

## Estimated Trends of Fertility, Mortality, and Natural Increase in the North Mindanao Region of the Philippine Islands, 1960-1970

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1. Rates of natural increase in the Philippines since 1945 have been among the most rapid in the world. Mindanao Island has absorbed a substantial amount of the resulting population growth. Between 1939 and 1960, the country as a whole grew at 2.5 per cent a year, but Mindanao (excluding the Sulu Archipelago) grew at the annual rate of 4.5 per cent,<sup>1</sup> and its density increased from 20.2 to 51.2 persons per square kilometer.<sup>2</sup> Data on Mindanao fertility and mortality levels are necessary to estimate how long Mindanao can continue to relieve population pressures of other parts of the Philippines. This paper estimates fertility and mortality rates and their trends for what may be called the North Mindanao Region, which grew at the annual rate of

3.12 per cent between 1939 and 1960. The Region as here defined comprises the provinces of Agusan, Bukidnon, Lanao del Norte, Misamis Occidental, Misamis Oriental, and the two Surigaos (which will be treated as one for convenience). The north Mindanao provinces constitute not only a geographic, but a cultural unit.

### Crude Fertility Levels, 1939-1960

2. Underreporting makes the vital registration data of north Mindanao inadequate for calculating fertility and mortality ratios. Accordingly, measures herein have been derived from the 1939 and 1960 Census data and sample survey data. The 1948 Census data have not been found reliable for the North Mindanao Region, and have not been used.

3. Analyzing 1939 Census data, Taeuber discovered fertility levels for four provinces of the Region which were above the national mean, if substantial comparability in errors of reporting throughout the Philippines is assumed.<sup>3</sup> She also found that the levels of two, Lanao and Bukidnon, were below the national level. However, she noted that these differentials might have been caused by provincial variations in reporting rather than by actual fertility differences. Table 1 summarizes several findings for the Region and the Philippines.

<sup>1</sup> The population of Mindanao (excluding Sulu but including small adjacent islands attached to Mindanao provinces, i.e., Camiguin, Basilan, etc.) was 1,997,304 on January 1, 1939 (the Census date), and was 5,057,266 persons on February 15, 1960. Corresponding figures for the Philippines were 16,000,303, and 27,087,685. Cf. Republic of the Philippines, Bureau of the Census and Statistics, *Census of the Philippines: 1960*, Bureau of the Census and Statistics, II, pp. 3-7 (1963). The total area of the Philippines is estimated at 297,409.7 square kilometers, while that of Mindanao (including the small adjacent islands but not Sulu) is estimated at 98,692.60 square kilometers. Cf. Commonwealth of the Philippines, Commission of the Census, *Census of the Philippines: 1939*, Bureau of Printing, II, Part 1, p. 43 (1941), and Republic of the Philippines, Department of Agriculture and Natural Resources, *Philippine Agricultural Statistics*, Bureau of Printing, II, p. 4 (1956).

<sup>2</sup> Cf. Francis C. Madigan, S. J., "Some Population Characteristics of Cagayan de Oro City," *Philippine Sociological Review*, X, (1962), 171-176.

<sup>3</sup> Irene B. Taeuber, "The Bases of a Population Problem: The Philippines," *Population Index*, XXVI, (1960), 97-115.

4. On the basis of her findings, Taeuber speculated that provinces with almost exclusively Christian populations, such as the Misamis provinces, Agusan, and Surigao, might have higher mean fertility than the populations of provinces where Muslims predominate, such as Lanao (66.8 per cent Muslim in 1939. Since then, Lanao has been split into two provinces, Lanao del Norte and Lanao del Sur.) This speculation has been followed up in Table 2 for the North Mindanao Region, plus Lanao del Sur, by analysis of 1939 and 1960 census data. Child-woman ratios were used because 1960 Census data on children ever born were not available when this paper was written.

5. Child-woman ratios for 1939 are not conclusive. Lanao exhibits higher fertility ratios (replacement ratios) when children 5-9 are considered, but lower ratios for children 0-4 years of age. The percentage deviations favor Lanao slightly but are not significant.

6. The 1960 Census data lend some support to Taeuber's hypothesis, however. In Lanao del Sur, where the Muslim proportion of the population was 94.0 per cent in 1960, all ratios indicate lower fertility than in the "Christian" provinces, and the differences are significant at beyond .02. In Lanao del Norte, where the proportion of Muslims was much smaller (20.9 per cent)<sup>5</sup> and the proportion of Catholics much larger (73.2 per cent), the sum of the percentage deviations also favored the "Christian provinces" by a substantial amount (16.7) but the differences were not statistically significant. Until more adequate data are available, one may cautiously accept the hypothesis of lower Muslim fertility based upon religious and/or other cultural differences.

7. The crude birth rate for the Philippines is estimated by many demographers, including the present writer, at near 50 births per thousand persons of the general population. Tables 1 and 2 lead one to judge, if the reporting of children in the North Mindanao Region is substantially as accurate as in the Philippines as a whole, that fertility levels for the Region are not significantly below national averages. All Regional means shown in both tables, with but one exception, exceed the national mean. While these differences are not significant, still, on the basis of pure chance, one would expect seven out of eight means to be in one or the other direction only about 7 times in 100 samples. The present writer assumes substantial homogeneity in reporting numbers of children born between the Region and other regions of the Philippines, and thus concludes that the Regional crude birth rate is close to 50 births per 1,000.

8. Mendoza-Pascual estimated crude birth rates for individual provinces for the year 1953 from the 1960 Census by the reverse-survival technique, apparently using either the 1948 or the 1939 Census in computing population bases for 1953.<sup>6</sup> She omitted Lanao del Norte, but her estimates of births per 1,000 persons for the other provinces of the North Mindanao Region are as follows: Agusan, 68; Bukidnon, 76; Misamis Occidental, 46; Misamis Oriental, 46; and Surigao, 48. Her rates for Agusan and Bukidnon are out of line, while those for the Misamis seem somewhat low. These estimates seem vitiated by failure to take account of net in-migration into each province. Until the Census Bureau releases the 1960 migration data, unless one has other bases for estimating migration for particular

<sup>4</sup> *Census*: 1960, I, Table 16, p. 28-14.

<sup>5</sup> *Ibid.*, I, Table 16, p. 27-12.

<sup>6</sup> Elvira Mendoza-Pascual, "Reinvestigation of Birth and Death Statistics in the Philippines," *The Philippine Statistician*, II (1962), 171-189.

provinces, the reverse-survival approach does not seem promising as a method of estimating provincial rates.

9. From data furnished by a Research Institute for Mindanao Culture sample survey in 1959, the present writer found a crude birth rate for Misamis Oriental Province of 47.7 births per 1,000 persons.<sup>7</sup> The three villages involved were chosen purposively, but the respondents (398 in all), were either selected without substitutions by random sampling methods from a complete listing, or (in one village) were completely enumerated.

10. Despite this finding of 47.7 births per 1,000, the present writer estimates the Misamis Oriental birth rate at a somewhat higher level, namely, at about 51.5 births per 1,000 persons, attributing the lower sample finding to random variation in a relatively small sample. The higher estimate seems to fit the various data more adequately.

11. Crude birth rates for each province of the region were developed by the writer from several points of view. These are shown in Table 3. Method A assumes a national crude birth rate of 50.0 births per 1,000 persons, and substantial homogeneity throughout the Philippines of reporting children ever born as well as children 0-4 and 5-9 years of age. It develops crude birth rates from the data of Tables 1 and 2 by application of the proportion:  $50.0/\text{Philippine child-woman ratio} = \text{Provincial Crude Rate}/\text{provincial child-woman ratio}$ . Besides logical comparability of fertility levels, some empiric justification of this procedure is found in Bogue and Palmore's finding, in a study of fifty nations for the period, 1955-1960, that child-woman ratios, for children 0-4 years old and woman 15-49 years of age, correlated .930 with the corresponding crude birth rates, and that child-woman ratios for children 5-9 years of

age and the same women correlated .886 with these birth rates.<sup>8</sup>

12. From Table 2, Method B estimates provincial crude birth rates from ratios of children 0-4 years of age to all women 15-44 years of age, applying for this purpose a zero-order regression equation which Bogue-Palmore (in the study just cited) developed for use with women 15-49 years of age. (Totals of women 15-44 years of age were employed because when totals for ages 15-49 were utilized, the estimates were below reasonable levels for Philippine fertility). Method C employs a similar Bogue-Palmore regression based on provincial ratios of children 5-9 years of age to women 15-44 years old. Finally, Method D estimates the crude rate from percentages of children 0-14 years of age in the 1960 Census by a further Bogue-Palmore equation.

13. The grand means of Table 3 accumulate the various aspects from which provincial fertility has been measured, giving each aspect equal weight. They probably represent as fair an estimate of rank-order in fertility, of provinces of the North Mindanao Region and of relative distance between fertility ranks as can be drawn from data now available. However, the *levels* of fertility represented seem slightly high to the present writer who has accordingly lowered the Misamis Oriental rate to 51.5 births per 1,000 persons, and the others in proportion. These reduced crude birth rates, conservative estimates of present North Mindanao fertility, are as follows for the provinces of Agusan, Bukidnon, Lanao del Norte, Misamis Occidental, Misamis Oriental, and

<sup>7</sup> Francis C. Madigan, S. J., "The Facts of Life in Misamis Oriental," *Philippine Sociological Review*, XI (1963), 105-106.

<sup>8</sup> Donald J. Bogue and James A. Palmore, "Some Empirical and Analytical Relations Among Demographic Fertility Measures, with Regression Models for Fertility Estimation," *Demography*, I (1964), 316-338.

Surigao, in that order: 49.0, 49.5, 47.9, 49.4, 51.5, and 45.7. The Regional mean of these rates is 48.8 births per 1,000 persons, while the mean for the "Christian" provinces is 48.9.

### Age-Specific Fertility

14. The only empiric data available to the present writer for estimating age-specific fertility in the North Mindanao Region were those from the previously mentioned sample study in Misamis Oriental Province.<sup>9</sup> Age-specific birth rates per 1,000 married women, of ages 15-49, husband present, were as follows for ages 15-19 and thereafter in order by five-year age groups: 388 births, 459 births, 448 births, 403 births, 290 births, 141 births, and 37 births. Approximate fertility weights for these same age groups of married women were therefore: 10.4, 12.4, 12.1, 10.9, 7.8, 3.8, and 1.0.

15. Inspection of these weights shows that women of the sample had maintained almost constant high fertility from their fifteenth to their thirty-fourth year of age, after which births had tapered off to the menopause.

16. It is interesting to compare these marital age-specific fertility weights with age-specific weights for *all* women. Some insight into the effects of marriage patterns and mortality in the specification of actual fertility levels is thus gained. By the same age groups in the same order, fertility weights for all women were as follows: 1.4, 8.2, 11.5, 11.3, 8.3, 3.9, and 1.0. When these weights are applied to the 1960 Census distribution of Misamis Oriental women 15-49 years of age and when a crude birth rate of 51.5 is hypothesized (the sample rate was in fact 47.7), the

following birth rates per 1,000 women of the general population result, in the same order as above: 49.0, 288.7, 405.3, 395.5, 292.9, 138.1, and 35.1. Note that highest fertility appears between the ages 25 and 34, whereas marital birth rates were highest between ages 15 and 34.

17. In the absence of further data, the fertility patterns revealed by these weights and rates may tentatively be assumed to resemble—at somewhat different levels of fertility, as estimated—the age-specific and the marital age-specific birth rates that would be found in the other "Christian" provinces of the North Mindanao Region. The rates that would be found among the Muslim populations of the Lanao and among the non-Christian peoples of Bukidnon may not differ much from the same patterns because these peoples, too, are rural, agricultural, and possessed of low average levels of education, although some divergence would be expected, due to earlier age at marriage, higher mortality risks at all ages, and the practice of divorce.

### Trends in Fertility

18. Eventually, high birth rates will of themselves generate effective pressures, in the presence of lowered death rates, for restricting family size. Although moderately-felt pressures already exist to some extent in the North Mindanao Region, there is no evidence that they will become sufficiently operative within the next five years to cause a significant decline in fertility levels. The Regional means and the means of the "Christian" provinces shown in Table 2 give no indication of such a fertility decline between 1939 and 1960. On the other hand, the increase in number of children reported in the 1960 over the 1939 Census with regard to the child-woman ratios is probably not due to higher crude birth rates but to better reporting of children.

<sup>9</sup> Francis C. Madigan, S. J., "Philippine Fertility and Mortality with Special Reference to the North Mindanao Region: A Critique of Recent Estimates. Part II: The North Mindanao Region," *Philippine Sociological Review*, XII (1964), 35-53.

19. Similarly, the data from the fore-mentioned sample survey gave no indication of declining fertility. For ages 15-29, cohorts of birth from the 1880 decade to the 1930 decade had the following birth rates per 1,000 married women, husband present: 400.00, 398.0, 448.0, 414.0, 452.3, and 471.9. The increase in rates toward the end of the period is probably occasioned by better recollection of recently born children. One concludes therefore that birth rates for the period 1960-1970 will remain at about the national average of 50 births per 1,000 without significant decline.

### Mortality Rates and Trends

20. Death rates in the North Mindanao Region are probably somewhat above national averages. The scarcity of doctors and medical facilities, the difficulties of transporting the sick and injured from the inland villages over break-neck mountain trails and extremely bumpy roads to the city hospitals, and the widespread ignorance on the part of the rural people of even rudimentary sanitary and medical knowledge coupled with strong faith in folk-ritualistic remedies, undoubtedly inflates mortality levels beyond what they might otherwise be.

21. After estimation of net in-migration to Misamis Oriental, 1939-1960, at approximately 29,350 persons (7.55 per cent of the 1960 Census total), the writer aged the 1939 Census age-sex distributions through to 1960 by applying survival ratios from various life tables. After repeated trials, the tables which best fitted the data had expectations of life of 32.5 (27.5 for men of the military ages), 40.0, and 42.5 years of life at birth for the periods, 1939-1948, 1948-1954, and 1954-1960, respectively. The crude death rates per 1,000 persons of the general population thus computed were: 31.1 deaths for 1939-1948;

23.3 deaths for 1948-1954; and 21.3 deaths for 1954-1960.<sup>10</sup>

22. These rates seem reasonable. If added to intercensal annual rates of natural increase slightly lower (because of higher mortality levels) than the national rates (1.91 per cent, 3.06 per cent and 3.06 per cent, respectively, for the periods, 1939-1948, 1948-1954, and 1954-1960), namely, 1.90 per cent, 2.82 per cent, and 3.02 per cent, the resulting crude birth rates for Misamis Oriental are 50.1, 51.5, and 51.5 births per 1,000 persons, which tally closely with the crude birth rates previously estimated. These death rates are also slightly above the national death rates, 21.6 per 1,000 for 1948-1954, and 18.5 per 1,000 for 1954-1960, computed by Avanceña and the present writer by the survival-ratio technique from the 1948 and 1960 Censuses.

23. The current crude death rate in Misamis Oriental probably approximates 19-20 deaths per 1,000 persons. Because of massive rural health problems, significant decline from this level during the next five years till 1970 seems unlikely. Mortality may in fact rise somewhat, if present conditions of high food prices plus slack employment opportunities do not improve.

24. Crude death rates were not estimated for the other north Mindanao provinces by survival methods because migration data were not available to the present writer. However, conditions in the "Christian" provinces closely resemble those in Misamis Oriental. Therefore, one may presume that crude death rates in those provinces are not significantly different from those of Misamis Oriental. The rates of Lanao del Norte and Bukidnon are probably somewhat less favorable than those experienced in the other four provinces. On this basis the writer

<sup>10</sup> Cf. Francis C. Madigan, S. J., *Facts of Life*, pp. 101-102.

estimates the current crude death rate of the North Mindanao Region at between 20 and 23 deaths per 1,000 persons.

25. In this paper, the crude birth rate for the North Mindanao Region was conservatively estimated at 48.8 births per 1,000 persons and the crude death rate was estimated to range from 20.0 deaths per 1,000 to 23.0 deaths per 1,000 persons. Little probability of a significant decline in either birth or death levels was foreseen for the next five years. Accordingly, the rate of natural increase conservatively estimated for the Region over

the next five years ranges from 2.6 per cent per annum to 2.9 per cent. At these rates, the population of the Region even without migration would double in from 24 to 27 years so that its density (96.8 persons per square kilometer) would make it less attractive to potential migrants.

<sup>11</sup> The population of the Region in 1939 was 905,775 persons, and in 1960 it was 1,732,964 persons. Cf. *Census: 1960, II*, table 2, p. 2.

<sup>12</sup> The area of the Region is estimated at 35,817.99 square kilometers and that of Luzon (including the Batanes, the Catanduanes, Marinduque, and Masbate, etc., but without Mindoro or Palawan) at 113,617.50 square kilometers. Cf. *Philippine Agricultural Statistics, II*, pp. 3-4, table 1 (1956).

TABLE I

Children Ever Born per Thousand Ever-Married Women, 45 to 54 Years of Age, in Provinces of North Mindanao Region in 1939, and Percentage Comparisons With Philippine Mean

	Agusan	Bukid.	Lanao <sup>b</sup>	Mis. Oc.	Mis. Or.	Surigao	Philippines
Children Ever Born	6,646	5,755	5,933	7,279	6,984	6,940	6,576
Per Cent Nat. Mean <sup>a</sup>	101.1	87.5	90.2	110.7	106.2	105.5	100.0
				Regional <sup>a</sup>		Christian Provinces <sup>a</sup>	
Means of Means (Unweighted)				6,590		6,962	
Per Cent Philippine Mean:				100.2		105.9	

<sup>a</sup> Computed by present writer.

<sup>b</sup> Muslims constituted 66.8 per cent of the total Lanao population. *Census of the Philippines: 1939. I. Reports by Provinces: Lanao*, Table 8, p. 18.

SOURCE: Irene B. Taeuber, "The Bases of a Population Problem: The Philippines," *Population Index*, XXVI, (1960), 106-107.

TABLE 2

Child-Woman Ratios for North Mindanao Provinces, and the Philippines and Percentage Deviations From the National Mean, 1939 and 1960.

	NUMBER OF CHILDREN PER 1,000 WOMEN, 15-44 YEARS OF AGE							
	1939 Census				1960 Census			
	0-4 Years of Age							
	All Women	x <sup>a</sup>	Ever-Married Women	x <sup>a</sup>	All Women	x <sup>a</sup>	Ever-Married Women	x <sup>a</sup>
Agusan	856	14.9	1,145	1.1	930	17.3	1,332	4.0
Bukidnon	872	17.0	1,052	-7.0	992	25.1	1,327	3.6
Lanao del N. <sup>b</sup>	(820)	10.1	1,042	-8.0	848	6.9	1,195	-6.7
(Lanao del S.) <sup>b</sup>	(820)	10.1	1,042	-8.0	(630)	-20.6	886	-30.8
Misamis Occ.	882	18.4	1,285	13.5	784	-1.1	1,322	3.2
Misamis Or.	852	14.4	1,252	10.6	895	12.9	1,416	10.5
Surigao	783	5.1	1,131	-0.1	775	-2.3	1,204	-6.0
Philippines	745	0.0	1,132	0.0	793	0.0	1,281	0.0

  

5-9 Years of Age								
	All Women	x <sup>a</sup>	Ever-Married Women	x <sup>a</sup>	All Women	x <sup>a</sup>	Ever-Married Women	x <sup>a</sup>
Agusan	774	8.6	1,034	-4.7	806	6.3	1,156	-5.6
Bukidnon	808	13.3	974	-10.2	865	14.1	1,157	-5.6
Lanao del N. <sup>b</sup>	(910)	27.6	1,156	6.5	797	5.1	1,123	-8.3
(Lanao del S.) <sup>b</sup>	(910)	27.6	1,156	6.5	(733)	-3.3	1,032	-15.8
Misamis Occ.	831	16.5	1,210	11.5	758	0.0	1,278	4.3
Misamis Or.	805	12.9	1,182	8.9	853	12.5	1,350	10.2
Surigao	729	2.2	1,052	-3.0	730	-3.7	1,133	-7.5
Philippines	713	0.0	1,085	0.0	758	0.0	1,225	0.0

MEANS FOR REGION, AND FOR CHRISTIAN PROVINCES

	Regional <sup>c</sup>	Christian
1939 Means, children 0-4/all women	844	843
1939 Means, children 0-4/married women	1,151	1,203
1939 Means, children 5-9/all women	810	785
1939 Means, children 5-9/married women	1,101	1,120
1960 Means, children 0-4/all women	871	846
1960 Means, children 0-4/married women	1,299	1,318
1960 Means, children 5-9/all women	802	787
1960 Means, children 5-9/married women	1,200	1,229

<sup>a</sup> Per cent of deviation from the national mean.

<sup>b</sup> Lanao del Sur is not defined as one of the North Mindanao Region provinces. In 1939, Lanao Province had not yet been divided into two provinces.

<sup>c</sup> Mean of Means (unweighted); "Christian" Provinces are: Agusan, Misamis Occidental, Misamis Oriental, and Surigao.

SOURCES: *Census of the Philippines*: 1939. Vol. II, pp. 118, 122, 181-186, Ta. 6, 9, 10; and *Census of the Philippines*: 1960 Vol. I, Report by Provinces, Tables 4 and 5, Vol. II, Tables 6 and 8.

TABLE 3  
Estimates of Crude Birth Rates for the North Mindanao Region by  
Provinces, From 1939 and 1960 Census Data

1939							
Children	Agusan	Bukid.	Lanao N.		Mis. Or.	Surigao	Women 15-44 <sup>a</sup>
Method A							
Ever born	50.5	43.8	45.1 <sup>a</sup>	55.3	53.1	52.8	Married <sup>b</sup>
0-4	57.4	58.5	55.0	59.2	57.2	52.6	All
0-4	50.6	46.5	46.0	56.8	55.3	50.0	Married
5-9	54.3	56.7	63.8	58.3	56.5	51.1	All
5-9	47.6	44.9	53.3	55.8	54.5	48.5	Married
Means,	52.1	50.1	52.6	57.1	55.3	51.0	Means
1960							
0-4	58.6	62.5	53.5	49.4	56.4	48.9	All
0-4	52.0	51.8	46.6	51.6	55.3	47.0	Married
5-9	53.2	57.1	52.6	50.0	56.3	48.2	All
5-9	47.2	47.2	45.8	52.2	55.1	46.2	Married
Means	52.8	54.6	49.6	50.8	55.8	47.6	Means
Means,							Means
Method A	52.4	52.4	51.1	54.0	55.6	49.3	Method A
Method B							Method B
0-4	49.3	52.6	45.0	41.6	47.5	41.2	All
Method C							
5-9	49.7	53.6	49.0	46.5	52.8	44.6	All
Method D							Method D
0-14	44.5	46.0	44.6	42.4	45.2	41.7	Means,
Means, B-D	47.8	50.7	46.2	43.5	48.5	42.5	Means
GRAND							GRAND
MEANS	51.2	51.8	50.0	51.6	53.8	47.7	MEANS

<sup>a</sup> Unless other ages are specified.

<sup>b</sup> Children ever-born to women of ages 45 to 54 only.