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THE ASSOCIATION

VARIABILITY OF PALAY PRODUCTION PER FARM IN THE 1956 PHILIPPINE CROP SURVEY*

by

Dolores S. Acayan and H. Fairfield Smith

Introduction

A sample survey design may be organized in many ways. To choose the best among various potential sampling units, to determine the sample size, and to allocate numbers of units to various stages of sampling depends on variabilities of the characteristics to be observed and on their relative magnitudes between units at each stage. This paper presents an endeavor to obtain some estimates of variability of palay production which may be helpful for future crop survey designs.

When sample units are homogeneous, optimal sample sizes at each stage are indicated in a simple manner by joint consideration of a cost function and the variance components associated with an ordinary analysis of variance. When sample units vary in size, as measured by the number of elements in each, the problem becomes more complex. If nothing is known about size of units before sampling, variability from that source may dominate the sampling variance of estimators. But if we have available ancillary data which are correlated with productions per unit, they may be utilized in various ways to reduce sampling variance. The degree of success depends on the mode of utilization, both in drawing the sample and in estimating procedure, as well as on their correlation with each character to be observed.

The sample units which have been utilized for Philippine agricultural surveys are municipalities, barrios and farm households (hereafter, for brevity, referred to as farms). All are extremely variable in size.

For crop surveys in the immediate future the Agricultural Economics Division plans to use a two stage sample with barrios as primary sampling units and farms as elements. Information on sizes of barrios is being collected in the form of municipal agriculturists' estimates of areas of cultivated land. Plans for the 1958 survey utilize this information to sample

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* A paper read to the Sixth Annual Conference of the Philippine Statistical Association, June, 1958; and a revision of part of the thesis submitted by D.S. Acayan to the University of the Philippines for the degree of M.A. (Statistics).

"Palay" is rice in husk. Its usual unit of measurement is a "cavan" which may be either 75 liters or 44 Kg.

barrios with probability proportional to these estimates of size.

Notation

Let

B = number of barrios in a given stratum

b = number of sample barrios observed

H_i = number of farms in barrio i, $H = \sum^{B} H_i$

h_i = number of sample farms in barrio i

a_i = a prior estimate of size of barrio i, $A = \sum^{B} a_i$

$z_i = a_i / A$ = the probability of selection for barrio i (with replacement)

$E(u_i)$ = expectation of $u_i = \sum^{B} z_i u_i$

$\bar{h}$ = average number of sample farms per barrio. $= \sum^{b} h_i / b$;

or, if h_i depends on H_i and hence on the barrios which happen to be sampled, is $E(h_i)$. For a self-weighting sample.

$$h_i = (\bar{h} H_i) / (H z_i)$$

y_{ij} = production of a stated crop in farm ij

$$y_i = \sum_{j=1}^{h_i} y_{ij}, \qquad \bar{y}_i = y_i / h_i$$

$$Y_i = \sum_{j=1}^{H_i} y_{ij}, \qquad \bar{Y} = Y_i / H_i$$

$Y = \sum^{B} Y_i$ = the production of a given stratum $\bar{\bar{Y}} = Y / H$

$\hat{Y}$ = an estimator for Y

$$\sigma^2_{\phi i} = \sum_{j=1}^{H_i} (y_{ij} - \bar{Y}_i)^2 \Big/ H_i \quad , \qquad \sigma^2_{\phi} = H_i \sigma^2_{\phi i} \Big/ H$$

In Table 1 there is an obvious alteration in usage of the subscripts ij for adaptation to the triple classification there considered.

Estimation formulae and the effect on variances of sampling proportional to various measures of size.

This section considers sampling barrios with replacement and with various probabilities of selection z_i and simple random sub-sampling of farms within barrios. Sub-sampling would ordinarily be without replacement, but we will ignore the consequent finite population correction to within barrio variances; it will not be worth bothering about relative to other assumptions which will be made.

Following Cochran (1953) sec. 11.6 the unbiased estimate for production of a stratum is

$$\hat{Y} = \frac{1}{b} \sum^{b} \frac{H_i \bar{y}_i}{z_i}$$

Its variance (from Cochran, sec. 11.9, but omitting the finite population correction for sub-sampling) is

$$\text{var}(\hat{Y}) = \frac{1}{b} \sum \frac{BH_i^2}{z_i} \left[(\bar{Y}_i - \frac{z_i Y}{H_i})^2 + \frac{\sigma^2_{\phi i}}{h_i} \right] \qquad (2)$$

$$= \frac{1}{b} \left[E (\frac{Y_i}{z_i} - Y)^2 + E (\frac{H_i^2 \sigma^2_{\phi i}}{z_i^2 h_i}) \right] \qquad (3)$$

Consider the first term of (3), viz:

$$E\left(\frac{Y_i}{z_i} - Y\right)^2 \qquad (4)$$

which states the contribution to sampling variance from variability between barrios. Its magnitude depends on correlation of z_i, the probability of selecting barrio i, with the production, Y_i, of the barrio . If we could choose $z_i = Y_i/Y$, this term would be zero. This of course is not possible since it implies prior knowledge of what is to be estimated. In the absence of knowledge about relative fertilities of all barrios, the irreducible minimum for variance (4) might be obtained if we knew the area of a given crop in each barrio, say X_i, and choose $z_i = X_i/X$. We would then have

$$(4) = X^2 E\left(\frac{Y_i}{X_i} - \frac{Y}{X}\right)^2 \qquad (5)$$

representing variance due to variation of mean yields per hectare between barrios. If we knew the number of farms per barrio we might choose $z_i = H_i/H$, and have

$$(4) = H^2 E(\bar{Y}_i - \bar{\bar{Y}})^2 = H^2 \phi_B^2 \qquad (6)$$

where ϕ_B^2 is variance between barrios of mean production per farm per barrio. This would usually be greater than (5) by a component representing variation between barrios of mean area per farm planted to the given crop. Theoretically it could be less than or equal to (5) if planted areas per farm were inversely proportional to fertilities, but that is very improbable. With no prior measure of barrio sizes and sampling with equal probability, $z_i = 1/B$, leads to

$$(4) = B^2 E(Y_i - \bar{Y})^2 \qquad (7)$$

where $\overline{Y} = Y/B$ is mean production per barrio. This is proportional to variance of total productions per barrio. It could be less than (6) and approximately equal to (5) if all barrios planted equal areas, that is, if average planted area per farm were inversely proportional to number of farms per barrio. This however, does not occur; in fact planted areas per barrio are known to be extremely variable so that (7) is likely to be very large indeed.

The assumption which will be made in this paper is that it may be possible to obtain estimates of barrio size which have about the same correlation with productions per barrio, Y_i, as have farm numbers, H_i. The contribution to sampling variance from between barrio variability will then be approximately similar to that given by (6). We further assume a self-weighting sample so that

$$E\left(\frac{H_i^2 \sigma^2_{\phi_i}}{z_i h_i}\right) = \frac{H^2 \sigma^2_{\phi}}{\bar{h}} \qquad (8)$$

We then have

$$\text{rel-var}\ (\hat{Y}) = \frac{\text{var}\,(\hat{Y})}{Y^2} = \frac{1}{\bar{Y}^2 b}\left(\sigma^2_B + \frac{\sigma^2_{\phi}}{\bar{h}}\right) \qquad (9)$$

This is the usual elementary formula for rel-variance of a mean with two stage sampling from nested infinite populations with variance components σ^2_{ϕ} and σ^2_B.

Variance Components for Palay Production

Mean productions per farm and the variance components in equation (9) can be estimated from observations in crop and livestock surveys of 1955-1957. In this paper we consider the data for palay production in the 1956 survey, which have been made available to us by the Agricultural Economics Division of the DANR. Computations have been restricted

to the 32 provinces in A. E. D. Regions I, III, IV, VII, and IX. These surveys used three-stage sampling within each province; the classifications being towns, barrios, and farms, each selected with equal probability at each stage. An analysis of variance for one province therefore leads to estimation of three variance components which will be designated by

σ_r^2 = variance of mean production per farm between towns within the province

σ_b^2 = mean variance of mean production per farm between barrios within towns

σ_ϕ^2 = mean variance of productions per farm within barrios

Variance between barrios as considered in the foregoing theoretical discussions for a two stage sample (with a province as stratum) is

$$\sigma_B^2 = \sigma_r^2 + \sigma_b^2$$

Table I presents an analysis of variance algebraically and, as an example, numerically for Batangas.

In Batanes no farms growing palay were observed; in Negros Oriental only one seventh of the observed farms grew palay. These two provinces are excluded from the following summary. Among the other thirty provinces average areas harvested per farm varied from 0.78 to to 2.97 ha. and productions per farm vary roughly in proportion from 12.8 to 111.7 cavans, although there is also considerable variation in mean yields per area, from 11.4 to 44.8 cavans per ha. As might be anticipated variability increases with size of farm and production per farm; $\hat{\sigma}_\phi$ varies from 10.2 to 66.0 cavans, $\hat{\sigma}_b$ from 3.6 to 61.8. These standard deviations tend to be proportional to mean productions. While the ratios vary appreciably between regions, they are reasonably constant for

provinces within a region. Table 2 therefore presents a summary of rel-variances by regions (except that Nueva Ecija, which has the highest average production per farm and the lowest farm coefficient of variability, is reported separately).

Details of areas, yields, variances, etc. by province are reported by Acayan (1958). There are several ways in which the rel-variances might be summarised. We have divided each sum of squares in the analysis of variance for each province by the square of the respective mean production per farm per province. These "rel-sums of squares", and their respective "k's" (table 1), were summed over the provinces of a region, leading to three equations to estimate the average "rel-variance components" of the region. This would be efficient procedure on the assumption that rel-variance components are strictly homogeneous throughout a region so that the best estimate of farm variance to subtract from the barrio mean square in each province, to estimate the barrio variance component, is the average rel-variance for farms over provinces; etc. An alternative would have been to compute variance components for each province separately and to average these with suitable weighting.

Sample sizes

If the cost of observing b barrios with $\bar{h}$ farms per barrio may be approximately expressed as

$$C = c_o + c_B b + c_\phi b\bar{h} \tag{10}$$

then, with assumptions outlined above, the optimum number of farms to observe per barrio is (Cochran, sec. 10.6)

$$h_{opt} = \frac{\sigma_\phi}{\sigma_B}\sqrt{\frac{c_B}{c_\phi}} \tag{11}$$

To apply these well known formulae to conditions of Philippine agricultural surveys there are a number of complications whose effects are not at once obvious. Firstly, the cost of listing depends on the total number of houses (non-farming as well as farming households) and on their dispersions in sample barrios. Therefore we cannot anticipate the listing cost for any particular sample. Common practice is to seek to minimize the average (or expectation of) cost to be anticipated. In 1954 a period of three days per barrio was allowed for listing. However the lists were later found to be incomplete. This may or may not have been due to insufficient time. We shall use as estimates of an average time both three and five days per barrio.

Secondly, listing requires longer for the first year a barrio is observed than for subsequent years when only some "updating" may be required. However, if one writes the second term of (10) as

$$c_{BO} b_O + c_{B1} b_1$$

where b_O implies barrios previously observed and b_1 is the number of new ones to be added in a later year, it turns out that h_{opt} remains the same for all years, and as given by (11) with c_{B1} in place of c_B. The value of c_{BO}, even if reduced to zero, does not affect the issue: if in successive years one wishes to reduce the variance, as repetition of the old sample becomes cheaper, this can always be done better by increasing the number of barrios than by increasing $\bar{h}$. Conversely, to retain a precision once reached it will always be more costly, in any one year, to add more barrios with reduced $\bar{h}$ than to retain the old sample. (Theoretically, if conditions remain stable, there would be a saving in the long run; however, in practice, for one reason or another, the sample would be altered, or complete relisting be called for, before any saving would be achieved). Therefore, we have to consider only costs with full listing.

Costs of earlier surveys have not been broken down in a way suitable for the present purpose. Opinion has been expressed that an interview can be conducted in 15 minutes, or, with time for finding farmers, about 10 interviewers per day. Our observations suggest that 30 minutes is minimum and most often 45 minutes will be needed. One of us has observed only 3 schedules being accomplished in a day in one municipality visited when an interviewer was at work. We will consider ₱0.50 and ₱2.00 as the possible range of cost per schedule.

In surveys of previous years it has been customary to recruit a local interviewer for each barrio and to pay him no travel costs. We assume that situation to continue, but if sub-sample sizes be reduced the job may become too small to attract recruits. If each interviewer be given two or more barrios, travelling costs may have to be added, somewhat increasing c_B and hence also h_{opt}; but the increase may be relatively small compared to other ambiguities. Supervision is assumed to be done by AED field officers as part of their regular duties so that its cost is part of c_o and need not concern us here.

As a first tentative endeavor to evaluate optimal sub-sample sizes we guess:

(1) Costs per barrio:	(a)		(b)
Supervisor: 1/6 day training	₱ 1.00		
Interviewer: 1 day training	5.00		
Interviewer: 3 or 5 days listing ...	15.00	or	₱25.00
Interviewer's reference guide	0.50		
c_1 =	21.50	or	31.50

(2) Costs per schedule:	(a)		(b)
Interviewing	₱ 2.00	or	₱ 0.50
Processing	1.60		
Paper and postage	0.10		
c_2 =	3.70	or	2.20

These costs lead to estimating $(c_1/c_2)^{1/2}$ as 2.4 or 3.8 as the extreme ratios, and thence, using variance components from Table 2, to estimates of optimal sub-sample sizes as shown in Table 3. It appears that, for estimating palay production, the optimum sub-sample size is about 5 farm households per barrio.

The number of barrios to be observed then depends either on the sampling variance to be achieved or on the funds available, and to some extent on the allocation to strata. Over a region with rel-variance constant the optimal allocation is to distribute numbers of barrios in proportion to total production per stratum (cf. Cochran, sec. 5.5). The rel-variance of an estimate of total production for a region with b barrios so distributed among provinces is then the same as for a single stratum, namely

$$\text{rel-var}\,(\hat{Y}) = (v_B^2 + v_\phi^2 / \bar{h}) / b \qquad (12)$$

where the v^2's are "rel-variance components" or $(\hat{\sigma}/\bar{y})^2$. To illustrate the order of magnitude of sample required, Table 4 shows the barrio numbers which would be required to achieve 2.5, 5 and 10 per cent standard errors under conditions outlined above and with 5 or 10 farms per barrio. It must be emphasized however that these are minimal numbers which are unlikely in practice to achieve the specified precisions. Firstly they depend on knowing, before sampling, a measure of size for each barrio which is as closely correlated with production as is number of farms. Secondly they assume optimal allo-

cation of numbers of sample barrios to each stratum or province. Neither condition is likely to be achieved in practice. Indeed the second is not possible for all crops when several are to be observed in the same survey. Furthermore they refer to an almost universally grown crop. Minor crops will tend to have higher coefficients of variability, though possibly smaller standard errors in units of measurements.

A minor crop

It has been noted above that in Negros Oriental only one-seventh of observed farms grew palay. We may consider the data for that province as an example of variability for a minor crop. Table 5 presents the variance estimates (i) for all farms (ii) considering only farms on which palay was grown. The latter are of little more than academic interest. They indicate the increase of precision which would be achieved for a crop grown on only a small proportion of farms if we listed barrios and farms which grow the crop and sampled only these. This might be done for a survey designed specifically for one crop but is not practicable for a general survey observing many crops. The optimal sub-sample size turns out to be about the same (4 to 5 farms per barrio) in either case; but, if numbers of palay producing farms be known, precision is 16 times greater than when all farms are sampled in ignorance of which produce the crop.

The foregoing result does not say that variance of single observations differ in similar manner, quite the reverse: the variance between barrios of means of 5 palay producing farms is 40 cavans^2, of means of 5 farms of all types is 13 cavans^2. The greater precision of the former for estimating province production results from the smaller expansion factor. Furthermore while the result, implies that the coefficient of variability may be high for the estimate of production of a minor crop for a single province in a general survey, this is usually of little consequence in a national estimate of which it may be a trivial part. (See Appendix). However the estimate given by a general survey for a crop that is minor in all provinces will always have a coefficient of variation relatively high compared to the estimates of more important crops. For example, a crop occuring in about one-seventh of farms everywhere and having variance components like palay in Negros Oriental would yield a national estimate on 1000 barrios with coefficient of variation about 7.5 per cent when that for a crop like palay may be only 2.5 per cent. Estimators for crops occuring only sporadically may have much higher coefficients of variability.

Cautionary note

We reiterate that all these results depend on having a prior measure of barrio size at least as good as number of farms per barrio. Sampling without such ancillary information must result in substantially larger standard errors for estimates of total production.

APPENDIX

The following is a simple example to illustrate the relation of standard error of a regional total whose parts comprise some strata with high production and low coefficient of variability while others have small production with high coefficient of variability.

For simplicity consider a region containing just two provinces with productions as for palay in Pagasinan and Negros Oriental. Suppose a two stage sample with 5 farms per barrio, and with rel-variance components as in Table 2 (region III) and Table 5. Let $v^2 = (\delta_B^2 + \delta_\phi^2 / 5) / \bar{\bar{Y}}^2$ be the rel-variance for a single primary sample unit or barrio. For 114 sample barrios, as apportioned to these two provinces in 1956, and for the same total sample size with optimal allocation the results might be as in Table 6 which shows how the variance estimates would combine to form the standard error of the regional total.

Optimal allocation occurs when the number of barrios in each province is proportional to Yv. In that situation the relative standard error for the estimate of the lower producing province would be 65.6 per cent, for the larger would be 7.04 per cent, and for the total of both together would be 7.21 per cent.

Of course, in practice "optimal" allocation would not be used since it would be bad allocation for another crop such as sugar or corn for which Negros is a large producer. With the allocation actually used in 1956 (and supposing other conditions as postulated) the relative standard errors would be respectively 38.8, 8.06 and 7.89 per cent. In either case the relative standard error for the total remains close to that for the large producing area.

It will be noticed that the relative standard error for a total may be greater than that for one of its parts. If the

two segments be denoted by subscripts i and j, with numbers of sample units n_i and n_j, that happens when

$$n_j < \frac{n_i v_j^2}{v_i^2 (1+2Y_i/Y_j)}.$$

In particular with optimum allocation, i.e. with

$$n_i/n_j = Y_i v_i / Y_j v_j,$$

it happens if

$$v_j/v_i > 2 + Y_j/Y_i$$

It would rarely happen for any crop in a general survey in which all strata would be well sampled.

SUMMARY

For a two stage sample survey (using barrios and farms as units) to estimate production of palay the optimal average sub-sample size seems to be about five farms per barrio. An estimate with standard error about 5 per cent is theoretically obtainable with a sample of about 400 barrios. This result however depends upon having available prior to sampling estimates of barrio size which are correlated with palay production per barrio at least as closely as is number of farms per barrio, and on assuming correct responses on production per farm by the farmers. With information at present available for sample design poorer results must be anticipated in practice.

Section 6 derives some further results for a crop grown in only one-seventh of all farms.

Literature Cited

Acayan, D.S. (1958) **Variability of palay production in the 1956 Philippine crop and livestock survey.** Master's Thesis, University of the Philippines.

Cochran, W.G. (1953) **Sampling techniques.** Wiley, New York.

Table 1
ANALYSIS OF VARIANCE

Source of Variation	(D.F.)	S. Sq.	E (S. Sq.)			For Batangas		
			σ^2_ϕ	σ^2_b	σ^2_r	D.F.	S. Sq.	M. Sq.
Between towns	$f_r = (t-1)$	$\sum_i h_i (\bar{y}_i - \bar{y})^2$	f_r	k_2	k_3	11	599834	5453.1
Barrios within towns ...	$f_b = \sum_i (b_i - 1)$	$\sum_{ij} h_{ij} (\bar{y}_{ij} - \bar{y}_i)^2$	f_b	k_1	—	27	52624	1949.0
Farms within barrios ..	$f_\phi = \sum_{ij} (h_{ij} - 1)$	$\sum_{ijk} (y_{ijk} - \bar{y}_{ij})^2$	f_ϕ			401	144368	360.0

$\bar{\bar{y}} = 20.9$ cavans p. farm. $\hat{\sigma}_\phi = 19.0$, $\hat{\sigma}_b = 11.8$, $\hat{\sigma}_r = 10.1$, $\hat{\sigma}_B = 15.5$

$$k_1 = h - \sum_{ij} (h_{ij}^2 / h_i) = 308.5$$

$$k_2 = \sum_{ij} (h_{ij}^2 / h_i) - \sum_{ij} h_{ij}^2 / h = 120.0$$

$$k_3 = h - \sum_i h_i^2 / h = 387.3$$

If numbers of farms were constant throughout each classification the k factors in mean squares would be the number of farms in each class. Hence, if only as a rough check on computations, it is of some interest to compare $k_1 / f_b = 11.4$ and $k_2 / f_r = 10.9$ with average number of farms per barrio = 11.3; and $k_3 / f_r = 35.2$ with average number per town = 36.7.

Table 2

ANALYSIS OF REL-VARIANCE (POOLED ESTIMATES) FOR VARIOUS GROUPS

Source of Variation	Degrees of Freedom	Rel-Mean Square	Estimated Rel-Variance Components
Regions I and IV			
Between Towns ...	70	12.8617	$v_r^2 = 0.2958$
Between barrios ..	159	4.6027	$v_b^2 = 0.3705$
Between farms	2,210	0.7657	$v_\phi^2 = 0.7657$
Region III (excluding Nueva Ecija)			
Between towns ...	43	6.5230	$v_r^2 = 0.1794$
Between barrios ..	106	2.5965	$v_b^2 = 0.1875$
Between farms	1,420	0.6656	$v_\phi^2 = 0.6656$
Nueva Ecija			
Between towns ...	11	1.4918	$v_r^2 = 0.0046$
Between barrios ..	26	1.2880	$v_b^2 = 0.0976$
Between farms ...	367	0.2627	$v_\phi^2 = 0.2627$

Region VII (excluding Negros Or.)

Between towns ...	44	10.6545	$v_r^2 = 0.1491$
Between barrios ..	101	3.6386	$v_b^2 = 0.2090$
Between farms ...	1,472	1.3559	$v_\phi^2 = 1.3557$

Region IX

Between towns ...	27	10.3285	$v_r^2 = 0.0021$
Between barrios ..	67	8.8637	$v_b^2 = 0.6693$
Between farms ...	969	1.6994	$v_\phi^2 = 1.6694$

All Provinces (excluding Neg. Or.)

Between towns ...	195	9.9739	$v_r^2 = 0.1554$
Between barrios ..	459	4.3615	$v_b^2 = 0.3533$
Between farms ...	6,438	.9905	$v_\phi^2 = 0.9905$

Table 3

ESTIMATES OF OPTIMAL NUMBER OF FARMS PER BARRIO FOR EACH REGION

Region		I and IV	III*	N. Ecija	VII+	IX	Total+
v^2_{ϕ}	=	.7657	.6656	.2627	1.3559	1.6694	.9905
v^2_B	=	.6663	.3669	.1022	.3581	.6714	.5087
v_{ϕ} / v_B	=	1.072	1.347	1.603	1.946	1.557	1.396
h_{opt} (a)	=	2.6	3.3	3.9	4.7	3.8	3.3
(b)		4.1	5.1	6.1	7.4	5.9	5.3

* Excluding Nueva Ecija.

\+ Excluding Negros Oriental.

Table 4

ESTIMATED NUMBERS OF SAMPLE BARRIOS REQUIRED TO ACHIEVE SPECIFIED STANDARD ERRORS OF ESTIMATED PRODUCTION UNDER MOST FAVORABLE CONDITIONS

Region	$\bar{h}$	Standard error per cent 10	5	2.5
III	5	50	200	800
	10	43	173	694
VII	5	63	252	1,007
	10	49	197	790
I, IV	5	82	328	1,311
	10	74	297	1,189
IX	5	100	402	1,608
	10	84	335	1,341

Table 5

VARIANCE COMPONENTS AND ESTIMATED SAMPLE SIZES FOR PALAY IN NEGROS ORIENTAL

	All farms		Only farms growing palay	
	df.	M.Sq.	df.	M.Sq.
Towns	10	237.8	7	272.4
Barrios	26	76.6	8	50.7
Farms (σ^2_ϕ)	384	15.19	44	48.8
Mean (Cavans)		1.51		10.60
σ^2_B		9.67		30.1
$\hat{\sigma}_\phi / \hat{\sigma}_B$		1.25		1.28
h_{opt} (a)		3.6		3.7
(b)		4.8		4.9
Rel-variance for one barrio with h = 5		5.58		0.354

TABLE 6

To illustrate standard error of a total of two strata with different magnitudes of production and with different allocations of a given sample size.

Stratum	Y	Rel-var v^2	Sample size as in 1956 survey. b	v^2/b	var(Y)	With optimal allocation b	v^2/b	var(Y)
Pangasinan	6,000,000	0.50	77	.00649	233.6×10^6	101	.00495	178.2×10^9
Negros Or.	235,000	5.58	37	.15081	8.3×10^6	13	.42923	23.7×10^9
Total	6,235,000		114		241.9×10^9	114		201.9×10^9
Rel-variance of estimated total					.00622			.00519

A SAMPLE SURVEY OF VOTERS' PREFERENCES IN QUEZON CITY *

by

Enrique T. *Virata*

Introduction

Elections for public office in the Philippines and elsewhere always generate a great deal of public interest. The importance of its results to party followers, business men, industrialists and the public in general is one of the reasons for the great interest which the people take in these elections. Consequently, an accurate prediction of the ultimate results of the election is a matter of great importance.

Prediction of the final results of a free election has long been done in many countries especially in the United States and England and most likely in other countries where the results of an election depend on the free will of the electorate. In the Philippines, however, we are just beginning to exert efforts in this direction.

It is the purpose of this study to find out if it is possible to make a pre-election prediction of the voters' preference in this country by sample surveys.

This study aims to find a methodology, if there is any, that will serve this purpose. Among others, it aims (1) to seek a frame that is useful and appropriate; (2) to discover the difficulties that are likely to be encountered in the conduct of the survey; (3) to find the most suitable timing; (4) to determine the most economical survey to attain a certain desired degree of accuracy in the prediction.

On account of the numerous problems that have to be solved, I have decided to make a partition of the study into three stages which for convenience may be called small unit phase, the medium unit phase and the large unit phase. In

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order that the results obtained and experiences gained in each phase may be used in the next, at least three elections have to be surveyed to complete the series. If funds could be made available, the writer intends to continue this study in the elections for 1959 and 1961.

This report covers the results of the first phase. It is a survey of the voters' opinion of Quezon City on their selection of the President of the Philippines in the 1957 elections.

The survey is a two-stage sampling survey. The primary units are the election precincts and the secondary units are the voters whose candidate preferences were solicited.

Method of Sampling

First, a complete list of the total number of polling precincts in Quezon City for 1957 was secured from the Commission on Elections. Of the 325 polling precincts registered at the Commission on Elections, only 25 were selected. The 25 polling precincts were selected by systematic method at intervals of 13 starting from the fourth precinct. This start was determined by the use of a table of random numbers.

In order to get sample voters from both the old and newly registered voters, the selection was made after the last day of registration(October 5, 1957), just about a month before election day.

The lists of registered voters in each of the 25 polling precincts were secured from the Register of Deeds of Quezon City. On the basis of the total number of voters in each of the 25 precincts, an interval of 5 between voters was decided, because it was desired that about one thousand voters be included in the survey. Starting from the second voter (this was the number determined by the use of a table of random numbers) every fifth voter was selected until the registry list was fully exhausted. This process accomplished in all 25 polling precincts finally yielded a total of 1,047 sample voters who were made as the prospective respondents to the survey.

Distribution of the Precincts Surveyed

The distribution of the 25 polling precincts used in the survey shows that: one is located in an exclusively very rich men's area (Broadway and Gilmore Avenue); one is located in the campus of the University of the Philippines; two are located in squatters' area (Tatalon in front and at the back of Quezon Institute); two are located in characteristically semi-rural areas (Barrio Balon Bato along the way going to Novaliches and Barrio Gulod in Novaliches); three are located in semi-slum areas (Sociogo, Bago Bantay and some

parts of La Loma); two are located in middleclass residential areas (Sierra Madre, Mayon and Apo Streets and along some other streets around this vicinity); four are located in low cost government housing projects (Projects 4 and 6, Quirino District and Roxas Homesite); four are located around the vicinity of military camps and a military hospital (Camp Murphy, MIS Compound at Cubao and V. Luna General Hospital); five are located in semi-residential areas (San Francisco del Monte and Kamuning).

The Sample Ballot

The opinion of the sample voters was expressed through the use of a printed sample ballot. An instruction in English with a Tagalog translation appeared on the sample ballot in order to guide the sample voters on how to express their opinions. The instruction also served as a letter of introduction in that it included a statement of purpose, the agency conducting the survey and above all a statement of assurance that the opinions given will be kept secret.

The sample ballot contained the names of five presidential candidates, namely, Carlos P. Garcia, Manuel Manahan, Antonio Quirino, Claro M. Recto and Jose Yulo. Opposite the name of each of the candidates listed in the sample ballot was a square in which the sample voter was instructed to place a check in order to mark his preference for president. Each sample voter was requested to choose only one candidate.

At the upper right hand corner of the sample ballot, the precinct number to which the sample voter belonged was indicated. This was intended to serve the purpose of finding out how much is the percentage of response in each precinct after a checked sample ballot got mixed with the rest of the sample ballots collected from the other precincts.

Method of Distribution and Collection

At the beginning of the study, either one of two methods of distribution and collection were considered for adoption. The first was by mail and the second was by personal interview. The sample voters of a particular precinct (P-153A) whose addresses were complete were sent the sample ballots by mail. Enclosed with the sample ballot was a self-addressed and stamped envelope. A typewritten instruction in English and translated in Tagalog was added to the original instructions requesting the sample voter to mail the checked sample ballot within the earliest possible time. Another precinct which was considered to present the greatest obstacles to personal delivery and collection of the sample ballot was tried. Precinct No. 99 which is located at the northern periphery of

Quezon City and whose voters' addresses were very general and vague was tried for the experiment.

The trial run for the distribution and collection of the sample ballots yielded two results which finally determined which of the two methods will be used in the survey.

Of the 33 sample ballots sent by mail, only 12 were returned to the Research Center. This constitute 36.4% of the total number of sample ballots sent. On the other hand in the trial on personal delivery and collection, a response of 77% was obtained. The experiment showed that besides obtaining a higher percentage of response in the personal delivery and collection, reasons for the non-delivery of some sample ballots can be explained since the research assistant can ask for some information regarding those who failed to be contacted while going from one sample voter to another. The research assistant can also inquire from these people the whereabouts of some sample voters whose addresses are either vague or entirely wrong. Hence the percentage of response in this manner can be increased. On the other hand, what happened to the unreturned sample ballots sent by mail cannot be known. Another significant observation in the two experiments showed that through the mail, collection was comparatively slower. It took more than a week for the 12 sample ballots to return after they were dropped at the mail box. Whereas the 77% response at Barrio Gulod, Novaliches was accounted for after seven and a half hours despite doing the work without the use of motor transportation in going from one voter to another.

Results Obtained

The following figures are the results obtained by the survey and the election returns:

	Garcia	Yulo	Manahan	Recto	Quirino
Survey Result	41.85	32.40	12.44	11.8	1.5
Actual Elections Results For Sample Precincts	34.0	30.0	19.0	13.0	4.0
Actual Election Result For the Whole City	33.60	31.40	19.60	13.0	2.4

Non-Respondents

Total number of voters in the sample	1,047
Total number of voters who responded	466
Total number of non-respondents	581
Percentage of non-respondents	55.5 %
Total number of voters registered	68,782
Total number of voters who voted	47,314
Total number of voters who did not vote	21,468
Percentage of registered voters who did not vote	31.2 %

The preceding figures indicate that the selection of voters to be included in the survey could still be improved so as to reduce the non-respondents and replace them with voters who are more likely to vote. The next phase of the study would provide the opportunity to adopt some modifications in the method used in this study.

These are the reasons for the existence of these non-respondents:

1.	Sample voters cannot be located	139 — 23.8%
2.	Given addresses located but no such person found	134 — 23.0%
3.	Sample voters who had transferred to other places	71 — 12.0%
4.	Addresses that cannot be found	71 — 12.0%
5.	Sample voters who cannot be contacted personally but did not return the sample ballots left in their homes ...	54 — 9.3%
6.	Impossibility of contact because gates are not opened to interviewers (rich group)	35 — 6.0%
7.	Sample voters in military camp not available to interviewers	34 — 6.0%
8.	Non-committal for personal reasons ..	14 — 2.4%

9.	Addressees and adddresses located but nobody at home to receive sample ballots	11 —	2.0%
10.	Not ready to make a choice	10 —	2.0%
11.	Sample voters who transferred residences but may vote in the same precinct	4 —	0.7%
12.	Sample voters who are known to be dead	2 —	0.3%
13.	Not voting in the election	2 —	0.3%
14.	Not sure of voting and would not make a choice	1 —	0.2%
	Total	584 —	100.0%

It may be observed from the preceding figures that a survey by mail will most likely increase the percentage of non-respondents.

Analysis of the Results

The difference in the results of the survey and the election results is still considerable and I firmly believe that a closer agreement could be attained in the next stage by a better selection of the sample voters with a view of reducing the non-respondents. The agreement of the election returns from the sample set of precincts and the entire city are very close to each other, proving the adequacy of the sample precincts. A further study on the election returns of each of the 13 sets of possible sample precincts showed that all of them yielded results in good conformity with the election results from the entire city. These findings lead to the inescapable conclusions that to obtain better estimates of the election returns, a better selection of the sample voters should be made in addition to the adequacy of the sample precincts.

Error of Results

As a general practice in any sampling work, a consideration of the limits of error of the final results is made part of the investigation. It furnishes a measure of reliability of the results obtained and the confidence that may be placed on their accuracy. In the case of an election survey, the importance of this portion of the investigation is diminished by the fact that the final results of the election is the best indicator of the accuracy of the result of the survey. This is the main reason I hesitated to consider this matter based on the formulas developed from theory. Furthermore, it should

be remembered that the results of the theory were based on statistical units which are unchanging and unchangeable such as colored chips or colored balls in a bowl experiment. The elector on the other hand may change his preference at any time before he actually casts his vote.

Cost Study

Since the cost factor is an important element in these surveys, studies were made on the determination of the most appropriate precinct intervals. For a larger area together with a great number of voters, it was found that a 25-interval is satisfactory and for the whole Philippines a 50-interval may prove sufficient. In the case of the City of Manila, the results of the last elections had confirmed the validity of the 25-interval, but no studies had been made on the 50-interval for the whole country. The suitability of any interval to be adopted is dependent on the closeness of the final results since it is conceivable that if the election result is too one-sided, a larger interval may also prove satisfactory.

Difficulties Encountered

These are the main difficulties encountered in the survey:

1. The problems of transferred voters: Many of the old voters who voted in the 1953 and 1955 elections have transferred their residences. Quite a number of sample voters within this category contributed to a considerable percentage to the total number of non-response. Some of the sample voters who have transferred their residences are coming back to the polling precincts during elections in order to vote. There was no way of getting in contact with this kind of sample voter unless the sample voter transferred to a new residence which is very accessible from the precinct surveyed.

2. The problem brought about by the renumbering of houses in Quezon City: Between 1953 and 1957, address numbers of houses in Quezon City were either renumbered or retained. The renumbering presented difficulties in locating the addresses of sample voters whose house number have been renumbered. It was only through patient inquiry that the addresses of some of the sample voters falling under this classification were found. Even then, this problem still accounted for the great percentage of non-response.

3. Problems brought about by the abolition of squatter areas: Included in the survey are two polling precincts located in squatter areas. At the time the survey was conducted on these areas, many of the squatters had been ejected either because the government ordered it so or because the land on

which they were squatting has been purchased by private individuals for residential or business purposes. Some of these sample-voter squatters did not go far from the original place they squatted on in which case through patient inquiry from the neighborhood, they were still located. Some have left the place and went to other areas rendering it impossible for the research assistant to find them.

4. The problem presented by vague addresses: A number of the sample voters failed to be contacted simply because their addresses copied from the registry list were too general or too vague. Under these circumstances, guides who were familiar to the sample voters were hired or if no guide was available, the research assistant inquired from the leaders of the political parties in a community, from the owners of sari-sari stores or simply asked from the sample voters that he can contact about the addresses of the sample voters under this group.

5. The problem of getting access to sample voters working and staying in military camps: The research assistant tried to reach the sample voters staying in these vicinities but permit was not granted to solicit opinion within the base without the corresponding approval of the base commander. With the time alloted to finish the survey, it was impossible to go over this red tape.

6. One of the biggest problems encountered by the research assistant was in trying to explain to each sample voter how his name was selected. The sample ballot did not contain an explanation relevant to this matter. A majority of those who were contacted personally asked for an explanation regarding the choice of their name.

7. Incidental problems: Some of the sample voters contacted were skeptical about the survey. Some suspected it of being the work of the Nacionalista Party which desires to remain in power and using the University of the Philippines merely as an instrument to attain this purpose. This was true especially among government employees. Careful and persistent explanation by the research assistant cleared their doubts.

Twice the research assistant was placed on a tight spot explaining the survey. In Barrio Gulod, Novaliches, an aggressive leader of the Progressive Party of the Philippines gave the researcher rough time proving that the survey was purely intended for a scientific study. In this instance, the survey was suspected of being a part of the Liberal Party's political machination in finding out where they were weak in order that votes may be bought. In a semi-slum area along the Quezon City-Manila boundary in the south, the research

assistant was interrogated and asked to explain the purpose of the survey and the agency sponsoring the study by a group of young men engaged in a drinking spree.

In all these cases tactfulness helped a lot avoiding trouble.

Summary of Observation

I. The choice of a certain number of precincts from the precinct list of a political subdivision like a municipality or province, city or the entire country at a certain fixed interval from a random start is satisfactory. In this case of this survey, in Quezon City, any one of the 13 sets of 25 precincts gave results that agree with the final results of the election. For larger political units an interval of 25 appears to give satisfactory results also. The effect of increasing the interval is to reduce the cost of the survey.

II. The results of this survey indicate that with a better method of the selection of the voters with the end in view of reducing the non-respondents and increasing their number will give a better estimate of the actual results of the voting on election day. The difference of the survey estimate and the final election returns are still big and unsatisfactory.

III. To insure the cooperation of the sample voters, the purpose of the survey and the method of choice of the precincts and voters should be fully explained to overcome any suspicion that they were selected for some secret purposes and not by random as prescribed by a scientific study.

IV. About two or three weeks before election day seems to be a satisfactory period to make the election survey if only the final results are desired. To observe changes in the trend of voters' opinion, several surveys in the two or three months period before election day is recommended although no such tests were actually made in this experiment.

V. The use of a personal interviewer rather than the mail is preferable whenever the funds for the survey can bear the cost.

Conclusion

Finally, if I may be permitted to make an assessment of the achievements so far accomplished, I can only state that there is no definite method evolved that can predict the election results within acceptable limits of accuracy. However, with the knowledge and experience already accumulated, I confidently hope that improvements and refinements can be incorporated into the method that had been tried so as to yield a fairly accurate prediction at reasonable cost the results of an election in the Philippines whether it be local or national. Subject to availability of funds the 1961 election would show whether we could establish a method that can be recommended for adoption.

A PROPOSED METHOD OF ESTIMATING ECONOMIC LOSSES RESULTING FROM INADEQUATE ENVIRONMENTAL SANITATION*

by

Reynaldo M. Lesaca, Dr. Eng'g. * *

Introduction

In public health programming, the administrator is often faced with the problem of adequately justifying proposed expenditures in the field of environmental sanitation. By and large the effects of a program of this kind are not immediately felt, and the average citizen is not fully aware of the benefits that follow the vigorous prosecution of carefully conceived sanitation projects. With the exception of increased municipal cleanliness which is immediately noticeable, results of improved environmental conditions such as the decline in morbidity and mortality rates occur over a period of years during the operation of the program and hence are not readily discernible to the layman. Furthermore, the field of environmental sanitation, as with the entire field of preventive medicine, aims at prevention thereby producing what appears as negative results, unlike engineering construction or surgery where the results are usually positive and dramatic and thus easily appreciated. It appears, therefore, that a fairly good way to justify the cost of environmental sanitation projects is to emphasize the monetary losses that result from the endemicity of debilitating diseases and the economic benefits derived from increased productive potential of a nation due to increased life span.

A simple and common method that is used to determine these economic losses is to estimate the lives saved and to multiply this figure by an assumed value of a human life.[1] This method, however, is open to a very serious objection since a human life is something held sacred and hence cannot be valued in terms of so many dollars and cents. While it is true that in certain legal cases, very often a human life is given a money value for purposes of damages or indemnities, in a greater sense, no amount of money can really equal a human life, especially if esthetic, sentimental or spiritual aspects are considered.[2]

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In this paper a method of estimating only the monetary value of improved sanitation shall be considered. The estimate divides into two distinct components: (a) that due to the increase in a population's productivity and the decrease in medical care due to a decrease in the frequency and severity of debilitating diseases, and (b) the increase in a population's total earning potential resulting from an increase in the life span of the wage earners.[3,4]

These components are considered rather distinct from one another and must be added to obtain the total value of improved sanitation. A theoretical approach shall first be used and an example followed through to demonstrate its application. At this point, it must be clearly understood that a reasonably accurate solution of this difficult and complicated problem must await the collection of reliable statistical and related data and whatever results obtained in the example must be viewed under this limitation.

Economic Gain Due to Increase in Productivity and Decrease in Medical Care

Let there be considered n debilitating diseases, $D_1, D_2, \ldots, D_n$ that respond quite readily to improved environmental sanitation, and let each disease be divided into m classes of severity $S_1, S_2, \ldots, S_m$, each class being given an equivalent of r_j ($j = 1,2,\ldots, m$) percentage loss of productivity. It shall be assumed that the diseases are mutually exclusive, that is, the proportion of population suffering from more than one disease is nil or negligible. From the vital statistics of population, the percentage of population p_{ij} ($i = 1,2, \ldots, n$; $j = 1,2,\ldots, m$) affected by each severity for every disease per year may be obtained or estimated. Also, from the characteristic of the disease considered, let the percentage of time during a 12 month period in which a person is ill for the various severities be denoted by q_{ij} ($i = 1,2,\ldots, n$; $j = 1,2, \ldots, m$).

When a wage earner is sick not only is he not-productive, but it requires one or more additional wage earners to care for him. Even if he goes to a charity ward his care becomes a negative factor to the national economy. There is a need to introduce, therefore, medical cost factors, which must necessarily be greater than 1, $f_1, f_2, \ldots, f_m$ corresponding to each class of severity. For non-wage earners, the loss to the national

economy are only the wages of those caring for them when they get sick. Hence these factors would have to be decreased by unity for non-wage earners. Finally from the national census are determined the percentage w of the population who are wage earners and the national average annual wage R per wage earner.

For each disease D_i $(i = 1, 2, .., n)$ the following tabulation may be obtained:

	Severity Class			
	S_1	S_2	S_3	S_m
Percent Loss of Productivity of wage earner	r_1	r_2	r_3	r_m
Proportion of population affected per year	P_{i1}	P_{i2}	P_{i3}	P_{im}
Proportion of 12 month period a person is ill	q_{i1}	q_{i2}	q_{i3}	q_{im}
Medical cost factor	f_1	f_2	f_3	f_m

Thus for wage earners the loss in productivity resulting from one disease D_i will be

$$w \sum_{j=1}^{m} p_{ij} q_{ij} r_j f_j \qquad (1)$$

and for non-wage earners will be

$$(1-w) \sum_{j=1}^{m} p_{ij} q_{ij} r_j (f_j - 1) \qquad (2)$$

For the n diseases, therefore, the economic loss per person per year as a proportion of a worker's annual wage will be

$$\sum_{i=1}^{n} \sum_{j=1}^{m} p_{ij} q_{ij} r_j (f_j + w - 1) \qquad (3)$$

Since w is the proportion of wage earners in the population and R the average annual wage earner's pay, the total economic loss per person per year is therefore

$$L_1 = Rw \sum_{i=1}^{n} \sum_{j=1}^{m} p_{ij} q_{ij} r_j (f_j + w - 1) \qquad (4)$$

Economic Gain Resulting from Increased Productive Years

A different approach is used to determine the economic gain resulting from an increase in life span and productive years due to improved sanitation. In essence the method depends upon the shift in the population age distribution and the increased life expectancy.

Let there be considered two periods: Y_1 the present one, and Y_2 say 20 to 25 or more years hence when the effects of improved health could be felt. Assume the population during these two periods broken down into the same k age groups with median age denoted by $a_1, a_2, \ldots, a_k$. Let the percentages in each age group be $g_{11}, g_{12}, \ldots, g_{1k}$ and $g_{21}, g_{22}, \ldots, g_{2k}$; the mortality rates by $u_{11}, u_{12}, \ldots, u_{1k}$ and $u_{21}, u_{22}, \ldots, u_{2k}$; and the life expectancies $l_{11}, l_{12}, \ldots, l_{1k}$ and $l_{21}, l_{22}, \ldots, l_{2k}$ for Y_1 and Y_2 respectively. The productive life from the median age a to retirement age Z, is (Z − a) for a $\geq$ A, where A is the age of person assumed to start earning. For a $\leq$ A, this productive life is (Z–A).

Let us now put

$$F_1 = (1+t)^a \qquad (5)$$

$$F_2 = \frac{(1+t)^A - 1}{t(1+t)^{A-a}} \qquad (6)$$

$$F_3 = \frac{1-(1+t)^{A-Z}}{t(1+t)^{A-a}} \qquad \text{for } a \leq A$$

$$= \frac{1 - (1+t)^{a-Z}}{t} \qquad \text{for } a \geq A \qquad (7)$$

$$F_4 = 0 \qquad \text{for } a \leq A$$

$$= \frac{(1+t)^{a-A} - 1}{t} \qquad \text{for } a \geq A \qquad (8)$$

where a = any of the median ages defined previously

A = age at which a person starts earning

Z = age at retirement

t = rate of interest

F_1 = present value of $1 cost of being born at t% interest compounded annually for a period equal to the median age a

F_2 = present value of $1 annual cost of raising a child from birth to age A

F_3 = present value of $1 annual income during productive years from A to Z

F_4 = present value of $1 annual actual earning from A to median age a.

Finally, let us take C_1 as the average cost of being born, C_2 the annual average cost of raising a child to age A, C_3 the cost of burial and R the average annual earnings per wage earner.

The following assumptions are considered fairly reasonable and shall be used:

(1) The improvement in environmental conditions accounts for only a fraction b of the economic gain resulting from an increased life span and productive years since other factors play their role in improving the public health conditions, such as immunization, better medical care, improved nutrition, improved personal health habits, etc.

(2) There is an equal number of males and females in the population and the slight difference in mortality rates between the sexes is for the present purpose negligible.

(3) The present values are defined for the median age of every age group.

(4) The average wage earner earns R per year s% of which he spends on himself leaving a net earning of R(1-s).

(5) Cost of burial is the same for each age group.

(6) After the retirement age Z, a male earns only enough to support himself so that his net earnings are O.

(7) The total net loss to society per male who dies, calculated for the two periods Y_1 and Y_2 is the algebraic sum of the present values of the:

a. Cost of being born
b. Cost of raising to age A
c. Estimated income from age A to age Z had he lived
d. Cost of burial
e. Actual net earnings.

For median age groups less than or equal to A, the actual net earning is O. For those above age A, the present value of the actual net earnings is negative since they are earnings rather than losses.

(8) Females do not have any net earnings. After age A, their cost of support is the same as each male. Hence for each female who dies the total net loss to society is the sum of the present value of the cost of:

a. Being born
b. Raising to age A
c. Burial
d. Support from age A to median age a (a $\geq$ A).

The present value of the cost of support from median age a to Z had she lived will be negative since it represents savings instead of costs.

The proposed method takes the nation as a whole and considers the cost to the country of raising the children, and the net earnings of these persons after reaching majority age. In the U.S. for example, Hanlon[5] states that a child who dies before 18 represents a net economic loss ranging

from $800 (if death is at childbirth) to $29,000 (if death is at age 18), while the person who lives beyond 18 represents during the rest of his life a net economic gain of about $50,000 (above his own living expenses).

It is thus reasonable to assume that, based on studies by Dublin[2], et al, a death at 15 represents a net loss to society while a death at 40 represents a net economic gain to society, and a death at 65 represents a net gain of more than twice as great.[8]

With these assumptions, it is seen that the total net loss per male who dies at median age a is

$$C_1 F_1 + C_2 F_2 + C_3 + R(1-w)\ (F_3 - F_4) = H_i \qquad (9)$$

while the total net loss per female is

$$C_1 F_1 + C_2 F_2 + C_3 - Rw(F_3 - F_4) = G_i \qquad (10)$$

Therefore the total loss for period Y_1 is

$$\sum_{i=1}^{k} g_{1i} u_{1i} (H_i + G_i)$$

and that for period Y_2 is

$$\sum_{i=1}^{k} g_{2i} u_{2i} (H_i + G_i)$$

The difference between these two figures is the expected annual savings per capita from improvement in mortality rates. Since only a fraction b of this is attributed to improved sanitation, the economic gain will then be

$$L_2 = b \sum_{i=1}^{k} (g_{1i} u_{1i} - g_{2i} u_{2i})\ (H_i + G_i) \qquad (11)$$

It is seen that the economic gain is due primarily to the shift in population age distribution, as noted above, and which results from an improvement of mortality rates.

The overall economic gain will therefore be the sum of (4) and (11)

$$L = L_1 + L_2 \qquad (12)$$

To illustrate the application of this method, an actual example will be worked out as was done in a recent World Health Organization Seminar[6] (on organic wastes held in Taipei, Taiwan, Oct. 14 to Nov. 1, 1956). Asian conditions will be used as the basis of the assumptions.

I. Economic Gain Due to Increase in Productivity and Decrease in Medical Care.

Although all filth-borne diseases are more or less debilitating in the occurrence, let us consider only three important diseases, namely ascariasis, hookworm, and amebiasis (D_1, D_2, D_3) which cause a large majority of debilitation. It is assumed, as mentioned earlier that these diseases are mutually exclusive. It is realized that diarrhea and enteritis which are also attributable to inadequate environmental sanitation cause probably no less economic losses than each of these three diseases. Thus the figures resulting from the use of only the three diseases will be underestimated.

Arbitrarily let us divide these diseases into three categories of severity of infections: severe, moderate, and mild (S_1, S_2, S_3), and assume that these severities cause 95%, 60%, and 15% loss of productivity (r_1, r_2, r_3), respectively, for each of the three diseases. An assumption which will have to be made is the percentage of population p_{ij} affected by each severity per year. Studies of available literature in the WHO seminar[6] indicated that the following figures appear to have some justification.

	Severe	Moderate	Mild	Total
Ascariasis	.1	4.0	20.9	25.0
Hookworm	1.0	4.0	5.0	10.0
Amebiasis	1.0	2.0	3.0	6.0

For the various percentages of time q_{ij} during a 12-month

period during which a person is ill for the various severities of the three diseases, the following were considered a fairly close estimate:

	Severe	Moderate	Mild
Ascariasis	2	10	100
Hookworm	2	10	100
Amebiasis	5	50	100

Because a severely sick person needs to be attended by at least two persons while a moderate case requires only one full-time and another half-time attendant, the medical cost factor f was assumed to be 3, 1.5, and 1.0 for those with a severe, moderate, and mild disease, respectively. For non-wage earners, these factors become 2, 0.5, and O, respectively.

Under Asian conditions it might be fair to assume 25% of the population as wage earners and that they earn on the average ₱400 (₱1 Philippines = $0.50 U.S.) per year.*

Table I summarizes these assumptions and indicates that for every person in the whole population, 2.045% of a worker's salary is lost due to the decrease in productivity resulting from the three debilitating diseases. Since it was assumed that one in four is a wage earner, this means that 8.18% of the total population's productivity or ₱8.18 per person per year is lost.

II. Economic Gain Resulting from Increased Productive Years.

Because of the lack of accurate or reliable statistical data in Asia covering the two periods mentioned, the application of the theoretical approach presents an almost insurmountable difficulty. It was felt that a comparable period of health improvement in the United States where fairly accurate vital statistics are available, would be more useful for purposes of illustration. The periods 1900-1902 and 1939-1941, will then be taken as Y_1 and Y_2, respectively. This interval was chosen primarily because it closely approximates the era which saw the virtual elimination of fecal and water-borne diseases and secondarily because it would not reflect the effects of various "wonder drugs" on prolonging the average life span. It may

*Based on the Philippine Statistical Survey of Households,[7] May, 1956 the figures are respectively 38.4% and ₱14.10 per week or about ₱705 for a 50-week year.

be estimated that this virtual elimination of filth-borne diseases was responsible for about 20% (the factor b) of the increase in life span. For, although there are relatively few actual deaths directly resulting from these diseases, the high and frequent infection pattern of these diseases certainly had their marked effects on the reduced resistance and early death from other infirmities or complications. In fact, C.E.A. Winslow[8], citing U.S. State Department Publication 3719 (1950) stated that in Mexico, 22% of the general mortality rate in 1948 is caused by water-borne diseases alone.

The other values of the various quantities that enter into the computations are assumed as follows:

C_1 = ₱50, cost of being born

C_2 = ₱20, annual cost of raising a child to median age 17.5

C_3 = ₱100, cost of burial

Rs = ₱100, what a wage earner spends on himself
$R_{(1-s)}$ = ₱300, a wage earner's net earnings
t = 5%, interest on money
A = 17.5 years, median age of group which starts to earn
Z = 65 years, age of retirement

For convenience, the details of the computations are given in Table 2. From the results it is seen that the shift in population age distribution and the decrease in mortality rates has resulted in an economic gain of ₱24.10 per capita out of ₱100 average income. Since only 20% of this is attributable to better sanitation, the resulting economic gain is therefore ₱4.82 per capita per year.

Thus the total monetary value of improved health due to improvement in sanitation is 4.82 + 8.18 or 13% of the average annual income, that is ₱13.00 per capita per year. For a country like the Philippines with a population of about 22 millions, the total gain to be realized is therefore of the order of ₱286,000,000 annually.

This estimate of monetary loss, it must be remembered, was based only on three debilitating diseases, so that if other diseases resulting from poor sanitation is also considered, the annual economic gain that might be expected would be far beyond the stated sum.

REFERENCES CITED

1. Padua, R. G. (1951) Official Records of World Health Organization Vol. 35, No. 38.

2. Dublin, L. I., Lotka, A. J. and Spiegelman, M. (1947) The Money Value of Man. New York.

3. Lesaca, R. M., Fitzgerald, E., Kim, K. S., Iwato, T. and Cabral, J. R. (1956) Economic Effects of Loss of Productivity as a Result of Infection by Diseases Attributed to the Improper Disposal of Organic Wastes. Group Task Report III, WHO Zone I, Environmental Sanitation Seminar, Taipei, Taiwan.

4. Lesaca, R. M., Fitzgerald, E., Kim, K. S., Iwato, T. and Cabral, J. R. (1956) Economic Loss Due to Shortening of the Productive Life Span of Labourers and Farmers, and Loss of Life Before Economic Productivity as a Result of Infection of Various Diseases. Group Task Report IV, WHO Zone I, Environmental Sanitation Seminar, Taipei, Taiwan.

5. Hanlon, J. J. (1955) Principles of Public Health Administration. C. V. Mosby Co., St. Louis. p. 70.

6. Report on the WHO Zone I Environmental Sanitation Seminar on the Collection, Disposal, and Utilization of Organic Wastes. (Held in Taipei, Taiwan, October 14, to November 1, 1956) WPRO WHO Publication.

7. Philippine Statistical Survey of Households Bulletin. (1957) Vol. I Nos. 1 and 2. National Economic Council, Manila. p. 21.

8. C. E. A. Winslow (1951) The Cost of Sickness and the Price of Health. WHO Monograph Series No. 7, pp. 11 and 19.

TABLE I

COMPUTATION OF LOSS IN PRODUCTIVITY DUE TO COMMON DEBILITATING DISEASES

DISEASE AND SEVERITY	D_1 — ASCARIASIS		
	Severe	Moderate	Mild
	S_1	S_2	S_3
1. Proportion productivity lost during period of illness, r	0.95	0.60	0.15
2. Proportion of population affected in a 12-month period, p	0.001	.040	.209
3. Proportion of 12 months a person is ill, q	0.02	0.10	1.00
4. Product of these 3 factors, pqr	.000019	.0024	.0314
5. Proportion of population who are wage earners, w	0.25	0.25	0.25
6. Medical cost factor for wage earners, f	3.0	1.5	1.0
7. Proportion of population who are not wage earners, 1-w	0.75	0.75	0.75
8. Medical cost factors for non-wage earners, f-1	2.0	0.5	0
9. Product for wage earners (4) x (5) x (6)	0.000014	.00090	.00785
10. Product for non-wage earners (4) x (7) x (8)	.000027	.00090	0
11. Sum of two products (9) + (10)	.000041	.00180	.00785
12. Sum for each disease	.00969		

TABLE I (CONTINUED)

COMPUTATION OF LOSS IN PRODUCTIVITY DUE TO COMMON DEBILITATING DISEASES

DISEASE AND SEVERITY	D_2 — HOOKWORM		
	Severe	Moderate	Mild
	S_1	S_2	S_3
1. Proportion productivity lost during period of illness, r	0.95	0.60	0.15
2. Proportion of population affected in a 12-month period, p	0.01	0.04	0.05
3. Proportion of 12 months a person is ill, q	0.02	0.10	1.00
4. Product of these 3 factors, pqr	.00019	.0024	.0075
5. Proportion of population who are wage earners, w	0.25	0.25	0.25
6. Medical cost factor for wage earners, f	3.0	1.5	1.0
7. Proportion of population who are not wage earners, 1-w	0.75	0.75	0.75
8. Medical cost factors for non-wage earners, f-1	2.0	0.5	0
9. Product for wage earners (4) x (5) x (6)	.00014	.00090	.00188
10. Product for non-wage earners (4) x (7) x (8)	.00027	.00090	0
11. Sum of two products (9) + (10)	.00041	.00180	.00188
12. Sum for each disease	.00409		

TABLE I (CONCLUDED)

COMPUTATION OF LOSS IN PRODUCTIVITY DUE TO COMMON DEBILITATING DISEASES

DISEASE AND SEVERITY	D_3 — AMEBIASIS		
	Severe	Moderate	Mild
	S_1	S_2	S_3
1. Proportion productivity lost during period of illness, r	0.95	0.60	0.15
2. Proportion of population affected in a 12-month period, p	0.01	0.02	0.03
3. Proportion of 12 months a person is ill, q	0.05	0.50	1.00
4. Product of these 3 factors, pqr	.00047	.0060	.0045
5. Proportion of population who are wage earners, w	0.25	0.25	0.25
6. Medical cost factor for wage earners, f	3.0	1.5	1.0
7. Proportion of population who are not wage earners, 1-w	0.75	0.75	0.75
8. Medical cost factors for non-wage earners, f-1	2.0	0.5	0
9. Product for wage earners (4) x (5) x (6)	.00035	.00225	.00112
10. Product for non-wage earners (4) x (7) x (8)	.00070	.00225	0
11. Sum of two products (9) + (10)	.00105	.00450	.00112
12. Sum for each disease	.00667		
13, Sum for three diseases	0.02045		

TABLE 2

COMPUTATION OF ECONOMIC GAIN RESULTING FROM INCREASED PRODUCTIVE YEARS

Age Group (1)	Median Age, a (2)	F_1 (3)	F_2 (4)	F_3 (5)	F_4 (6)	$C_1 F_1$ (7)	$C_2 F_2$ (8)	C_3 (9)	$R(1-w)x(F_3-F_4)$ (10)	$Rw \times (F_3-F_4)$ (11)
Under 5	2.5	1.13	12.98	8.65	0	57	260	100	2595	865
5-14	10	1.63	18.70	12.44	0	82	374	100	3732	1244
15-19	17.5	2.35	26.98	18.03	0	118	540	100	5409	1803
20-24	22.5	3.00	34.55	17.48	5.53	150	691	100	3585	1195
25-34	30	4.32	49.64	16.37	16.82	216	993	100	-135	-45
35-44	40	7.04	80.94	14.09	39.97	352	1619	100	-7,764	-2,588
45-54	50	11.47	131.66	10.38	77.68	573	2633	100	-20,190	-6,730
55-64	60	18.68	214.49	4.33	139.11	934	4290	100	-40,434	-13,478
65 and over	70	30.40	349.66	——	139.00	1530	6933	100	-41,733	-13,900

NOTE:

$F_1 = (1.05)^a$

$F_2 = \dfrac{26.98}{(1.05)^{17.5-a}}$

$F_3 = \dfrac{18.03}{(1.05)^{17.5-a}}$ a ≤ 17.5

$= \dfrac{1-(1.05)^{a-65}}{.05}$ a ≥ 17.5

$F_4 = 0$ a ≤ 17.5

$= \dfrac{(1.05)^{a-17.5}-1}{.05}$ a ≥ 17.5

C_1 = ₱50, cost of being born

C_2 = ₱20, annual cost of raising a child to 17.5 years

C_3 = Cost of burial

TABLE 2 (CONTINUED)

COMPUTATION OF ECONOMIC GAIN RESULTING FROM INCREASED PRODUCTIVE YEARS

Age Group	Median Age, a	H	G	Y : 1900-1902			
				l_1	Prod. Period	Percent Pop. g_1	Mortality Rate Per 1,000 u_1
(1)	(2)	(12)	(13)	(14)	(15)	(16)	(17)
Under 5	2.5	3012	-448	50	47.5	11.8	78
5-14	10	4288	-688	51	47.5	21.8	3.5
15-19	17.5	6167	-1,045	45	45	10.0	4.8
20-24	22.5	4526	-254	43	42.5	9.3	6.0
25-34	30	1174	1354	36	35	16.2	7.9
35-44	40	-5,693	4659	28	25	12.4	10.0
45-54	50	-16,884	10036	22	15	8.5	15
55-64	60	-35,110	18802	15	5	5.4	28
65 and over	70	-33,170	22403	7	——	4.6	148

$$H = C_1 F_1 + C_2 F_2 + C_3 + R(1-s)(F_3 - F_4) = \text{total loss per male}$$

$$G = C_1 F_1 + C_2 F_2 + C_3 - RS(F_3 - F_4) = \text{total loss per female}$$

TABLE 2 (CONCLUDED)

COMPUTATION OF ECONOMIC GAIN RESULTING FROM INCREASED PRODUCTIVE YEARS

Age Group (1)	Y_2 : 1939-1941 $_1^2$ (18)	Prod. Period (19)	Percent Pop. g_2 (20)	Mortality Rate per 1,000 u_2 (21)	$g_1u_1 - g_2u_2$ (22)	H + G (23)	(22) X (23) Millions (24)
Under 5	65	47.5	8.5	27	691	2564	1.77
5-14	59	47.5	16.6	1.0	60	3600	0.22
15-19	52	47.5	9.2	1.2	37	5122	0.19
20-24	47	42.5	8.8	1.9	39	4272	0.16
25-34	40	35	16.1	2.5	88	2528	0.22
35-44	31	25	13.9	4.4	63	-1,034	-0.06
45-54	23	15	12.0	9.5	14	-6,848	-0.10
55-64	16	5	8.3	21	-23	-16,308	0.38
65 and over	8	——	6.6	132	-190	-10,707	2.04
							4.82

Total Gain = ₱4.82 million for 200,000 population.

Column 22: The product gu represents the number of males or females dying per 100,000. Hence, total gain is per 200,000 population, as stated.

PHILIPPINE INTER-COMPANY MORTALITY INVESTIGATION INITIAL REPORT*

Robert L. Bergstresser, F. S. A.

This is an attempt of insurance companies operating in the Philippines to secure mortality statistics on insured lives in this country. While all companies are aware of the importance of this investigation, only three were able to participate in this initial investigation. The data have been compiled by Mr. D. Francisco of the National Life, Mr. V. Gonzalez of the United States Life, and Mr. J. Abanilla, Jr. of the Insular Life. While it is true that in the past several attempts were made to start a Philippine inter-company mortality investigation, no real progress was made until recently when the matter was again revived during the 1957 visit in the Philippines of Mr. Henry F. Rood, President of the Society of Actuaries of America, and thanks to the able direction and work of Mr. Robert L. Bergstresser, F.S.A., Consulting Actuary of the Insular Life, and the full cooperation of the participating companies, the investigation was actually started and the initial work completed. A number of American actuaries have been consulted.

The study would estimate a five year select and ultimate table with emphasis on the ultimate table. The exposure would start at the policy anniversary date in 1956 and the period thereafter.

I. Scope of Investigation

A series of annual investigations by number of policies and amount of insurance of the mortality on Philippine standard ordinary insurance. While it is desirable to have as much uniformity among the contributing companies as possible, complete uniformity is not essential so long as each company is consistent in its own treatment of exposures and death claims. For instance, different companies could adopt different definitions of Philippine business, such as insurance written in the Philippines, insurance on lives of residents of the Philippines regardless of where originally issued, etc. Another example: it would not matter greatly if different companies used different systems for determining amounts of insurance on decreasing term riders provided each company treated its claims in the same way as its exposures.

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* Read by E. S. Sevilla for Robert L. Bergstresser, F. S. A. to the Sixth Annual Conference of the Philippine Statistical Association, June 28, 1958.

II. Type of Investigation.

To derive the exposure primarily from the inforce records of the contributing companies as of the end of each successive calender year. To obtain the exposures as of the policy anniversaries in 1956: (a) The insurance inforce on December 31, 1956 and (b) the exposures on death claims incurred in 1956 after the policy anniversary date and reported prior to the end of that calendar year. The claims corresponding to this exposure will of course not be known completely until after December 31, 1957, in the case of policies with December anniversaries. A minor disadvantage is that the exposure for the first policy year will be understated to the extent that some business dated in 1956 was not reported paid until sometime in 1957.

III. Basis of Expected Mortality.

In the absence of any suitable table of modern Philippine experience, we have used the new Table X^{18} (upon the suggestion of Mr. N. F. Buck, Associate Actuary, Lincoln National Life through Mr. R. L. Bergstresser, Consulting Actuary) which represents American inter-company standard experience in the sixth and subsequent policy years, between policy anniversaries of 1950 and 1954.

IV. Subdivisions of Exposures.

The basic subdivisions of exposures are (a) ordinary business with medical examinations (b) ordinary non-medical business and (c) group business. Classification by sex and race is not indicated in the valuation records of several companies.

V. Claims.

A. The basic point is that each company treat its claims in the same way as its exposures.

B. *Compromises* — On compromised claims, legal and investigation expenses are excluded from the claim amount. When the amount of exposure in the study on a particular case is not the same as the insured amount in that year, the amount entered in the study as a claim would bear the same relationship to the exposure amount.

C. Claim payments for less than the insured amount.

1. Suicide within 2 years from date of issue —

   Death claim treated as full face amount for exposure but amount actually paid for claim was taken up as amount actually paid, excluding legal expenses and interest paid due to delay in settling claim.

2. Pregnancy Lien — Premium refund if death occurs within the stated period after issue date — treated as Item No. 1.

3. Aviation Death on Policies with an Aviation Exclusion Clause — treated as Item No. 1.

4. War Deaths — On policies with war exclusion clause treated as Item No. 1.

D. Misstatements of Age — We made an attempt to segregate misstatements of age. We found this item insignificant insofar as the entire population of data is concerned.

E. Delayed Claims — When a claim is not reported until too late to get into the study for the proper year it would be reported and included at the correct age and policy duration in the next study made after the claim is reported. In this way the studies for several successive years would be combined and the claims should be correct in total.

F. Unsettled Claims — When a claim has not been settled by the time the appropriate investigation is made, an estimate of the amount payable is made. If this estimate proves to be incorrect, an adjustment will be made in the subsequent study. This adjustment is similar to that of the delayed claims.

G. Data on Individual Claims — Data compiled on claims are as follows: age at issue, date of issue, date of death, date reported, amount of insurance, plan of insurance, amount of claim, and insured's name.

VI. Special Problems.

A. Substandard Business — We excluded this for the present. The group is too heterogenous.

B. Joint Life Policies — Excluded because of different treatments by different companies. True ages of both insureds could not be possible and a claim in one insured of the joint lives loses the exposure risk of surviving insured.

C. Reinsurance — Excluded were the reinsurance accepted and reinsurance ceded, not deducted either from the financial exposure or life exposure.

D. Juvenile Policies with Graded Death Benefits in the Early Years— In these cases amount of risk would be used for exposures and the same amount for claims. These cases give us actual mortality rates independent of the variation of the death benefit, which is proper because the true mortality rate is used in the premium calculation with the proper modification in the premium formula for any variation in the amount of the death benefit.

E. Retirement Income Type of Policies in which the cost value exceeds the nominal face amount — Exposure amounts same as amounts for claims.

F. Policies with varying amounts of insurance such as decreasing term riders — Treated as Item D.

G. Migration of Policyholders — Treated as Item D.

H. Currency — The study was made by number of policies and by financial exposure. Financial exposure in dollar were converted to pesos at the rate of $0.50 per peso.

I. Policies issued without evidence of insurability, e. g., conversions from group insurance were excluded from the study since their mortality will markedly affect the results in the early policy years.

J. Policy options of extended term insurance and reduced paid-up are not included in the study.

The initial report on the study prepared by Mr. R. L. Bergstresser is as follows:

"PHILIPPINE INTER-COMPANY MORTALITY INVESTIGATION

Initial Report on Experience between 1956 and 1957 Anniversaries

"This report comprises the first installment of data for the 1956-1957 policy year. Three companies (Insular Life, United States Life, and National Life) were able to supply data for that year; some others hope to be able to reconstruct their exposures, in which case a new summary will be prepared for the expanded data.

"The size of the exposure is shown in the folowing table, in which the Insular Life accounts for about two-thirds of the total:

Policy Year	Number of Policies	Amount of Insurance
1	24,418	₱ 85,148,826
2	12,343	47,799,485
3	7,308	26,985,685
4	4,882	17,238,099
5	4,091	13,351,602
6 and over	25,506	86,071,725
Total	78,548	₱276,595,422

"While data was submitted from age O upwards, the bulk of the exposure was in the range of issue ages 20-50. Even in the ultimate section, the exposures were sparse above age 60.

"The expected and actual claims for the three companies combined are given below. Expected claims were computed on Table X_{18} for select durations as well as for the ultimate durations.

INTER-COMPANY MORTALITY INVESTIGATION

Policy	Expected Deaths		Actual Deaths		A. / E.	
Year	Number	Amount	Number	Amount	No.	Amount
1	54.74	₱212,384	30	₱102,841	54.8%	48.4%
2	27.27	149,252	26	66,000	95.3	44.2
3	15.39	66,082	14	80,000	91.0	121.1
4	10.91	44,726	9	36,000	82.5	80.5
5	8.55	34,757	8	26,000	93.6	74.8
6 and over	115.26	442,283	100	354,000	86.8	80.0
Total	232.12	₱949,484	187	₱664,841	80.6%	70.0%

"The two largest single claims noted were one for ₱20,000 at duration 1 and one for ₱30,000 at duration 3.

"For the year studied, 1956-1957, the over-all mortality was quite favorable in comparison to the recent American data represented by Table X_{18}.

"It is hoped that the combined experience of seven companies will be included in next year's report covering the two years 1956-1958.

R. L. BERGSTRESSER
Consulting Actuary"

May 1, 1958.

A word of caution: Although the above results appear to be optimistic, insurance premiums and non-forfeiture values should not be accordingly modified just yet.

No actual statistical tests have been made as to be the reliability of results. The set of data used here is so small a proportion of the entire universe that we cannot say that it is representative. However, as more companies participate in this study in the coming years, it is expected that more reliable results would be obtained.

GRADUATED 1950-1954 EXPERIENCE TABLE (TABLE X18)

Age	Mortality Rate	Age	Mortality Rate	Age	Mortality Rate
0	.00633	35	.00141	70	.04330
1	.00100	36	.00153	71	.04709
2	.00078	37	.00168	72	.05100
3	.00066	38	.00187	73	.05501
4	.00058	39	.00210	74	.05923
5	.00052	40	.00236	75	.06380
6	.00047	41	.00264	76	.06885
7	.00043	42	.00295	77	.07452
8	.00040	43	.00328	78	.08092
9	.00038	44	.00363	79	.08799
10	.00037	45	.00402	80	.09564
11	.00039	46	.00445	81	.10378
12	.00043	47	.00492	82	.11232
13	.00047	48	.00546	83	.12120
14	.00051	49	.00606	84	.13045
15	.00055	50	.00672	85	.14012
16	.00061	51	.00745	86	.15027
17	.00067	52	.00821	87	.16098
18	.00075	53	.00902	88	.17239
19	.00081	54	.00992	89	.18475
20	.00085	55	.01091	90	.19838
21	.00087	56	.01201	91	.21371
22	.00089	57	.01322	92	.23124
23	.00090	58	.01455	93	.25147
24	.00092	59	.01599	94	.27490
25	.00093	60	.01757	95	.30303
26	.00095	61	.01928	96	.34336
27	.00098	62	.02112	97	.40979
28	.00100	63	.02310	98	.52262
29	.00104	64	.02525	99	.70855
30	.00108	65	.02761	100	1.00000
31	.00113	66	.03021		
32	.00118	67	.03308		
33	.00124	69	.03966		
34	.00132	68	.03624		

PHILIPPINE STATISTICAL ASSOCIATION

Incorporated

P. O. Box 3223, Manila

BOARD OF DIRECTORS

For the Year 1958

OFFICERS

President ..... Manuel O. Hizon

First Vice-President..... Bernardino G. Bantegui

Second Vice-President .... Leon Ma. Gonzales

Secretary-Treasurer .... Domingo C. Alonzo

DIRECTORS

Paz B. Culabutan
Cesar M. Lorenzo
Vicente Mills
Exequiel S. Sevilla
Enrique T. Virata

---o---

PAST PRESIDENTS

1. Cesar M. Lorenzo 1951-1955
2. Enrique T. Virata 1956
3. Exequiel S. Sevilla 1957

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

SYCIP, GORRES, VELAYO & CO.

Certified Public Accountants

490 San Luis, Manila

Philippine Statistical Association, Incorporated

Manila

We have examined the statement of cash receipts and disbursements of Philippine Statistical Association, Incorporated for the year ended December 31, 1957. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying statement of cash receipts and disbursements, with the notes to this statement, presents fairly the transactions of Philippine Statistical Association, Incorporated for the year ended December 31, 1957, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

(SGD.) SYCIP, GORRES, VELAYO & CO.

April 21, 1958

PHILIPPINE STATISTICAL ASSOCIATION, INCORPORATED
STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
FOR THE YEAR ENDED DECEMBER 31, 1957

The Association started the year 1957 with:

Petty Cash	₱ 100.00	
Philippine Trust Company-Current Account	237.00	
Philippine Trust Company-Savings Account	2,095.96	
Security Bank and Trust Co.-Savings Account	7,836.84	₱10,269.80

During the year cash was received from:

Individual members for their dues	₱ 790.00	
Institutional members' contribution for 1957	7,450.00	
Interest on savings deposits	126.34	
Interest received on government rehabilitation and development bonds	195.05	
Individual members for their share of luncheon meeting expenses	428.00	
Non-member subscriptions to the "Philippine Statistician"	12.00	9,001.39
The total funds available therefore amounted to		₱19,271.19

To carry out the activities of the Association, cash was spent for:

Printing and bookbinding of "The Philippine Statistician"	₱4,773.77	
Salary of the Executive Director	3,600.00	
Luncheon meeting expenses	2,104.50	
Clerical help	2,040.00	
Registration fees for students at the Statistical Center during the In-Service training sponsored by the Association	224.00	
Transportation of clerical help	180.00	
Stationery and supplies	156.10	
Messenger service	150.60	
Photographs and cuts	110.50	
Postage and cables	42.40	
Post Office box rental	16.00	
Miscellaneous	23.68	
Total amount spent during the year		13,421.55

This left cash balances as at December 31, 1957 of:

Petty Cash	₱ 100.00	
Philippine Trust Company-Current Account	690.50	
Philippine Trust Company-Savings Account	1,117.53	
Security Bank & Trust Co.-Savings Account	3,941.61	₱ 5,849.64

PHILIPPINE STATISTICAL ASSOCIATION, INCORPORATED
NOTES TO STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
DECEMBER 31, 1957

In addition to the above cash funds, the Association had the following assets and liabilities as at December 31, 1957:

a) Office Equipment:

	Cost	Accumulated Depreciation	Net Book value	
Two filing cabinets	₱ 802.50	₱ 663.50	139.00	
One "Underwood" typewriter	500.00	295.82	204.18	
One typewriter table and chair	61.00	30.00	31.00	
One office table	31.67	15.30	16.37	
One index card cabinet	50.50	14.30	36.20	
	₱1,445.67	₱1,018.92		₱ 426.75

b) 5 Government rehabilitation and development bonds (due 1959) 5,000.00

c) Individual members, dues still uncollected:

1956 dues	₱160.00	
1957 dues	360.00	520.00

d) Advances on luncheon meetings (as shown in the Association's subsidiary ledger):

Due from members	88.00	
Due from non-members	36.00	124.00

e) Interest on savings accounts not taken up in the Association's books:

Philippine Trust Company	₱ 14.01	
Security Bank and Trust Company	69.50	83.51

f) Expenses unpaid (all paid in March, 1958)

Printing Expenses	₱660.00	
Postage stamps	6.70	666.70

PHILIPPINE STATISTICAL ASSOCIATION, INCORPORATED
COMPARATIVE STATEMENTS OF CASH RECEIPTS AND DISBURSEMENTS FOR THE SIX MONTHS PERIOD ENDED JUNE 30, 1957 & 1958

	1957		1958	
The Association started the year with:				
Petty cash	₱ 100.00		₱ 100.00	
Philippine Trust Company-Current-Account	237.00		690.50	
Philippine Trust Company-Savings-Account	2,095.96		1,117.53	
Security Bank and Trust Company-Savings	7,836.84		3,941.61	
Central Bank R & D Bonds	5,000.00	₱15,269.80	5,000.00	₱10,849.64
During the period cash was received from:				
Life membership	₱ —		₱ 732.00 *	
Individual members for their dues	390.00		200.00	
Institutional members' contributions	6,250.00		4,450.00 [1]	
Interest on savings deposits	49.66		83.51	
Interest on Central Bank R & D Bonds	—		100.00	
Non-member subscription to Phil. Statistician	12.00		8.00	
Collected from members for their share of luncheon meeting expenses	152.00		140.00	
Share of Mr. Max Lacroix in the reprinting expense of his article published in the Phil. Statistician Vol. VII, No. 1	—	6,853.66	47.50 [2]	5,761.01
The total funds available therefore amounted to		₱22,123.46		₱16,610.65
To carry out the activities of the Association, cash was spent for:				
Printing of the Phil. Statistician	₱1,859.50		660.00	
Bookbinding of the Phil. Statistician	326.25		—	
Reprints of the Phil. Statistician	261.00		—	
Annual Conference program	100.00		80.00	
Registration fees for students at The Statistical Center during the In-Service training sponsored by the Association	224.00		368.00	
Meetings-Committee on National Income	32.40		—	
Meetings-Meetings of the Board	230.80		174.40	
Meetings-Expenses for guests and delegates of				

Institutional Members	320.30		534.20	
Meetings-Annual Conference ..	527.00		238.20	
Salary of Executive Director	1,800.00		900.00	
Clerical Help	960.00		900.00	
Office Equipment	—		103.23	
Stationeries and supplies	115.75		204.10	
Postage and cables	12.40		11.70	
Photographs and cuts	37.50		—	
Metropolitan Express Co. (Messenger Service)	72.40		—	
Transportation of Clerical Help	90.00		90.00	
Notarial fees	5.00		—	
Post Office Box rental	16.00		16.00	
Bank Charges	1.58		2.50	
Total expenses for the period		6,991.88		4,282.33

This left cash balances as at June 30 of:

Petty cash	₱ 100.00		₱ 100.00	
Philippine Trust Company-Current Account	3,049.12		3,585.67	
Philippine Trust Company-Savings Account	1,106.44		1,131.54	
Security Bank & Trust Co-Savings Account	5,876.02		2,511.11	
Central Bank R & D Bonds	5,000.00	₱15,131.58	5,000.00	₱12,328.32

Note:

* Membership fees corresponding to the current year will be used for disbursements during the year 1958, the balance will be deposited as a life membership fund.

1/ Includes G. S. I. S. contribution for 1957.

2/ The cost of reprinting the article amounts to ₱118.75.

CERTIFIED CORRECT:

(Sgd.) DOMINGO C. ALONZO
Secretary-Treasurer

——oOo——

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PHILIPPINE STATISTICAL ASSOCIATION

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June 15, 1958

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(Required by Act 2580)

The undersigned, BERNARDINO G. BANTEGUI, editor of THE PHILIPPINE STATISTICIAN, published quarterly, in English at 18 J. Nieto, Paco, Manila, after having been duly sworn in accordance with law, hereby submits the following statement of ownership, management, circulation, etc., which is required by Act 2580, as amended by Commonwealth Act No. 201:

Name	Address
Editor: BERNARDINO G. BANTEGUI	18 J. Nieto, Paco, Manila
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Publisher: PHIL. STATISTICAL ASS'N.	P. O. Box 3223, Manila
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Office of Publication:	18 J. Nieto, Paco, Manila

If publication is owned by a corporation, stockholders owning one per cent or more of the total amount of stocks: None

Bondholders, mortgagees, or other security holders owning one per cent or more of total amount of security: None

In case of publication other than daily, total number of copies printed and circulated of the last issue dated March, 1958;

1. Sent to paid subscribers	486
2. Sent to others than paid subscribers	38
T o t a l	524

(Sgd.) BERNARDINO G. BANTEGUI
Editor

SUBSCRIBED AND SWORN to before me this 1st day of April, 1958, at Manila, the affiant exhibiting his Residence Certificate No. 0208837 issued at Manila, on Feb. 14, 1958.

Doc. No. 187
Page No. 39
Book No. V
Series of 1858

(Sgd.) GERARDO V. CUI
Notary Public
Until December 31, 1958

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