistical Center, University of the Philippines, P. O. Box 479, Manila.

1952 **VIBAL, Hilarion P.;** Business Writers Association of the Philippines; 323 Samanillo Building, Escolta, Manila.

1960 **VILLAVICENCIO, Capt. Benito;** Q-130, Ft. William McKinley, Rizal.

1951 ***VIRATA, Dr. Enrique T.;** Executive Vice-President, University of the Philippines, Diliman, Quezon City.

1960 **VOLANTE-TIENZO, Irenea Mrs.;** Department of Labor, 1003 Arlegui, Quiapo, Manila.

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1951 **YOINGCO, Angel:** Joint Legislative-Executive Tax Commission, Phoenix Bldg., Intramuros, Manila.

1957 **YOUNG, Donald E.;** 3958 Suitland Road, S.E., Washington 23, D.C., U.S.A.

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1961 **ZALAMEA, Cesar C.;** Assistant Vice-President, The Philippine American Life Insurance Co., Wilson Building, Juan Luna, Manila.

1960 **ZAMORA, Miss Nelia C.;** c/o National Science Development Board, Herran, Manila.

1961 **ZIALCITA, Edgardo P.;** Department of Economic Research, Central Bank of the Philippines, Intramuros, Manila.

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LIFE MEMBERS

1953 **BALICKA, Miss Sophya M.;** USOM/Karachi, U.S. Embassy, Karachi, Pakistan.

1953 **CLEMENTE, Dr. Tito;** U.P. Social Hall, University of the Philippines, Diliman, Quezon City.

1951 ***GIVENS, Dr. Meredith B.;** Harvard Advisory Group, Room 261, Hotel Metropole, Karachi, Pakistan.

1951 ***GONZALES, Dr. Leon Ma.;** 1417 Perez, Paco, Manila.

1957 **LACROIX, Max;** Statistical Office United Nations, P.O. Box 20 (Room 3054) Grand Central, New York 17, New York, U.S.A.

1951 **LEGARDA, Jr., Dr. Benito;** Department of Economic Research, Central Bank of the Philippines, Manila.

1951 **LORENZO, Cesar M.;** Philippine Phoenix Surety and Insurance, Inc., 112 Phoenix Building, Intramuros, Manila.

1952 **PANLASIGUI, Dr. Isidoro;** U. P. Site, Diliman, Quezon City.

1952 **SALVOSA, Dr. Luis R.;** Philippine International Life Insurance Co., San Vicente, Manila.

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* Founding Member

DEATHS

The Philippine Statistical Association has lost three of its devoted members in the deaths of Messrs. Vicente Mills, Francisco Sacay and Mariano de los Santos.

Mr. Vicente Mills, one of the Founding Members of the Association, was its Executive Director and Editor of "The Philippine Statistician" up to 1957. He was a member of the Board of Directors for many years. His field of specialization was Demography and Census Methodology, having been associated with the Bureau of the Census and Statistics for a long time.

Mr. Francisco Sacay was formerly Administrator of the Agricultural Credit and Cooperative Financing Administration and also connected with the College of Agriculture, University of the Philippines, as Professor and Head of the Department of Agricultural Economics and Agricultural Education. He served on various committees for the Association, was chairman of the Agricultural Statistics Committee.

Mr. Mariano de los Santos was the President of the University of Manila and a Life Member of the Association. He contributed much to the various activities of the Association.

We, who are left behind in the Philippine Statistical Association, deeply mourn their passing away so early.

PHILIPPINE STATISTICAL ASSOCIATION

Incorporated

P. O. Box 3223, Manila

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1. Cesar M. Lorenzo 1951-1955
2. Enrique T. Virata 1956
3. Exequiel S. Sevilla 1957
4. Manuel O. Hizon 1958-1959
5. Bernardino G. Bantigui 1960

The Association was organized on December 22, 1951 and incorporated on September 24, 1952.

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National Life Insurance Company of the Philippines	— Exequiel S. Sevilla[1]
Provident Insurance Company of the Philippines	— Exequiel S. Sevilla[1]
The Insular Life Assurance Co., Ltd.	— Walfredo Fojas
	Che Lin
The Philippine American Life Insurance Company	— Alexander T. Brooks
	C. H. Grau[1]

[1] Also Individual Member of the Philippine Statistical Association.
[2] Institutional Member has not selected its Official Delegates.