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## SECOND YEAR OF A DUAL RECORD SYSTEM IN WESTERN MISAMIS ORIENTAL

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### INTRODUCTION

This report is directed toward program administrators and higher executives of the Commission on Population and of the Population Center Foundation. It should however also be of interest to the Census and Vital Statistics officials and personnel, and to demographers and other vital statisticians, as well as to social scientists, social infrastructure project administrators, and to specialists or technicians in health and medical fields.

A combination of census base populations and of annual vital statistics is the most common method of preparing estimates of the vital statistics of a country. However, in many developing countries the vital statistics system covers less than 70 per cent of all birth and death events, and in some countries no such system exists at all. On the other hand, the census usually occurs only once every ten years or longer, and is easily outdated. While in the Philippines, currently, the census is taken every five years, the vital statistics system is far from complete and the amount of incompleteness varies from year to year. Registration systems of course can and should be improved. However, such improvement rests not upon the officials of the vital registration system so much as upon the citizens at large. If they do not make an effort to report promptly the births and deaths in their households, the coverage of the vital registration system will remain imperfect. Many experts believe that bringing about such a change in public mentality will require twenty years or more. For such reasons other methodologies have been worked out to supply the basis of estimates for the present years.

Principal methodologies worked out to provide such estimates of vital rates without requiring a recent census or a reasonably complete vital registration system are: sample registration areas, various techniques authored by William Brass, the maternity history approach, the own children method, multi-round surveys, and dual record studies.

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Dual record studies have been recognized as producing high quality estimates. But they tend to be expensive. The present series of dual record studies in western Misamis Oriental has as objectives producing high quality data in a relatively inexpensive manner. This series began in January 1978, and has completed its second year of operation, reported in the present document.

#### THEORETICAL BASIS OF THE DUAL RECORD SYSTEM APPROACH

This basis was explained in the first operational year's final report of the present series and thus can be more briefly treated here. It is based on the same idea as that frequently used in a census to gauge census under-registration, namely, a post-enumeration survey. A small sample is taken of the census population, which sample is then interviewed. The percentage of underenumeration found in the sample of the Census corresponding to the post-enumeration survey by means of the post-enumeration survey is then taken as the estimate of underenumeration (or overenumeration) of the entire census. The logic is that the true but unknown number of persons (or in the case of vital statistics of events, e.g., birth) is estimated by the equation:

$$n = n_1 n_2 / m$$

where  $n$  is the true number of persons (or events) estimated from the post-enumeration survey,  $n_1$  is the number of persons enumerated in the census,  $n_2$  is the number of persons enumerated in the post enumeration sample, and  $m$  is the number of matches, within certain tolerance limits, found between the persons recorded in the post-enumeration survey and the persons recorded in the same households by the census.

Chandrasekaran and Deming (1949) extended this post-enumeration check into a data-gathering method and used it with considerable success in a district of the Calcutta area, India. The basis of the method is the mathematical theorem of joint independent probability. This states that the probability of a joint occurrence is equal to the product of the two single independent occurrences. For example if  $P_f$  is the probability of a female child in a particular family line, and if  $P_t$  is the probability in the same family line of a tall child, then the probability of a tall, female child is  $P_f P_t$ , if  $P_f$  and  $P_t$  are independent probabilities.

#### THE DUAL RECORD PROJECT IN WESTERN MISAMIS ORIENTAL PROVINCE

Both the Census Bureau (on a national sample basis) and the Research Institute for Mindanao Culture (in a provincial area) carried out dual record studies between 1971 and 1975. This earlier Research Institute (RIMCU) project was fielded between September 1, 1971, and June 30, 1975, and produced high

quality estimates of birth and death rates for the areas of study, namely, a rural area in western Misamis Oriental, consisting of parts of four municipalities, and a 75 per cent sample of the Poblacion of Cagayan de Oro City. (See Madigan-Herrin, Smithsonian, 1976.) This study showed that dual record projects could be carried out more cheaply by relying (with very little loss of quality of data) upon one survey per year) and by a recording system based upon informants where the individual recorder covered a rather large tract of area (larger type clusters).

The sample of the present study consists of 80 area clusters (barangays) drawn with replacement in the first sampling stage from a complete listing of all barangays by total number of households as enumerated in the 1975 Census for the ten municipalities of western Misamis Oriental (no exclusions) by means of a table of random numbers. From each sampled cluster, a subsample of 50 households was drawn (ideal size), the usual procedure in PPS sampling in order to produce equal probability of selection for each element. Actual size as contrasted to ideal size depended upon the ratio of actual number of households at interview date to the 1975 Census enumeration total.

Within each barangay, the sample of households was picked by systematic sampling.

Choice of the western ten municipalities of the Province was motivated by the presence of a rural electric service cooperative whose birth and death rates the RIMCU had been following since 1971 in its first dual record study (POPLAB). It was desirable to maintain this series over a number of further years, spanning most of the 1970 decade.

A baseline survey obtained population counts per barangay, produced maps of the barangay areas with dwelling units entered upon the maps as well as other helpful detail, and listings of the households living in the barangay. It also was a means of familiarizing project workers with the area. The final report for operational year one presented the list of barangays in the Appendix.

On completion of the baseline survey, the recording system was put into the field. For the first operational year, this was not until February, 1978, because contractual and financial problems had held up operations of the baseline survey, scheduled for July 1, 1977. The recording system continued in the field until August of 1978, although the study period of observation terminated early in the morning of July 1, 1978. This was to ensure complete coverage of events up through the June 30 period. As is evident from the above recountal of dates, the recording system had to be partly retrospective as well as prospective, in order to cover the dates July 1, 1977 - June 30, 1978. It was not possible to begin field operations without the assurance of a signed contract, which did not eventuate until January, 1978.

The same financial problems plagued the operation in its second financial year, when the contract was signed well after the planned date for beginning of field operations. It has also plagued the third operational

year. Contracts, because antedated, permitted only about five or six months of the operational year. Although not ideal, this is the shape of the real world in which researchers must often live, and adjustment must be made to such problems.

The survey (System Two) takes place in July and August. During its operation, data collection by the recording system does not take place in the particular barrios where the survey is carrying on operations (usually not more than two weeks per barrio). The staff directing the recording system and that directing the interview system are different sets of people, except at the highest level.

The matching of the births and deaths of the two systems takes place in November and December, since this aspect has to await completion of the data processing. Computation of rates and statistical as well as substantial analysis can begin after the matching work is completed.

Independence of case getting by the workers of each system is an obvious necessity of a dual record system. Otherwise the theorem of joint independent probability does not apply. The final report for the first operational year details the manner in which the RIMCU strives to maintain this independence of systems.

#### CURRENT FERTILITY

Current fertility in the form of age specific birth rates for the period July 1, 1978 to June 30, 1979 was:

<u>15-19</u>	<u>20-24</u>	<u>25-29</u>	<u>30-34</u>	<u>35-39</u>	<u>40-44</u>	<u>45-49</u>	<u>TFR</u>	<u>GFR</u>	<u>GRR</u>
49.0	268.4	272.5	284.0	171.0	81.6	28.7	5,776.2	162.6	2,716.9

This set of rates is slightly higher than that for the preceding 18 months (January 1, 1977 - June 30, 1978), whose total fertility rate was approximately six per cent lower:

37.9	234.2	278.1	212.5	189.0	80.8	24.6	5,435.5	160.6	2,620.8
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The standardized crude birth rate summarizes the foregoing data and makes it more comprehensible by reducing it to a single figure. Standardization takes some population (here the population of the rural area of Misamis Oriental Province) and applies the birth rates to it in order to obtain a total of expected births for women of ages 15 to 49 for each of the two (or more) compared populations. These births are then divided by the total standardized population to produce the standardized rate. The standardized birth rate per

thousand persons computed and the rate similarly computed for January 1977 - June 1978 are:

<u>July 1978 - June 1979</u>	<u>January 1977 - June 1978</u>
36.5	34.8

Again a slight difference remains with slightly lower fertility in the earlier period. The data therefore do not show, for all women, a further decline in the birth rate since June 1978. The difference of 1.7 points is neither large enough to be significant nor important.

Comparison of the fertility for currently married women shows essentially the same time comparison, that is, an apparently slightly lower fertility in the earlier period, January 1, 1977 - June 30, 1978.

	<u>15-19</u>	<u>20-24</u>	<u>25-29</u>	<u>30-34</u>	<u>35-39</u>	<u>40-44</u>	<u>45-49</u>	<u>TFR</u>	<u>GFR</u>	<u>GRR</u>
1977-78	539.1	479.2	356.6	241.5	208.8	90.6	27.4	9,716.0	270.6	4,678.1
1978-79	542.0	539.8	369.4	330.6	190.4	90.9	33.3	10,481.8	282.7	5,040.2

Actually, close inspection of the rates shows that most of the difference occurs at ages 20-24 and 30-34 years of age. Other differences are small.

#### TIME TRENDS, AGE SPECIFIC RATES

Table 1 presents data disaggregated to the two six month periods, July 1, 1978 - December 31, 1978 and January 1, 1979 - June 30, 1979. Each of these sets of data have been annualized. For comparative purposes, the table also presents data for the two nine month periods, January 1, 1977 - September 30, 1977, and October 1, 1977 - June 30, 1978.

Examination of Table 1 shows that the slight increase in fertility level apparent in the more summary measures already seen, is not a general finding of the more disaggregated data. The disaggregated data show increases in some age groups over time but decreases in others. Further, often differences in fertility level for specific age groups between the two first time segments in each of the two periods are reversed by differences between the same age groups of the second segments of the same years. These findings suggest that fertility may have remained fairly constant over the two and a half years of the study since January 1977. The slight increases already noted appears to result principally from a recorded higher fertility for age groups 20 - 24 and 30 - 34 in the second period of observation.

Table 2 shows a longer time trend for study of fertility by dual record methods in western Misamis Oriental. Data for 1973-1975 are from the Philippine POPLAB Study (Madigan and Others, 1976, Table 23-8). The samples are not the same but they are drawn from the same population (the ten western municipalities of Misamis Oriental) by similar sampling procedures, namely, two-stage cluster probability sampling with a PPS design giving equal probability of selection to elements (households). The 1974-75 sample was about one-third the size of the sample of the present study.

The total fertility rates for the six periods compared in the table show a clear decline in level of fertility from approximately 6.6 thousand births per thousand women of ages 15-49 to a level ranging between 4.9 and 6.0 thousand (both scored in the first two periods of nine months each of the present study), a decline ranging from 9 to more than 25 per cent. In terms of crude birth rates, the decline has been from 43 births per thousand in 1973-74 to 36 in 1979. Although the decline may have leveled off during the last two years, it has been substantial over time, and probably can be expected to decline further with the passage of time, given reasonably normal living conditions. The various programs to reach the rural area should assist this decline.

#### Association Between Electricity Installation and Fertility

In the final report for Operational Year One of the present study, an inquiry was made into the possible association of installation of electricity in the dwelling unit and fertility. An electric service cooperative, administered by a governmental office, the National Electrification Administration (NEA), had provided rural electrification to those households in the western ten municipalities of Misamis Oriental Province, beginning in 1971. Costs of installation were moderate, although difficult for the poorer households to manage, and the cost of the minimum monthly electric bill was competitive or less than the corresponding price of oil lamps.

In fact, various types of data examined showed an association between electrification and lower fertility for the period of observation of operational year one of the study. One explanation of this finding was the hypothesis that to finance the costs of installation and the monthly bills (coming at the same time, since the poor would have to borrow the money for the installation and make monthly repayments), many families had tried to avoid a child during the year, and to this end they had begun practise of family planning. In short, the hypothesis was one of opportunity costs, with the benefit of electrification as the cost if expenses could not be met. A second hypothesis that families would also be buying on credit simple electric appliances like a clothes iron (for pressing laundered articles), an electric radio, and so forth, supplemented reasons why families installing electricity might be practising family planning.

Naturally, this finding was followed up during the second operational year of the study. This time however, a set of current birth rates was developed to compare the fertility of women whose families had installed electricity and of women whose families had not.

General characteristics of the population studied will be found on pages 7 and 8 of the report for operations year one. Characteristics of households that had installed electricity and those that had not are also described in the same source (8-12). These include percentage distribution of installing households, average number of installations per month, duration of marriage, age of married women, educational attainment, and mean number of children ever born.

The relevant birth rates are shown in Table 3. This table contrasts the current birth rates for two periods (July 1-December 31, 1978, and January 1 - June 30, 1979) of ever-married women who have installed electricity in their dwelling units with those who have not.

The two sets of birth rates for the electrified households clearly show lower fertility than the sets of rates for the non-electrified households. This is evident in an inspection of the columns of the table. More rates of the electrified households are lower than those of non-electrified households, and they are also cumulatively lower. The comparison of the average total fertility for both periods together sums up this difference. The rate for the electrified households was 10,324.4 births per thousand ever-married women, while it was 10,761.4 for the non-electrified households, while the average gross reproduction rates were respectively 4,772.8 and 4,974.8.

This result does not of course prove the hypothesis to be true, but it definitely supports the hypothesis. The question that needs to be answered is whether people with lower fertility install electrification to a greater extent or whether people who install electricity tend to be influenced in some way concerned with the electrification to decrease their fertility.

CURRENT MORTALITY IN WESTERN MISAMIS ORIENTAL PROVINCE

The crude death rates per thousand persons for the ten municipalities of the Province over the two years of the present study were as follows:

<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>Weighted Average</u>
12.4	9.4	7.7	10.0

These rates appear to show a downward trend in mortality. However, such a finding should be viewed with caution since annual fluctuations in the death rates appear to be large in Misamis Oriental Province. The trend from 1973 to 1977 shows similar movement in the opposite direction, for example.

<u>1973-74</u>	<u>1974-75</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>
9.4	8.4	12.4	9.4	7.7

From this data, one would conclude to a death rate fairly constant at the level of about 9 to 10 deaths per thousand persons.

### Age Specific Mortality

The usual finding of higher male mortality is apparent in the death rates by sex and age presented in Table 4. These rates are ungraduated. In each sex there is a slight improvement in mortality between the first period of six months and the second period. This difference more likely represents seasonal or annual variation rather than the beginning of a downward trend.

Table 5 presents the same mortality experience in graduated form. Graduation (the smoothing away of irregularities probably due to sampling variation) attempts to present an approximation to the true force of mortality, which is conceived, after the very early years of life, as representing the gradually increasing weight of mortality upon the populace by age and sex. Ages 0 to 4 were not graduated nor the values above 64. The graduation was accomplished by application of a Whittaker-Henderson Type A difference equation with the a constant set at 2.0, which emphasizes smoothness over fit but still keeps fairly close to the original data.

Tables 6 and 7 present additional data relevant to mortality but combining the 1978 data into an annual rate, and showing data for 1977 also.

Inspection of the death rates shows considerably lower death rates for children under one year of age and between ages 1 and 4 than revealed in the rates for 1977 and 1978. At present, it is not known whether these differences represent a real decline (as one would hope), or merely seasonal and/or annual variation.

Ages	<u>Males</u>				<u>Females</u>			
	<u>1977</u>	<u>1978a</u>	<u>1978b</u>	<u>1979</u>	<u>1977</u>	<u>1978a</u>	<u>1978b</u>	<u>1979</u>
0	122.7	33.8	28.4	68.1	126.0	55.5	50.5	53.8
1- 4	29.1	14.4	9.7	4.8	9.7	13.4	4.2	5.1

1977 January 1 - September 30, 1977.

1978a October 1, 1977 - June 30, 1978.

1978b July 1 - December 31, 1978.

1979 January 1 - June 30, 1979.

### Association Between Installation of Electricity and Mortality

In the first report, an attempt was also made to investigate a possible relationship between installation of electricity in the dwelling unit of the household and lower levels of mortality of children. Such an association was found in the data, in fact. This may reflect benefits due to electricity (e.g., women can increase family income by taking employment in the daytime and doing their housework at night by means of the electric light). Or it may reflect the higher mean educational attainments of those who install electricity.

In the present study for operational year two, an attempt was made to probe more deeply into this question by studying not only the mortality of children but the general mortality experience of the population. Have persons who live in dwelling units wherein electricity has been installed, experienced lower mortality during the year July 1, 1978 to June 30, 1979?

The data for the study are shown in Tables ( ), ( ), and ( ). The ungraduated rates are shown in Table ( ) and the graduated rates in Tables ( ) and ( ).

The data do show lower mortality for children less than four years of age, and indeed for ages 0 to 14. For the older population however, rates do not seem to differ by much. This may be because too many other factors beside the electrification or non-electrification of the home enter into the mortality experience of adults.

The fact that two periods of study in a row do show lower mortality for children is interesting, however. It may show better nutrition on the part of children of mothers with higher educational attainment and/or greater income. On the other hand, electrification of the home may enter into the picture through the benefits which electrification makes possible such as increased income.

#### COVERAGE RATES

Coverage rates in the first operational year which covered an 18 month period exhibited better birth than death coverage. This has been the usual experience of the RINCU dual record studies. This may be because death is not considered "lucky" to speak about, or possibly it may reflect failure to register deaths and burials without proper certification, for which penalties are heavier than for failure to register births. Or it may reflect both such factors and/or others besides.

Coverage percentages for operational year one were thus estimated:

	<u>1977</u>	<u>1978</u>	<u>1977-78</u>
Births	95.3	96.7	96.0
Deaths	68.5	85.4	77.0

Coverage of deaths improved during the second operational year, as might be expected. Results for this year were:

	<u>July - December</u> <u>1978</u>	<u>January - June</u> <u>1979</u>	<u>Mean</u>
Births	93.6	95.3	94.5
Deaths	74.3	89.3	81.8

The recording system of both rounds was based upon an informant system of gathering information. On the average, during our first operational year about five informants were contacted for each barangay. These usually consisted of such persons as the following: the barangay (barrio) captain, a midwife or mananabang, a sari-sari store owner, a barangay (barrio) councilman, and a housewife.

Experience of this type of informant led us finally to conclude that such persons usually reside in the barrio center, and that as a result they may be unaware of events which have occurred in remote areas of the barrio. During the second operational year, in addition to the informants listed above, an informant was picked from clusters of houses in various neighborhoods of the barrio.

The new arrangement is credited with the improvement of the case detection by the recording system workers. However, we are still not satisfied with the coverage of this arrangement, and plan in the third operational year to attempt a modified household visit, very short in length, to each of the sample households which will then also be visited later by a survey interviewer with a more substantial survey questionnaire.

#### SUMMARY

Briefly, fertility remained at about the same level during operational years one and two in rural western Misamis Oriental Province. However, fertility has clearly fallen over the years 1973 - 1979. The fertility levels found concord well with those estimated from the regional Area Fertility Study surveys.

Mortality also appears to have remained constant over time at a level of about 9 to 10 deaths per thousand since 1973. However, the data do show a slight decline since 1977, although this may represent nothing more than annual or seasonal variation.

Electrified households exhibited lower fertility in both operational years of study. In both operational years, the mortality of children was found to be lower in electrified than in non-electrified homes. However, the same more favorable mortality experience did not appear for older persons in homes where electricity had been installed.

Coverage rates remained high for fertility during the second operational year of study, and improved considerably for death reporting in the same period. It is hoped that mortality coverage will improve still further during the third operational year.

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## APPENDIX A: VARIANCE FOR 1978-1979 RATES

The Final Report for Operational Year One discussed the variance formulas used in the present study (pp. 21-22), and the sampling design.

It also presented the variances for the crude birth and death rates.

Variances are presented here for the estimates of the crude birth and death rates, 1978-1979, as well as for the age specific fertility rates.

	<u>Variance</u>	<u>Standard Error</u>	<u>Rate</u>	<u>95% Confidence Limits</u>	
Crude birth rate	.000002993	.00173	.0365	.0331	.0399
Crude death rate	.00000095639	.000978	.0108	.0089	.0127

## STANDARD ERRORS OF AGE SPECIFIC BIRTH RATES

	<u>15-19</u>	<u>20-24</u>	<u>25-29</u>	<u>30-34</u>	<u>35-39</u>	<u>40-44</u>	<u>45-49</u>
ALL Women	.0080	.0207	.0227	.0260	.0224	.0166	.0113
Currently Married Women	.0628	.0340	.0283	.0295	.0246	.0184	.0130

Appendix Table 1. Annualized Age Specific Birth Rates Per Thousand, for All Women and for Currently Married Women, 1977 - 1979, The Ten Western Municipalities of Misamis Oriental Province, Philippines

Ages	Birth Rates Per Thousand Persons Specified							
	All Women				Currently Married Women			
	1977 <sup>a</sup>	1977-78 <sup>b</sup>	1978 <sup>c</sup>	1979 <sup>d</sup>	1977 <sup>a</sup>	1977-78 <sup>b</sup>	1978 <sup>c</sup>	1979 <sup>d</sup>
15 - 19	72.6	63.2	41.2	56.8	493.8	584.3	449.0	635.1
20 - 24	244.4	224.0	252.7	284.1	513.2	445.2	496.2	583.1
25 - 29	299.6	256.6	282.3	262.7	372.6	340.7	385.6	353.1
30 - 34	238.2	186.3	299.1	268.8	269.7	213.3	345.7	315.6
35 - 39	185.5	192.5	206.3	135.8	204.0	213.6	230.0	150.8
40 - 44	117.3	44.3	74.5	88.8	131.4	49.7	83.2	98.6
45 - 49	39.3	9.8	19.3	38.1	43.4	11.3	22.6	44.0
GFR	176.0	145.2	163.4	161.7	292.7	248.5	283.8	281.6
TFR	5,984.5	4,883.9	5,877.0	5,675.1	10,140.5	9,289.6	10,061.6	10,902.4
GRR	2,957.5	2,281.2	2,716.9	2,623.6	5,011.4	4,344.8	4,651.5	5,040.2

<sup>a</sup>January 1 - September 30, 1977.

<sup>c</sup>July 1 - December 31, 1978.

<sup>b</sup>October 1, 1977 - June 30, 1978.

<sup>d</sup>January 1 - June 30, 1979.

Appendix Table 2. Annualized Age Specific Birth Rates Per Thousand Women, 1973 - 1979, Western Misamis Oriental, Philippines

Year/Period	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
1973-74	86.5	305.2	379.4	330.2	162.4	47.6	0.0	6,556.5
1974-75	81.4	287.6	238.6	245.6	198.2	87.3	26.9	5,828.0
1977	72.6	244.4	299.6	238.2	185.5	117.3	39.3	5,984.5
1977-78	63.2	224.0	256.6	186.3	192.5	44.3	9.8	4,883.9
1978	41.2	252.7	282.3	299.1	206.3	74.5	19.3	5,877.0
1979	56.8	284.1	262.7	268.8	135.8	88.8	38.1	5,675.1

Appendix Table 3. Annualized Age Specific Birth Rates Per Thousand Ever-Married Women by Age Group and By Electricity Use, Western Miasmis Oriental, Dual Record Study, 1978-1979

Age Group	Birth Rates Per Thousand Ever-Married Women			
	Electrified Households		Non-Electrified Households	
	1978 <sup>a</sup>	1979 <sup>b</sup>	1978 <sup>a</sup>	1979 <sup>b</sup>
15 - 19	454.6	684.1	472.1	623.1
20 - 24	511.2	719.5	584.0	535.8
25 - 29	391.0	301.0	360.7	367.3
30 - 34	253.0	197.4	379.9	381.0
35 - 39	237.4	146.6	219.0	153.1
40 - 44	49.3	115.4	95.8	66.5
45 - 49	9.8	29.5	28.4	37.9
GFR	234.5	246.1	301.1	287.6
TFR	9,531.8	11,117.1	10,698.7	10,824.0
GRR	4,406.6	5,139.0	4,946.0	5,003.5

<sup>a</sup>July 1 - December 31, 1978.

<sup>b</sup>January 1 - June 30, 1979.

Appendix Table 4. Annualized Age Specific Death Rates Per Thousand Persons by Sex and by Calendar Year, Western Misamis Oriental, Mindanao Center for Population Studies, July 1978 - June 1979

Ages	M a l e s		F e m a l e s	
	1978 <sup>a</sup>	1979 <sup>b</sup>	1978 <sup>a</sup>	1979 <sup>b</sup>
0	28.4	68.1	50.5	53.8
1 - 4	9.7	4.8	4.2	5.1
5 - 9	0.0	9.6	0.0	3.6
10 - 14	12.2	1.2	1.6	1.3
15 - 19	7.1	0.0	5.6	1.5
20 - 24	10.3	2.1	0.0	2.3
25 - 29	0.0	5.8	3.4	2.8
30 - 34	4.8	15.2	9.5	3.7
35 - 39	9.0	10.8	0.0	0.0
40 - 44	15.3	4.1	5.2	4.1
45 - 49	18.3	0.0	25.4	5.1
50 - 54	24.7	31.4	7.9	0.0
55 - 59	40.9	24.9	10.2	0.0
60 - 64	36.0	28.2	51.6	20.8
65+	86.4	61.2	24.2	25.9
All Ages	12.4	10.2	6.9	5.2

<sup>a</sup>July 1 - December 31, 1978.

<sup>b</sup>January 1 - June 30, 1979.

Appendix Table 5. Graduated Age Specific Death Rates Per Thousand Persons by Sex and by Calendar Year, Western Misamis Oriental, Mindanao Center for Population Studies,<sup>a</sup> July 1978 - 1979

Ages	M a l e s		F e m a l e s	
	1978 <sup>c</sup>	1979 <sup>d</sup>	1978 <sup>c</sup>	1979 <sup>d</sup>
0	28.4	68.1	50.5	53.8
1 - 4	9.7	4.8	4.2	5.1
5 - 9	3.1	1.9	0.5	1.6
10 - 14	4.4	2.6	1.0	1.7
15 - 19	5.3	3.4	1.5	1.8
20 - 24	6.1	4.4	2.1	1.8
25 - 29	7.1	5.8	3.1	1.9
30 - 34	8.9	7.4	4.6	2.1
35 - 39	11.8	9.2	6.7	2.4
40 - 44	15.8	11.5	9.8	3.0
45 - 49	20.6	14.8	14.0	4.0
50 - 54	26.1	19.0	19.1	5.6
55 - 59	32.0	23.3	25.4	7.8
60 - 64	37.7	27.7	32.8	10.6
65+	86.4	61.2	24.2	25.9
All ages	12.4	10.2	6.9	5.2

<sup>a</sup>Graduated by Whittaker-Henderson Type A Difference equations with constant  $a = 2.0$ .

<sup>b</sup>Ages 0-4 and 65+ are not graduated.

<sup>c</sup>July 1 - December 31, 1978 annualized.

<sup>d</sup>January 1 - June 30, 1979 annualized.

Appendix Table 6. Annualized Age Specific Death Rates Per Thousand Persons, by Sex, by Age Group and by Calendar Year, Western Misamis Oriental, January 1977 - June 1979

Ages	M a l e s			F e m a l e s		
	1977*	1978	1979*	1977*	1978	1979*
0	122.7	31.1	68.1	126.0	53.0	53.8
1 - 4	29.1	12.1	4.8	9.7	8.8	5.1
5 - 9	5.8	1.3	9.6	3.6	0.7	3.6
10 - 14	4.6	6.1	1.2	0.0	0.8	1.3
15 - 19	5.1	4.4	0.0	2.0	4.4	1.5
20 - 24	5.6	5.2	2.1	1.3	3.4	2.3
25 - 29	3.7	1.6	5.8	1.7	3.2	2.8
30 - 34	6.9	2.4	15.2	6.5	4.8	3.7
35 - 39	9.6	8.5	10.8	10.0	4.1	0.0
40 - 44	14.4	23.8	4.1	3.1	2.6	4.1
45 - 49	22.0	26.0	0.0	2.4	12.7	5.1
50 - 54	13.9	12.4	31.4	9.7	11.2	0.0
55 - 59	20.0	25.2	24.9	18.3	19.2	0.0
60 - 64	15.5	33.2	28.2	23.7	43.7	20.8
65 +	75.5	82.7	61.2	96.4	51.9	25.9
All Ages	15.0	11.0	10.2	9.8	7.8	5.2

\* Annualized six month period rates.

Appendix Table 7. Graduated Age Specific Death Rates Per Thousand Persons, by Sex, by Age and by Calendar Year, Western Misamis Oriental, Mindanao Center for Population Studies,<sup>a</sup> January 1977 - June 1979

Ages	M a l e s			F e m a l e s		
	1977	1978	1979	1977	1978	1979
0	322.7	31.1	68.1	126.0	53.0	53.8
1 - 4	29.1	12.1	4.8	9.7	8.8	5.1
5 - 9	3.6	1.9	1.9	0.0	0.8	1.6
10 - 14	4.3	2.6	2.6	0.5	1.1	1.7
15 - 19	5.1	3.4	3.4	1.5	1.5	1.8
20 - 24	6.0	4.5	4.4	2.4	2.0	1.8
25 - 29	7.3	6.1	5.8	3.5	2.6	1.9
30 - 34	9.0	8.5	7.4	4.7	3.7	2.1
35 - 39	11.0	11.6	9.2	6.3	5.5	2.4
40 - 44	13.0	15.1	11.5	8.0	8.3	3.0
45 - 49	14.9	18.7	14.8	10.3	12.4	4.0
50 - 54	16.4	22.1	19.0	13.3	17.7	5.6
55 - 59	17.6	25.9	23.3	16.7	24.1	7.8
60 - 64	18.7	29.9	27.7	20.4	31.2	10.6
65 +	75.5	82.7	61.2	96.4	51.9	25.9
All Ages	15.0	11.0	10.2	9.8	7.8	5.2

<sup>a</sup> Graduated by Whittaker-Henderson Type A Difference Equations with constant  $a = 2.0$ .

<sup>b</sup> Ages 0-4 and 65 are not graduated.

Appendix Table 8. Annualized Age Specific Death Rates Per Thousand Persons, by Age Group and by Presence of Electricity, Western Pisanis Oriental, Dual Record

Ages	Death Rates Per Thousand Persons On			
	Electrified Household		Non-Electrified Household	
	1978 <sup>a</sup>	1979 <sup>b</sup>	1978 <sup>a</sup>	1979 <sup>b</sup>
	<u>MALES</u>			
0	18.6	45.1	33.3	80.5
1 - 4	11.1	4.5	9.2	5.0
5 - 9	0.0	3.1	0.0	14.2
10 - 14	3.4	0.0	19.4	2.2
15 - 19	10.7	0.0	3.5	0.0
20 - 24	5.5	4.5	16.3	0.0
25 - 29	0.0	0.0	0.0	10.5
30 - 34	0.0	17.3	8.0	12.9
35 - 39	0.0	8.7	15.0	12.2
40 - 44	22.3	0.0	9.3	7.5
45 - 49	27.1	0.0	10.7	0.0
50 - 54	29.2	23.5	15.1	24.3
55 - 59	37.3	60.2	47.3	0.0
60 - 64	44.3	35.8	23.3	18.8
65+	57.7	69.9	105.9	48.9
All Ages	11.3	9.5	13.3	10.8
	<u>FEMALES</u>			
0	83.4	33.7	35.9	67.7
1 - 4	0.0	4.8	6.6	5.3
5 - 9	0.0	0.0	0.0	5.9
10 - 14	3.4	0.0	0.0	2.3
15 - 19	3.4	0.0	8.2	3.3
20 - 24	0.0	0.0	0.0	4.9
25 - 29	7.9	0.0	0.0	5.0
30 - 34	19.2	7.7	0.0	0.0
35 - 39	0.0	0.0	0.0	0.0
40 - 44	10.2	0.0	0.0	7.8
45 - 49	12.4	0.0	36.6	9.8
50 - 54	0.0	0.0	17.4	0.0
55 - 59	0.0	0.0	22.5	0.0
60 - 64	47.7	19.3	54.7	22.1
65 +	13.9	33.6	37.5	15.1
All Ages	7.1	3.3	6.9	7.0

<sup>a</sup>July 1 - December 31, 1978.

<sup>b</sup>January 1 - June 30, 1979.

Appendix Table 9. Graduated Age Specific Death Rates Per Thousand Persons, by Sex, by Age Group, and by Presence of Electricity, Western Misamis Oriental, July 1 - December 31, 1978<sup>a</sup>

Age Group <sup>b</sup>	Electrified Households		Non-Electrified Households	
	Male	Female	Male	Female
0	18.6	83.4	33.3	35.9
1 - 4	11.1	10.0	9.2	6.6
5 - 9	0.0	1.3	0.0	0.0
10 - 14	0.8	2.1	2.0	0.0
15 - 19	2.4	3.0	6.7	0.2
20 - 24	3.6	4.1	9.4	0.4
25 - 29	5.2	5.2	10.8	1.3
30 - 34	7.7	6.2	12.0	3.2
35 - 39	11.6	7.1	13.4	6.5
40 - 44	17.0	8.4	15.4	11.4
45 - 49	23.0	10.4	18.3	17.8
50 - 54	29.4	13.6	22.0	24.8
55 - 59	36.1	18.3	26.2	32.8
60 - 64	42.8	24.3	29.9	41.4
65 +	57.7	13.9	105.9	37.5
All Ages	11.3	7.3	13.3	6.9

<sup>a</sup>Graduated by Whittaker-Henderson Type A Difference Equation with constant  $a = 2.0$ .

<sup>b</sup>Ages 0-4 and 65 are not graduated.

Appendix Table 10. Graduated Age Specific Death Rates Per Thousand Persons, by Sex, by Age Group and by Calendar Presence of Electricity, Western Misamis Oriental, January 1 - June 30, 1979<sup>a</sup>

Age Group <sup>b</sup>	Electrified Households		Non-Electrified Households	
	Male	Female	Male	Female
0	45.1	33.7	80.5	67.7
1 - 4	4.5	4.8	5.0	5.3
5 - 9	0.4	0.0	3.6	2.5
10 - 14	0.7	0.0	4.3	3.0
15 - 19	1.3	0.0	4.9	3.2
20 - 24	2.2	1.0	6.0	3.3
25 - 29	3.7	1.5	7.2	3.3
30 - 34	5.7	1.7	8.4	3.3
35 - 39	8.3	1.7	9.2	3.7
40 - 44	12.2	1.9	9.9	4.5
45 - 49	17.9	2.4	10.6	5.6
50 - 54	25.4	3.6	11.6	7.1
55 - 59	33.8	5.5	12.7	9.3
60 - 64	41.8	7.7	13.9	12.1
65 +	69.9	33.6	48.9	15.1
All Ages	9.5	3.3	10.8	7.0

<sup>a</sup>Graduated by Whittaker-Henderson Type A Difference Equation with constant  $a = 2.0$ .

<sup>b</sup>Ages 0-4 and 65 are not graduated.