MEASUREMENT AND EXPLANATION OF FERTILITY LEVELS IN HONDURAS, 1930 to 1961

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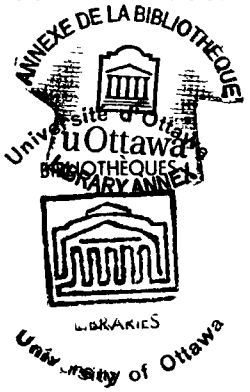

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CURRICULUM STUDIORUM

Mercedes Rivera Jarmasz was born March 19, 1944, in Tegucigalpa, Honduras. She received the Bachelor in Social Sciences degree from the University of Ottawa in 1966.

TABLE OF CONTENTS

LIST OF TABLES

Table page

LIST OF FIGURES

INTRODUCTION

The aim of this study is to measure fertility and the factors linked with fertility in Honduras, a Central American republic. This study will focus on a thirty year period, from 1930 to 1961. The problem is to find indicators and to assess techniques that could be employed to measure fertility levels in a country where statistics on fertility are practically non-existent.

The concept of fertility is complex, since it can be used as a social, demographic or biological variable; measures of fertility have indeed been developed by demographers, economists and psychologists. Human fertility which is often associated with the problem of population explosion, can also be associated with the problem of depopulation.

The problem of human fertility has implications at the individual level but more so at the national level. In countries with high birth rates, for example, there is more need for educational and sanitary facilities. A small number of large families would not put stress on the structure of a nation. The size of the problem depends on fertility levels and of course on the overall social, demographic and economic situation of a country.

There is constant need to measure fertility levels and to improve the techniques and methods for its measurement. Fertility is defined in the present study as the number of children born alive to a woman or to a group of women. Natality has been measured in Honduras in terms of the crude birth rate but the reliability of these measures could be questioned. The crude birth rate has not been estimated for the Departments of the country. In Honduras the number of births is recorded on an annual basis. Censuses are taken regularly but there are no specific questions on fertility in the census questionnaires.

To assume that fertility levels are high in Honduras would be correct because most of the less developed countries are characterized by high birth rates. Fertility levels are one of the many indicators of development. In general terms, technological, industrial or economic progress is one of the main indicators of development but dependency ratios, crude birth and death rates, illiteracy levels etc., could also be indicators of development. If the crude birth rate is considered as a good indicator of fertility, Honduras would have one of the highest levels in the world.

Honduras has an area of 112,088 square kilometers, its population density per square kilometer of arable land is 190 persons. The last national census was taken in 1961

and the total population reported for that year was of 1,884,765 persons. These persons resided in eighteen major areas called Departments. There were 279 municipalities in the country, including the central district. Vital statistics are compiled in 279 municipal offices. Nuptiality in the country is very low: in 1963, 30% of the unions were common law unions. Moreover it is difficult to study the population of Honduras and its characteristics because statistics in this country are not complete and are inaccurate.

Fertility has an effect on several demographic variables and in order to study its implications it is necessary to know its levels. There are several ways to measure and interpret fertility levels; for example, birth rates could be classified as low when the number of children born per thousand persons is below 20; as medium when the rates are between 20 and 35, anything above 35 would be a high crude birth rate. By fertility levels is meant the number of children born in relation to the population studied. Different levels entail different demographic situations.

When statistics are not available traditional ways of measuring fertility are not satisfactory and indirect methods have to be used. The review of the literature on fertility suggested several hypotheses and methods that can

be used to measure fertility in Honduras. The basic hypotheses are that reasonably accurate fertility levels can be estimated for Honduras, that the levels are high but they differ from one Department to another and that the relationship between demographic measures facilitates the study of the crude birth rate.

To study the relationship among variables census data will be used. Vital statistics data provided the basis to test some of the techniques and methods to measure fertility. Both vital statistics and census data in Honduras are not reliable, therefore these data were analysed before being used. These statistics provide little information on fertility but since they are the only sources to measure the crude birth rate for the country and its Departments this study is based mainly on these two sources of data. The age structure, a variable that reflects fertility levels, can be studied from census data. The rate of growth, or the indicator of population changes from one period to another, can be measured from census and vital statistics figures. Both variables depend on fertility and affect fertility.

These variables in conjunction with the stable population theory are used to study and measure fertility. The indirect measures obtained are not sufficient, mainly nowadays when the study of fertility has become so complex.

A survey was carried out by the writer in 1968 to study other aspects of fertility such as cohort fertility, average family size and birth intervals. The survey was designed with the idea of also studying some of the factors linked with fertility. This part of the study differs from the rest because it is only exploratory, the population studied is not the total population of the country and the methods to measure fertility also differ from those used in the rest of the research.

The present study is a survey on demographic data for Honduras, a country where fertility levels for its components have not been studied. The factor analysis technique has not been applied before to data available in Honduras and it is hoped it may clarify the concept of human fertility as such.

CHAPTER I

FERTILITY MEASURES. REVIEW OF THE LITERATURE

Fertility in this study is defined as the number of children born alive to women in a given population. Human fertility is synonymous with natality, that is to say, the number of births that occur in a given population. Demographers would agree with this definition but they would differ in the ways of measuring fertility. Fertility is "the actual birth performance as measured by the number of offspring".[1] There are several ways of measuring fertility. The total number of children born alive per 1,000 persons in the population; the number of children born per 1,000 women; the number of children born per 1,000 women aged 15 to 44, etc., are fertility measures. All these rates are related but their interpretation differs. The number of children born to every married woman would be a marital fertility rate. Some of the traditional fertility measures are given in Appendix 1.

This chapter is an endeavour to bring together some of the techniques, methods and theories behind the study of fertility.

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1 William Petersen, Population, second edition, MacMillan Co., Collier-MacMillan, U.S.A., 1970, p. 173.

1. Interpretation and Use of Some Fertility Measures

The crude birth rate is commonly used to study fertility levels in the world. The reasons to study fertility and the rates employed to measure it vary. John Hajnal,[2] summarized the meaning and use of fertility measures from 1930 to 1959. "Gini in a paper delivered in 1933 listed 72 ways of measuring the fertility of marriage".[3] But these measures were not always acceptable and had no practical use. In the 1920's "there emerged in full vigor a way of looking at fertility analysis that was to dominate the subject for the next two decades".[4] Fertility was measured in terms of reproduction rates, the measurement of fertility was based on stable population concepts that had been developed by A. J. Lotka.[5] In the 1920's the word 'fertility' tended to become identified with Gross Reproduction Rate (GRR). In the 1930's the focus was on family planning, the computation of pregnancy rates per year of exposure and differential

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2 Milbank Memorial Fund, "The Study of Fertility and Reproduction: A Survey of Thirty Years", Thirty Years of Research in Fertility: Retrospect and Prospect, New York, 1959, p. 11-37.

3 Milbank Memorial Fund, Op. Cit., p. 13.

4 Idem, Ibid., p. 12.

5 L. I. Dublin and A. J. Lotka, "On the True Rate of Natural Increase". Journal of the American Statistical Association, 1925, Vol. 20, 151, p. 305-339.

fertility, all these measures were linked with the GRR.

> The use of reproduction rates spread rapidly. Within a few years they largely ousted other indices from the study of fertility ... it soon came to be felt that a statistically respectable country needed an officially computed reproduction rate, almost like a flag or a national anthem. Where the distribution of births by age of mother was not available, indirect methods were developed to estimate it. In some countries the information collected at birth registration was extended to include the age of mother. Eventually the League of Nations included comparative tables of reproduction rates in its Statistical Year Book. No other index of fertility, apart from the crude birth rate, was ever accorded this honour.[6]

With the depression and World War II fertility rates dropped and after the war increases in fertility were recorded. Interest shifted to countries with high birth rates, not only to those countries where fertility had increased slowly but to countries where the rates had remained high.

Since 1959 interest has centered on areas having high crude birth rates and high, increasing rates of growth. Several studies have been carried out in Latin America, Asia and Africa. The reasons for this interest are varied. Among others, it is easier to apply the traditional methods of measuring fertility to populations with natural fertility[7] and to interpret the results because intervening variables

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6 Milbank Memorial Fund, Op. Cit., p. 12.

7 Natural fertility being defined as the fertility of populations where voluntary birth control is not practised.

affecting fertility have been studied widely. Rates in most of these areas are not known because data are incomplete or not reliable. There is a desire to study fertility in order to change its trends and levels. The rate of growth of less developed areas is considered as a threat to human development.

In recent years interest is shifting again to countries with low fertility. Certain aspects of fertility are not known in these countries. Population growth is studied with interest among demographers, and fertility is an important element in population growth. The development of demographic measures and their use has remained at a theoretical level. Many demographic measures require data that are not available in most countries of the world. This is the case for most of the less developed countries.

2. Fertility Studies in Latin America

Data, in most Latin American countries, are incomplete and/or unreliable. No sound analysis of the characteristics of a population can be made without evaluating data available and collecting new data. In recent years universities, governments and private organizations have contributed to the study of the Latin American demographic and social structures. Honduras has profited from this interest in demographic variables. Cornell University

researchers have studied fertility rates and attitudes towards family planning in urban-depressed areas of the Central District.[8]

CELADE (Centro Latinoamericano de Demografia)[9] is initiating a program to evaluate vital statistics in Honduras. CELADE's researchers have studied different demographic aspects in Latin America. The above institutions are interested in recent fertility trends and their impact on the populations. A. Collver,[10] E. Arriaga[11] and

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8 Cornell University demographers carried a series of surveys in Tegucigalpa, D.C., during the summer of 1968 and the winter of 1969. The investigations consisted of a series of socio-demographic studies centering on health, fertility, migration and family planning. The writer had the opportunity of doing some field work during the surveys. Programa Internacional de Poblacion, Universidad de Cornell, Una Evaluacion de Fecundidad y Programas de Salud y Planificacion Familiar en "Las Crucitas", Tegucigalpa - Comayaguela, Honduras, Cornell University, Ithaca, July 1969, iii - 120 p.

9 CELADE, the Latin American Demographic Centre, has analysed trends in demographic data and has projected the population of Honduras to 1981. CELADE's next project is the evaluation of Census and Vital Statistics Data for Honduras.

10 Andrew O. Collver, Birth Rates in Latin America New Estimates of Historical Trends, California, 1965, 187 p.

11 Eduardo E. Arriaga, New Life Tables for Latin American Populations in the Nineteenth and Twentieth Centuries, Population Monograph Series, No. 3, University of California, Berkeley, 1968, 324 p. And E. Arriaga Mortality Decline and its Demographic Effects in Latin America, Population Monograph Series, No. 6, University of California, Berkeley, 1970, xiv - 232 p.

J. R. Rele[12] have considered historical perspectives and their interest centers on the methodology to measure demographic variables. These authors have published valuable data for Latin American countries, among them Honduras.

Andrew O. Collver studied birth rates in Latin America. Collver's study was undertaken with the idea of reconstructing the actual history of birth rates in the region,

> going back as far as published census and registration statistics allowed. The idea was to re-examine the basic data on which rates must be computed, to use techniques for correcting these data, and then to compute new rates which would be much closer to the truth than the official rates previously published.[13]

In his analysis Collver ignored official rates, that is, rates published by governments or computed from official statistics. The observed rates for Honduras were calculated for this study and are given in Appendix 2. These rates are based on unadjusted census figures and vital statistics data. No estimates were used for the calculations. Collver has, "above all ... documented a recent rise in fertility among those countries with already extremely high birth

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12 J. R. Rele, Fertility Analysis Through Extension of Stable Population Concepts, Population Monograph Series, No. 2, University of California, Berkeley, 1967, xiii, 91 p.

13 Andrew O. Collver, Op. Cit., Foreword, no page.

rates".[14] One of Collver's aims was very similar to this study's goal: to measure "birth rates with fragmentary data".[15] Census data were the main source of fragmentary information used by Collver, his analysis was a reconstruction of past levels in the crude birth rate.

For Honduras, Collver has given a model to represent population movements - that is, changes in the number of births, deaths, population growth - since 1910. Collver's model rests on the assumptions that the 1930 and 1961 censuses were accurate, "and that the age distribution of registered deaths is representative of all deaths occurring in the country".[16]

The crude birth rate estimates by Collver are given in Table I. Collver derived them by:

1) accepting the 1930 and 1961 censuses as given;
2) estimating the growth curve between 1910 and 1960 as .98 times registered natural increases; and
3) calculating births and deaths in each five-year period from the number of survivors at age five, the population growth and the proportion of deaths under age five.[17]

The rates estimated by Collver are similar to observed rates. The reasons for this similarity could be

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14 Idem. Ibid., Foreword.

15 Collver, Op. Cit., p. 5

16 Idem. Ibid., p. 133.

17 Idem. Ibid., p. 133.

(a) improvement in reporting and recording of data, (b) errors in both the numerator and denominator going in the same direction and neutralizing each other.

The methods that were used in the present study are not the same as the ones used by Collver. Once 'new birth rates' are estimated for Honduras, the results will be compared again to Collver's findings.

Arretx[18] estimated fertility while preparing the assumptions for population projections for Honduras. The sources employed for population projections in the above study were the censuses of 1945, 1950 and 1961 and vital statistics on births and deaths. The rates calculated by Arretx are shown in Table I. The estimated rates are very different from the observed rates, the methods used by Arretx for smoothing the data are not clearly indicated.

E. Arriaga calculated life tables for Latin American countries. The life tables for Honduras were based on the assumption that vital statistics cannot be utilized but the age structure of the population and the rate of growth can be used to estimate mortality. This first study lead Arriaga to study some aspects of fertility and the rates that he estimated for Honduras are given in Table I.

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18 Arretx, Proyecciones de la Poblacion de Honduras, por Sexo y Grupos de edad 1940-1981, CELADE, Serie A, No. 70, 1967, 66 p.

FERTILITY MEASURES

TABLE I

Comparison and Trends of Crude Birth Rates in Honduras for Selected Years[19]

Year	Rate	Difference	Rate	Difference	Rate	Difference
1965....	43.7(1)U.					
1964....	48.1(2)E.		27.2(6)H.U.S.	+ 20.9		
1961....	51.0(3)C.	+ 5.5	45.6(3)O	+ 5.4	45.3(4)E.	+ 0.3
				∓ 0.1		- [illegible]
1960....	49.7(6)C.Hyp.	+ 4.2	48.5(6)E.	∓ 1.2	25.4(6)Hyp.	+ [illegible]
				± 3.0		- 20.1
1960's..	53.1(6)C.Hyp.	∓ 7.6	49.7(6)E.A.	+ 3.4	48.5(6)E.Of.	+ [illegible]
				+ 4.2		+ [illegible]
					25.4(6)E.Hyp.	∓ [illegible]
1955-1960	45-50(2)E.		45-50(1)E.	0.0		- 20.1
1955-1959	49.9(4)S.		46.0(4)E.	+ 3.9	42.4(6)E.Of.	+ 3.6
1955....	29.3(6)Hyp.					
1951-1956	54.0(5)E.					
1950-1954	48.6(4)S.	+ 6.5	46.0(4)E.	+ 2.6	40.8(6)E.Of.	+ 5.2
				∓ 3.9		- 2.3
1951....	52.6(3)C.	+ 10.5	45.3 E.	+ 7.3	43.3(3)O.	∓ 2.0
				+ 3.2		+ 1.2
1950....	32.7(6)Hyp.	- 9.4				
1945-1950	45-50(2)E.					
1945-1949	46.1(4)S.	+ 7.2	44.5(4)E.	+ 1.6	38.6(6)E.Of.	+ 5.9
				+ 5.6		- 0.3

19 1) United Nations Demographic Year Book 1966, New York, p. 208.

2) Population Information Center, 1965-66 Document II, p. 1.

3) CELADE, Proyecciones de la Poblacion de Honduras, por Sexo y Grupos de Edad 1940-1981, Serie A, No. 70, 1967, p. 55.

4) Andrew O. Collver, Birth Rates in Latin America, New Estimates of Historical Trends and Fluctations, University of California, Berkeley, 1965, p. 28.

5) United Nations Bulletin of Population, No. 7, 1963, No page.

6) E. Arriaga, Mortality Decline and Its Demographic Effects in Latin America, Population Monograph Series, No. 6, University of California, Berkeley, 1970, p. 150, 153, 165, 196 and 206.

TABLE I (Continued)

Comparison and Trends of Crude Birth Rates
in Honduras for Selected Years

Year	Rate	Difference	Rate	Difference	Rate	Difference
1945....	35.5(6)Hyp.	- 3.4				
1940-1944	44.8(4)S.	+ 7.2	43.8(4)E.	+ 1.0	36.7(6)E.Of.	+ 7.1
				+ 6.2		- 0.9
1940....	37.7(6)Hyp.	+ 0.1				
1935-1939	41.9(4)S.		41.9(4)E.	0.0	35.6(6)E.Of.	+ 6.3
1935....	39.5(6)Hyp.					
1930-1934	42.0(4)E.		40.9(4)E.	+ 1.1	33.5(6)E.Of.	+ 7.4
1930....	41.3(6)Hyp.					
1925-1929	44.1(4)E.					
1920-1924	44.3(4)E.					
1915-1919	41.7(4)E.					
1910-1914	43.7(4)E.					

SYMBOLS

_____ - Underlined differences were computed from observed rates given in Appendix 2. Other differences were calculated from the next higher rate in the same year or period.
U. - indicates data known to be incomplete or unreliable.
E. - Estimated - usually data have been adjusted for these estimates.
H.U.S. - Hypothetical crude birth rate assuming same age - specific fertility rates as the United States in 1964.
C. - Corrected for under-reporting of births and misreporting of age and population counts.
O. - Observed, the rates calculated for this study could be called observed.
E.Of. - Estimated from official data.
C.Of. - Corrected but taking as basis official data.
Hyp. - Hypothetical - the hypothetical crude birth rates are those that Latin American countries would have had if they had the same birth and mortality rates as European countries.
S. - Standardized by age.
E.A. - Estimated from actual population.
C.Hyp. - Corrected hypothetical ... see Hyp. above.
E.Hyp. - Estimates hypothetical.

Arriaga pointed to the relationship between mortality age structure and fertility. Techniques similar to the ones used by Arriaga to estimate life tables will be used in this study. There is a relationship between life tables and stable populations.[20]

> In recent years, model life tables and stable populations have been used with increasing frequency in estimating the characteristics of populations having only meager records of births and deaths and only incomplete or inaccurate data on age and sex distributions.[21]

The use of this technique or model has been developed by Coale and Demeny.[22] A series of Life Tables with related stable populations was published in 1966 by the two authors. Stable populations will be used to estimate crude birth rates in Honduras.

J. R. Rele used successfully the stable population concepts to measure fertility. The rates for Honduras estimated by Rele are given in Table I.

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20 This relationship will be explored infra, in Chaper IV.

21 W. Brass, A. J. Coale et al, The Demography of Tropical Africa, Princeton, New Jersey, Princeton University Press, 1968, p. 120.

22 A. J. Coale and P. Demeny, Regional Model Life Tables and Stable Populations, Princeton University Press, Princeton, New Jersey, 1966, xiii - 871 p.

J. R. Rele pointed out that

> For most underdeveloped countries of the world today, fertility analysis presents special problems because of the inadequacy of the basic data obtainable from the registration of births. At the same time the urgency of obtaining correct estimates of the birth rate, or allied measures of fertility, is as great in these countries as in the developed countries, in order to assist planning and economic development.[23]

This interest made Rele use stable population models to "estimate measures of fertility which otherwise could not be directly computed because of inadequate registration of data".[24] Rele estimated the crude birth rate from the intrinsic birth rate of the stable populations. The model used by Rele was based on the GRR (Gross Reproduction Rate) to derive stable populations. Even when the methods used by Rele will not be used here the assumptions made for the study of fertility in Honduras are very similar to Rele's assumptions. Stable population concepts will be used to measure fertility. Life table populations are stationary, the number of deaths is equal to the number of births and the rate of growth is zero. N. Keyfitz considered the

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23 J. R. Rele, Op. Cit., p. 1

24 Idem. Ibid., p. 1

stable populations a "less artificial model"[25] to study populations. Stable age distributions are determined by different rates of growth associated with a given life table function. S. H. Abdel-Aty studied the relationship between life tables and quasi-stable populations.[26] The methods used by Abdel-Aty will be employed in Chapters IV and V of this work. Abdel-Aty estimated life tables for Egypt and from life tables he calculated stable population functions. The relationship between fertility and the stable population has been expressed by the formula:

$$C(a) = b\, e^{-ra}\, p(a)$$

Where C(a) = the density of age distribution such that, out of a total number N of persons, a number of $NC(a)_x da$ are comprised within the age limits a and a+da

b /is/ the birth rate

r /is/ the rate of natural increase or the excess of birth rate b over death rate d, i.e., b - d

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25 N. Keyfitz, Introduction to the Mathematics of Population, Addison-Wesley Publishing Co., California, London, Ontario, 1968, p.170.

26 S. H. Abdel-Aty, "Life-Table Functions for Egypt Based on Model Life-Tables and Quasi-Stable Population Theory", The Milbank Memorial Fund Quaterly, Vol. XXXIX, No. 2, April 1961, p. 350-377.

> and p(a) /is/ the probability of surviving (a) years after birth which equals the life table number of survivors l at age (a) divided by the size of the cohort at birth l.[27]

Rele estimated the crude birth rate from the intrinsic birth rate of the stable population:

$$b_c = b_i \frac{\text{(Weighted sum total population) for the given population}}{\text{(Weighted sum total population) for the corresponding stable population}}$$[28]

> Where b_c is the crude 'observed' birth rate and b_i is the intrinsic birth rate.

"Differences in fertility produce quite different stable age distributions"[29] and "the estimates of fertility derived from stable analysis are ordinarily more trustworthy than estimates of mortality".[30] Presently stable population models will be used to measure fertility in Honduras.

The crude birth rates given in Table I are recent estimates. The crude birth rate is not an adequate measure of fertility but it can be a good indicator. The crude

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27 S. H. Abdel-Aty, Op. Cit., p. 351.

28 J. R. Rele, Op. Cit., p. 56-57.

29 S. H. Abdel-Aty, Op. Cit., p. 351.

30 United Nations, Methods of Estimating Basic Demographic Measures from Incomplete Data, Manual IV, ST/SOA/Series A/42, 1967, p. 23.

birth rate has been used by individuals and institutions interested in population trends to formulate most of the following assumptions:

1. Fertility in Honduras shows one of the highest rates in Central America.
2. There has been an increment in fertility when the age structure is considered.
3. The birth rate is increasing.
4. There is no sound information in relation to the age structure, nuptiality or mortality in Honduras that would allow to further the study in fertility.

Assumptions 2 to 4 will be checked if data available permit it.

3. Explanation of Fertility Levels

Fertility levels are closely related to demographic, social, economic and political factors. Once fertility is measured an attempt will be made to study the factors linked with it. Fertility is highly related to other biological, social and economic variables. Countries with different characteristics have different vital rates. There are factors that help the decline or increase in fertility and there are factors "affecting recent trends in fertility".[31] The following factors were listed by the United Nations as

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31 United Nations, The Determinants and Consequences of Population Trends, ST/SOA/17, New York, 1953, p. 83.

having an effect on fertility:

1. Age structure and marriage patterns.
2. Decline of mortality among infants and young children.
3. Religion.
4. Social class.
5. Residence (primitive societies had higher fertility rates).
6. Clerical celibacy.
7. Increase in prosperity leading to the decline in fertility.
8. Love of luxury.
9. The desire for advance in the social scale.
10. The desire to avoid the sub-division of property by inheritance, etc.
11. "In recent years, there is almost universal agreement that the major part, if not all, of the decline in family size has been brought about by the practice of family limitations".[32]
12. Urbanization.
13. Social mobility and economic situation.
14. Status of women and family organization.
15. Participation in the labour force and occupation.
16. Level of living and cost of rearing children.
17. Decline of religious interest.
18. Other causes listed by the United Nations are housing shortages, poverty, economic insecurity, unemployment and fear of war.

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32 United Nations, Op. Cit., p. 75.

Another element that could be added, and was not mentioned by the United Nations, are the laws of the country. Some countries favour the increase in fertility and this is shown by baby bonuses, awards for prolific mothers and so forth.

All the variables mentioned above have been used to explain the decline in fertility. These variables no doubt have an effect on fertility, their study however is very complex because some of them cannot be readily measured. The question is to what extent fertility is affected by some of the above mentioned variables and under what circumstances.

To answer these questions, J. Blake and K. Davis[33] noted that there are differences in fertility among countries having high fertility rates. They developed a model to study the impact of society on fertility levels. "For more than a dozen years, the list of intermediate variables proposed by Davis and Blake has served as an inventory of immediate determinants of fertility".[34]

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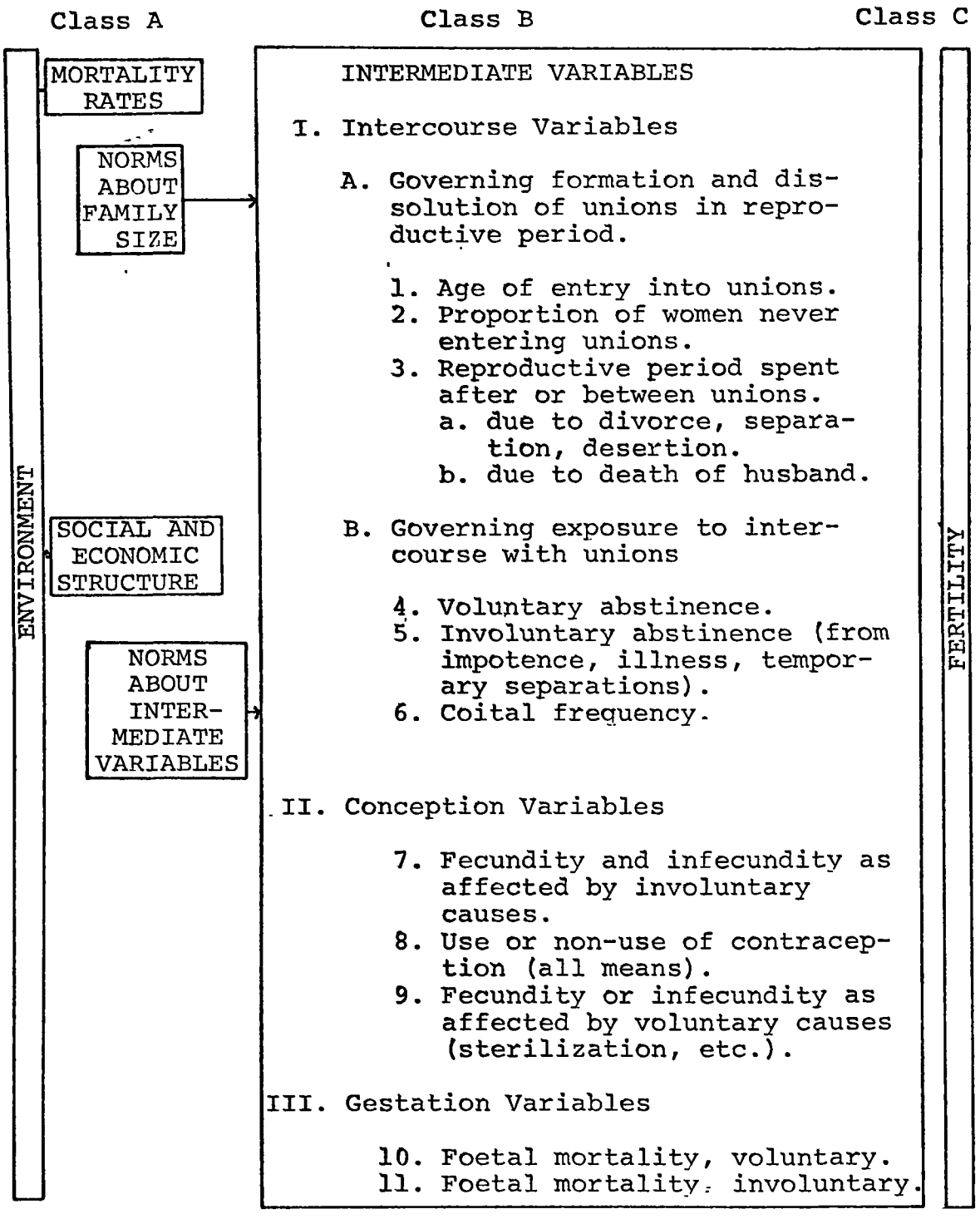
33 K. Davis and J. Blake, "Social Structure and Fertility An Analytic Framework", Economic Development and Cultural Change, No. 4, April 1956, p. 211-214.

34 D. Yaukey, "On Theorizing About Fertility", The American Sociologist, Vol. 4, No. 2, 1969, p. 100.

FIGURE 1. Determinants of Fertility[35]



35 Idem, Ibid., p. 101

R. Freedman[36] listed the social variables that may have an impact on the variables that influence fertility. Figure 1 gives under class A the variables listed by Freedman, under class B the 'intermediate variables' proposed by Davis and Blake, class C is fertility itself. These authors provided the models to study variables linked to fertility.

John B. Wyon summarized the variables linked to fertility.

> Some of the factors affecting fertility cannot be understood apart from their ecological context. These factors range from the influence of the physical environment as climate and temperature, including their effect on nutrition, through biological factors of micro-organisms and endocrine influences, to social factors such as age at marriage, desire for sons, laws of inheritance, religion and politics.[37]

There are many ways of listing the variables related to fertility. The number of variables that can be measured for a given population are limited by the characteristics of the population studied, by the resources available, by the nature and the working hypotheses formulated for the study.

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36 R. Freedman, "The Sociology of Human Fertility: A Trend Report and Bibliography", Current Sociology, Vol. 10, No. 11, 1962, p. 35-121.

37 John B. Wyon, "Field Studies on Fertility of Human Populations", from Human Fertility and Population Problems, Roy O. Greep, Editor, Schenbman Publishing Co., Inc., Cambridge, Massachusetts, 1963, p. 95.

An attempt was made in the present study to measure some of the variables mentioned and a factor analysis was carried out.

Factor analysis models have been used mainly in psychology but the technique has been used in the social sciences.[38] Factor analysis originated with C. Spearman in 1904. Since then the concept of factor analysis has evolved greatly. The model has hardly been used in demography.[39] Demographers have been more interested in developing measures and only recently their interest has turned to the factors affecting demographic variables.

"Factor analysis is a quasi-statistical method of explaining a matrix of correlations between variables in terms of a few hypothetical 'causes'".[40] Factor analysis is very useful in clarifying concepts mainly

> in areas of research where there is apparently no end to the number of indices which may be computed

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38 The technique has been applied in sociology, economics and political science. Among the sociological studies, R. B. Cattell, H. Breuel and H. Parker Hartman used factor analysis in an attempt at more "Refined Definition of the Cultural Dimensions of Syntality in Modern Nations", American Sociological Review, 17, 1952, p. 408-421.

39 The closest to applications in Demography has been the study and delineation of geographic areas for example "The Structure of Urban Areas: A New Approach" in The Town Planning Review, Vol. 35, 1964, p. 5-21.

40 O. Porebski, Introduction to Factor Analysis, unpublished article, Ottawa, no date, p. 1.

> but where the theory underlying use of these indices is either not in existence or badly in need of clarification.[41]

Factor analysis is going to be used in an attempt to limit the field of investigation and to obtain a better understanding of fertility in Honduras. It is expected that the factor analysis will reduce a group of variables to meaningful clusters of variables. This part of the study is of exploratory nature.

> The principal concern of factor analysis is the resolution of a set of variables linearly in terms of (usually) a small number of categories or "factors". This resolution can be accomplished by the analysis of the correlations among the variables. A satisfactory solution will yield factors which convey all the essential information of the original set of variables.[42]

To the writer's knowledge the factor analysis technique has not been applied to fertility studies, although it can be helpful in defining the variables related to the number of children born. The purpose of this study being to measure fertility in Honduras and then to explore the factors related to it, the usefulness of a factor analysis is obvious.

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41 Hubert M. Blalock, Social Statistics, McGraw-Hill Book Co., Inc., New York, 1960, p. 388.

42 Harry H. Harman, Modern Factor Analysis, Second Edition, The University of Chicago Press, Chicago and London, 1967, p. 4.

4. Hypotheses and Assumptions

The review of the literature suggests a series of methods that can be applied to the study of fertility in Honduras. Furthermore, Table I shows the differences in the crude birth rate computed by means of different methods. It is assumed that the birth rate is high in Honduras and that probably it has been increasing. But there is no certainty about its levels. Some sources indicate that the rate has increased, others show that the rate has decreased. None of the sources available, with the exception of the General Bureau of Statistics and Censuses of Honduras, gives rates for the Departments of the country. It is not known whether the data for some of the departments are more reliable than for other.

In Appendix 2 the crude birth rates for 1950 and 1961 are given for each department of the country.

The review of the literature of fertility suggests several hypotheses. The following hypotheses related to fertility in Honduras will be tested:

A. There has been an increment in fertility when the age structure is considered.

B. The crude birth rate is increasing.

It has also been assumed that the study cannot be carried further due to the lack of sound data on the age structure, nuptiality and mortality in Honduras.

More specifically these following hypotheses will be tested:

1. The 'observed' crude birth rate is a good indicator of past fertility trends in Honduras, trend being defined as a tendency to increase or decrease over a given period of time.

2. The crude birth rate is increasing for the country as a whole and for most of the departments.

3. The differences in the crude birth rate from one census year to another are significant but the differences in the rate between departments are not significant.

4. Fertility for the country as a whole was very close to natural fertility from 1930 to 1961, natural fertility being understood as fertility uninhibited by voluntary birth control measures.

5. There is a negative relation between fertility rates and the degree of urban development of a given population. The population of Honduras is mainly rural but the crude birth rates for urbanized areas within departments may have changed over the years.

6. There is a negative correlation between educational status and achievements and fertility rates.

7. There appears to be a negative relation between fertility rates and the indices of socio-economic emancipation of women, that is, participation in the labour force.

The above hypotheses are based on four main assumptions:

A. That fertility in Honduras can be measured indirectly even when data available are meagre and of borderline quality.

B. That there is a close relationship between demographic variables. That this relationship provides the basis for the study of fertility in countries with incomplete or unreliable statistics.

C. That the population of Honduras is stable or quasi-stable.

D. That fertility in a given population is determined by a limited number of factors mainly when fertility is high.

For testing purposes the specific hypotheses are restated here in the null form:

1. There is no significant difference between the trend given by the observed crude birth rate and the estimated crude birth rate.

2. There is no significant difference in the increase of the crude birth rate for Honduras from 1930 to 1961 and for the Departments from 1950-1961.

3. There is no significant difference in the crude birth rate for the country as a whole from one census year to another and there is no significant difference in the rate between Departments.

4. There is no significant difference between the estimated fertility and natural fertility.

5. There is no significant difference between the degree of urbanization and fertility.

6. There is no significant difference in fertility for various levels of education.

7. There is no significant difference in fertility for various levels of participation in the labour force.

The last three null hypotheses have been rejected in the light of data gathered for different countries. The factor analysis may help to explain the relationships among fertility and other biological, social or demographic variables.

This study has two purposes, to measure fertility in Honduras and to establish its relationship with other variables. In this attempt it will be very important to test hypotheses 1 to 4. If the 'observed' crude birth rate were reliable the study of fertility could start from this rate rather than anew.

The review of the literature, however, indicates that data for Honduras are not reliable. It is assumed in this study that the 'observed' crude birth rates are incorrect and the history of fertility in Honduras has to be reconstructed. This reconstruction will start by analyzing data by age for the country as a whole. Population counts are the denominators to calculate birth rates and the distribution of the population by age is a useful fertility indicator. Errors in population counts and age distributions would hinder the analysis of fertility.

CHAPTER II

SOURCES OF DATA

The official sources of data for a study of fertility at the national and departmental levels are census and vital statistics. Both sets of data have been compiled and published periodically by the Central Bureau of Statistics and Censuses of Honduras. The census gives the age distribution and other characteristics of the population under study. Vital statistics provide information on the number of births, deaths and marriages taking place in the same population. Unfortunately the two universes through which data are gathered are different. Vital statistics record events as they happen, census figures refer to the state of the total population at a given date. Methods to collect the information and probably the quality and reliability of the data also differ.

Surveys are another source of data but their coverage is usually limited. For this study a survey on fertility was carried out in Honduras by the writer during the summer of 1968.

1. Census Data

Censuses of population are taken periodically to obtain information about the state of the population. A census of population may be defined as the "total process of collecting, compiling, evaluating, analyzing and publishing demographic, economic and social data pertaining, at a specified time, to all persons in a country or in a well delimited part of a country".[1] In Honduras all persons are counted. The enumeration is extended over a period of about one week. The way of enumerating is traditional, i.e., enumerators go from dwelling to dwelling, gathering information on housing conditions and on the age, sex, marital status, religion, education, etc., of the population. This study is mainly concerned with the distribution of the population by age from census data.

Data on age are subject to several types of error and the most common ones are over-reporting at certain ages and under-reporting at other ages. Usually census figures, for any country, are under-estimated. The reasons for under-estimation are varied, sometimes it is difficult to reach groups of people living in isolated areas. In Latin

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1 United Nations, Principles and Recommendations for the 1970 Population Censuses, Statistical Papers Series M, No. 44, Statistical Office, New York, 1967, p. 3.

American cities there are large slum areas where enumerators may have a hard time finding and enumerating all the population. Often the population enumerated do not have a permanent residence.

> "With the high costs and relatively limited resources available for the collection of mass population data, it is not possible for any census operation to achieve perfection in coverage, quality, or comparability [...] With improved techniques for evaluating census and sampling data, adjustments are increasingly possible.[2]

In Honduras, data by single years of age were published for 1961. Unfortunately these data were not published for other censuses but comparisons are always possible. Data by single years of age will be evaluated and to illustrate the technique the example of Mexico is given; this is another Latin American country with sufficient social basic similarities to warrant the comparison.

There are several methods to find what the errors on age reporting are and how to graduate or smooth the data.

The questions on age asked in Mexico for the 1960 census were identical to the questions in the census schedule of Honduras for 1961, namely

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2 P. M. Hauser and O. D. Duncan, Editors, The Study of Population - An Investory and Appraisal, The University of Chicago Press, 1959, p. 72.

How old is this person? _____
completed years of age
How many months old? (for persons under one year of age). Is this person less than one month old? If yes mark with an X.

In other countries the questions on age ask for the date of birth of the person enumerated.

To show some of the errors in age reporting for Mexico Stockwell[3] applied the blending technique developed by Myers, to Mexican data. The same technique was used to evaluate data for Honduras. Briefly, this technique derives a 'blended' population which is a weighted sum of the persons who reported ages ending in digits 0 - 9. The underlying assumption made by Myers in 1942 is that the 'blended' sum at each terminal digit should be very close to ten per cent. Data from several U.S. censuses and age distributions from Life Tables[4] were employed by Myers in testing the accuracy of his assumptions. Deviations from ten per cent indicate preference or avoidance of certain digits. The overall measure of over and under selection of particular digits is the Index of Preference. This index is one half

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3 Edward G. Stockwell, "Digit Preference and Avoidance in the 1960 Census of Mexico", Estadistica, No. 23, September 1965, p. 438-448.

4 For a definition of the Life Table functions, see Chapter IV.

TABLE II

Digit Preference as Shown From Age Data by Single Years of Age, for Honduras, 1961 (for persons aged 10-89)[5]

Deviations from Ten Per Cent and Index of Preference

Terminal Digit	Total			Male			Female		
	Blended Population			Blended Population			Blended Population		
	Total Product	Percentage Distribution	Deviation from 10%	Total Product	Percentage Distribution	Deviation from 10%	Total Product	Percentage Distribution	Deviation from 10%
0	1,574,675	15.6	+ 5.6	741,688	15.0	+ 5.0	832,987	16.2	+ 6.2
1	735,556	7.3	- 2.7	375,656	7.6	- 2.4	359,900	7.0	- 3.0
2	1,010,354	10.0	-	510,331	10.3	+ 0.3	500,023	9.7	- 0.3
3	896,188	8.9	- 1.1	451,650	9.1	- 0.9	444,538	8.6	- 1.4
4	915,110	9.0	- 1.0	452,405	9.1	- 0.9	462,705	8.9	- 1.1
5	1,233,988	12.2	+ 2.2	600,134	12.1	+ 2.1	633,854	12.3	+ 2.3
6	970,721	9.6	- 0.4	470,941	9.5	- 0.5	499,780	9.7	- 0.3
7	845,988	8.4	- 1.6	413,680	8.4	- 1.6	432,308	8.4	- 1.6
8	1,111,027	11.0	+ 1.0	545,352	11.0	+ 1.0	565,675	11.0	+ 1.0
9	813,730	8.0	- 2.0	391,950	7.9	- 2.1	421,780	8.2	- 1.8
TOTAL	10,107,337	100.0	Index of Preference 8.8	4,953,787	100.0	Index of Preference 8.4	5,153,550	100.0	Index of Preference 9.5

5 See Appendix 3 for a detailed account on the calculations.

of the absolute sum of the deviations for each of the terminal digits.

In Table II the 'blended' population and the Index of Preference for Honduras, 1961, are given. Data are shown for the total population in the age group 10 to 89 and by sex.

Preference for reporting certain digits in Table II is shown by a positive deviation from ten per cent.

Avoidance of a digit is represented in terms of a negative deviation from ten per cent. The greater the positive deviation from ten per cent, the greater the heaping for the given digit.

Stanley Turner[7] pointed out that since the most familiar way of counting is with the base ten, heaping should occur at ages ending in multiples of ten, the next largest at multiples of five. This may not be true in less developed countries but it is a clear pattern studied in the United States.

In Table III Myers' technique was applied to data for Mexico. A summary of Tables II and III shows that heaping for the total population is more pronounced for Mexico

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7 Stanley H. Turner, "Patterns of Heaping in the Reporting of Numerical Data", A.S.A. Proceedings of the Social Statistics Section, 1958, p. 248-251.

TABLE III. Application of Myers' Method of "Blending" to Age Data Collected for the Total Population in the 1960 Census of Mexico

Terminal digits	Number at specified ages								Sum for ages	
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	10-89	20-89
0	1,029,718	741,806	780,796	619,400	521,492	473,450	200,200	88,484	4,455,406	3,425,688
1	756,819	449,264	237,792	106,534	94,500	46,045	20,313	7,520	1,718,787	961,968
2	948,976	631,145	407,655	289,035	179,693	89,935	52,712	13,514	2,612,665	1,663,689
3	814,823	571,535	333,444	188,088	131,504	69,421	31,757	9,537	2,150,109	1,335,286
4	807,980	553,262	291,948	158,347	136,170	65,859	28,389	9,283	2,051,238	1,243,258
5	753,742	706,091	592,958	431,949	283,510	191,430	88,484	26,625	3,074,789	2,321,047
6	703,138	474,468	324,719	184,203	145,273	60,826	28,812	8,169	1,947,608	1,244,470
7	703,225	443,467	276,213	158,776	99,482	48,671	19,474	6,115	1,755,423	1,052,198
8	798,608	533,010	441,177	290,396	165,741	78,878	36,715	7,616	2,352,141	1,553,533
9	576,552	357,856	267,613	168,284	105,893	34,359	14,288	4,891	1,529,736	953,184
Sum ...	7,893,581	5,461,964	3,972,315	2,595,012	1,863,258	1,158,874	521,144	181,754	23,647,902	15,754,321

Terminal digits	Ages 10-89			Ages 20-89			"Blended" population			
	Sum	Coefficient	Product	Sum	Coefficient	Product		Sum	Per cent distribution	Deviation from 10%
1	4,455,406	1	4,455,406	3,425,688	9	30,831,192		35,286,598	17.8	+ 7.8
2	1,718,787	2	3,437,574	961,968	8	7,695,744		11,133,318	5.6	− 4.4
3	2,612,665	3	7,837,995	1,663,689	7	11,645,823		19,483,818	9.8	− 0.2
4	2,150,109	4	8,600,436	1,335,286	6	8,011,716		16,612,152	8.4	− 1.6
5	2,051,238	5	10,256,190	1,243,258	5	6,216,290		16,472,480	8.3	− 1.7
6	3,074,789	6	18,448,734	2,321,047	4	9,284,188		27,732,922	14.0	+ 4.0
7	1,947,608	7	13,633,256	1,244,470	3	3,733,410		17,366,666	8.8	− 1.2
8	1,755,423	8	14,043,384	1,052,198	2	2,104,396		16,147,780	8.1	− 1.9
9	2,352,141	9	21,169,269	1,553,533	1	1,553,533		22,722,802	11.5	+ 1.5
0	1,529,736	10	15,297,360	953,184	0	0		15,297,360	7.7	− 2.3
							Sum	198,255,896	100.0	26.6
							Index of preference			13.3

and for all terminal digits:

Terminal Digits	Deviations from ten per cent		Absolute Difference
	Honduras	Mexico	
0	+ 5.6	+ 7.8	2.2
1	- 2.7	- 4.4	1.7
2	-	- 0.2	0.2
3	- 1.1	- 1.6	0.5
4	- 1.0	- 1.7	0.7
5	+ 2.2	+ 4.0	1.8
6	- 0.4	- 1.2	0.8
7	- 1.6	- 1.9	0.3
8	+ 1.0	+ 1.5	0.5
9	- 2.0	- 2.3	0.3

There is in Honduras and Mexico a clear preference for digits ending in 0 and 5, this type of preference is prevalent in many other countries. The degree of heaping has declined over the years. One explanation could be that the methods for census taking become more accurate and that the people become more used to reporting their age. If the Index of Preference for Honduras in 1961 was 8.8 for the total population, 8.4 for females and 9.5 for males, it is possible that in previous censuses the index was higher.

In the United States the Index of Preference has declined from 10.4 in 1880 to 0.4 in 1960.

Industrialized countries have a lower Index of Preference and therefore better reporting in their age data. Table IV indicates that in 1880 the Index of Preference was lower for the United States than for Honduras in 1961. The

TABLE IV

Indices of Preference,[8] for Selected Populations

Country	Index
United States, 1880	10.4
United States, 1890	7.8
United States, 1900	4.7
United States, 1910	5.6
United States, 1920	4.5
United States, 1930	4.3
United States, 1940	3.0
United States, 1950	2.2
United States, 1960	0.8
Sweden, 1960	0.4
Netherlands Antilles, 1960	1.0
Ryukyu Islands, 1960	1.3
Rhodesia and Nyassaland, 1956	1.4
Republic of Korea, 1955	1.4
Taiwan, 1956	1.6
Monaco, 1961	1.8
Bermuda, 1960	1.8
Western Samoa, 1961	2.0
Hong Kong, 1961	2.0
St. Pierre and Miquelon, 1962	2.2
Thailand, 1960	2.2
Singapore, 1957	2.2
Macau, 1960	2.7
Malta and Gozo, 1957	2.8
Turks and Caicos Islands, 1960	2.8
Bulgaria, 1956	3.1
Puerto Rico, 1960	3.5
Romania, 1956	3.6
Cayman Islands, 1960	4.0
Jamaica, 1960	5.4
Uganda, 1959	6.5
Fiji Islands, 1956	6.5
Seychelles, 1960	6.7
Federation of Malaya, 1957	8.2
Tanganyka, 1957	8.8
Philippines, 1960	10.1
Mexico, 1960	13.3
Ghana, 1960	15.7
Turkey, 1960	22.3

8 These indices were computed by application of the blending technique to Census data. The indices for the United States were obtained from the U.S. Bureau of the Census, U.S. Census Population: 1960, Detailed Characteristics: United States Summary, P C (1) - Washington, 1963, p. XII. Indices of Preference for the other countries were computed by E. Stockwell, Op. Cit., p. 440-441.

'Index' for Honduras in 1961 is, however, lower than the same index for Mexico in 1960. The reasons for this could be many, Honduras is a smaller country, the population is more homogeneous, the 1961 census is said to be one of the most reliable in Honduras.

Thirteen censuses have been taken in Honduras in the present century. The latest census took place in 1961. These data were analyzed to find out what types of errors in addition to heaping can be found in Honduran census data.

The sex ratio is another variable derived from population counts.

Sex Ratio in Honduras, 1961[9]
Selected Age Groups

Age	M/F
Less than 1	1.02
1 - 4	1.02
5 - 9	1.04
10 -14	1.06
15 -19	0.94

The ratio for the first two groups is within normal limits. There are more male than female births. But infant mortality is higher for males and soon the difference levels out. In Honduras the increased rate from 1.02 to 1.04 (age group 5-9) to 1.06 (age group 10-14) may indicate

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9 The sex ratio was calculated from the age distribution for 1961, part of this distribution is given in Appendix 3.

misreportings. There is no leveling of the sex ratio and selective migration for males aged 10-14 should not be high. The sex ratio should tend to decrease because male mortality is higher.

In Honduras infant mortality for 1964 was reported as follows:

Infant Mortality in Honduras, 1964[10]

Age	Males %	Females %	Total %
0-1 day	2.9	2.0	2.6
1-6 days	10.3	9.8	10.0
7 days to 1 month	16.5	15.8	16.2
1-6 months	36.5	38.2	37.2
6 months to 1 year	33.8	34.2	34.0

It is difficult to evaluate the errors in this information. The census-takers were instructed to mark with an X the children whose age was one month or less. It is not known how the population used to compute the rates shown above was estimated. Probably the breakdown by days was obtained from birth and death registers.

Nineteen population questions were asked in the 1961 census. Data from the census were evaluated by the Central Bureau of Statistics and Censuses. The following conclusions were reached from the evaluation:

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10 Direccion General de Estadistica y Censos, Annuario Estadistico de Honduras, Tegucigalpa, D.C., Honduras, 1964, p. 65

i) The census must be corrected for heaping in ages ending in 0, 2 and 5;

ii) After a post-enumeration survey based on 32 out of 279 cities in the country it was found that there was an overall under-estimation of 5.3%. It could be assumed that the total population was under-estimated by 5.3%;

iii) Deaths were more under-reported than other demographic or social measures.

Data used in this work are not corrected, adjusted or smoothed. Corrections were introduced only when the magnitude of the errors, if any, was known.

The most serious problems with census data are under-reporting and misreporting. The latter can be solved to a certain extent if distributions by broad age groups are used. Distributions by five year age groups were used, when possible, in this study. This provided a balance between the preferred and avoided digits.

Errors due to under-reporting are more difficult to correct. This problem is not too important when the data to calculate different rates are taken from the same universe. But in the Honduran census questions on fertility have not been asked. The births to calculate different rates are gathered from vital statistics. If the quality of reporting events such as births and deaths differs from the quality of answers to census questions the rates found may not reflect a true picture.

It is assumed that the 1961 census was carefully planned and that enough publicity was made to ensure success. Collver accepts the 1961 census as one of the most accurate for Honduras.

Reasons for under-reporting are varied. In the first place one characteristic of the population that would explain under-reporting is that the majority of the people live in rural areas. In 1961 the urban population reported was 437,818 or 23.2% and the rural population was 1,446,967 or 76.8%, this shows that the population of Honduras is mainly rural. In rural areas under-reporting is common. This may be due, among other, to ignorance, illiteracy, to the difficulty of access to certain rural areas and to the meaning attached to children.

The laws of the country may also have something to do with under-reporting. It is possible that many people who enter illegally into the country will be included in the census but many of them may not declare infant or child mortality. Others may claim that they are in the country for a few days when they have been living there for years. Even if the laws enforce reporting of deaths there will be always some who escape the laws. Regulations may be ambiguous, for example the definition of live birth varies from one country to another.

2. Vital Statistics Data

> Vital records may be defined as those dealing with births, deaths, stillbirths, foetal deaths, marriages, adoptions, legitimations, recognitions, annulments, divorces and separations; in short all the events which have to do with an individual's entrance into or departure from life, together with changes in civil status. For legal reasons such events have, in many countries, long been recorded in registers of which the most common are the register of births, the register of marriages and the register of deaths. Vital statistics or registration statistics are prepared from these registers, generally by means of transcripts or transcriptions from the registers or from draft entries in the registers.[11]

The focus here is mainly on births and deaths registration. In Appendix 4 the forms employed for the official registration of births and deaths are given.

Information is gathered in every municipality, sent to the departmental capital and then to the Central District. Statistics are compiled and published by the Central Bureau of Statistics and Census of Honduras.

Collver evaluated misreportings in vital statistics data:

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11 United Nations, Multilingual Demographic Dictionary, English Section, Department of Economic and Social Affairs, New York, 1958, p. 13-14.

Table V

Completeness of Birth and Death Registration in Honduras[12]

Selected Years	Completeness Births	Deaths	Selected Years	Completeness Births	Deaths
1910- 14	.827	.689	1935- 39	.898	.787
1915- 19	.752	.767	1940- 44	.895	.791
1920- 24	.792	.723	1945- 49	.937	.817
1925- 29	.852	.804	1950- 54	.969	.856
1930- 34	.887	.771	1955- 59	.987	.903

It is assumed that there is under-reporting in Honduras. Collver corrected the error in relation to deaths by multiplying the registered deaths by 1.33. The methods employed for correction are often subjective. Most of the reasons for under-reporting in Honduras are common to other Latin American countries. The reasons for under-registration of deaths are not explained by Collver nor in the statistical reports of Honduras. There has been a slow but steady improvement in births and deaths registration. The under-registration of births and deaths seems to be less pronounced than the under-reportings in population counts. This indicates that rates calculated from census and vital statistics data may be higher than what they are in reality.

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12 Andrew O. Collver, Birth Rates in Latin America, New Estimates of Historical Trends, California, 1965, fragment from Table 6, p. 41.

Another reason for misreporting could be that many children are illegitimate, both in rural and urban areas. This may cause omissions.

Under-reporting of deaths is higher because the legal consequences related to the non-reporting of a death are not as important as those occurring from non-reporting a birth. Birth registers are used to prove the age of a person, to apply for a job or for entrance to school.

Data available in Honduras for the study of fertility are not reliable. It is assumed that both census and vital statistics data have improved over the years. The following rough estimates were given by Arretx in preparing the material for population projections to 1981:[13]

Period	1946-1951		1956-1961	
Vital Characteristics	Births	Deaths	Births	Deaths
Under-reporting	30%	51%	13%	51%

This meant that in 1946-1951 only 70% of the births were registered and 49% of the deaths were registered. The data, however, can be used as indicators.

Another limitation of census and vital statistics data is that only few fertility rates can be calculated from them. Both sources provide enough information to study at

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13 Carmen Arretx, Proyecciones de la Poblacion de Honduras, Por Sexo y Grupos de Edad, 1961-1981, Serie A, No. 70, CELADE, 1967, 66 p.

least crude birth rates.

3. Survey Data

Vital statistics records were used to choose the population for a survey on fertility conducted for this study. This was a pilot project to explore the field and to test some methods to study fertility.

"An inquiry or survey ... is generally an operation which is designed to furnish information on a special subject ... and which has limited aims. ... A field survey is an inquiry in which information is obtained by personal interview".[14]

One hundred and seven women married in 1930, 1931 and 1932, in the municipality of Tegucigalpa, were interviewed by the writer. These years of first marriage were chosen to have a cohort of women who by 1961 had completed their procreation cycle.

The director of the General Bureau of Statistics and Censuses made the access to the marriage files possible. Detailed lists from the Nomina de Matrimonios Realizados en el Municipio de Tegucigalpa (List of Marriages Celebrated

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14 United Nations, Multilingual Demographic Dictionary, English Section, Department of Economic and Social Affairs, New York, 1958, p. 12.

in the Municipality of Tegucigalpa) in the above mentioned years were prepared.

The list provided the name of the spouses (wife's maiden name), the age at marriage, the occupation, citizenship and place of residence of the spouses.

After preparing this list two persons, former term employees of the General Bureau of Statistics and Censuses, worked from March to June 1968 locating the women. This was a difficult task because many of the subjects had changed residence or were deceased.

By June 1968, most of the couples had been located and the questionnaires were ready. The questionnaire employed is given in Appendix 5.

Nineteen questions were asked in face to face structured interviews carried out by the writer and a female assistant. The questionnaire was designed specially for this study. Questionnaires used in other fertility surveys were consulted and findings from different studies[15] were taken into account while preparing the questions. The questionnaire was designed to find out about fertility and

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15 Among other Leon Tabah, "Plan de Recherche de sept enquetes comparatives sur la fecondite en Amerique Latine", Population, No. 1, 19 e anne, jan-mars, 1964, Pages 95-126.

the factors related to it.

The questionnaire was tested before it was used. The ideology of the population interviewed was taken into account. Specialists in questionnaire construction at the General Bureau of Statistics and Censuses of Honduras were consulted on the terminology and wording of the questions.

The enumeration was extended over a period of three months, both enumerators worked on a part-time basis.

The main question was question sixteen. It gave the necessary information to measure fertility. Fertility was defined in terms of the number of children born alive to a woman.

In order to get to the above information, a series of sub-questions were asked. The type and date of termination of each pregnancy were recorded. For children born alive the sex was asked, followed by the age or date of death of a person (if the person was not alive at the moment of the survey). The marital status of the mother at the moment of the event was asked. Women who have had children prior to their first marriage were eliminated; women who became widowed, divorced or separated during their period of procreation were also eliminated.

The above measures were taken to control the exposure of a woman to the risk of conception. This is important to calculate birth intervals or what is commonly known as child

spacing. Intervals were found to estimate how close to natural was the fertility of the women in the population studied.

It would have been easier but more expensive to interview a sizable group of women and to sort out their characteristics. This would have introduced enumerator biases and little control over the aspects measured.

One advantage of the survey was that information to calculate different rates was on one schedule. Therefore the problem of under or over-reporting was not as crucial. Misreportings, to a certain extent, were checked because answers given at marriage were compared to the same answers given during the survey.

Enumerators knew exactly what was expected from every question and the response rate was over ninety per cent in every question.

The questions were asked once the procreation period was over and an attempt was made to relate variables to that period.

The population interviewed did not practise birth control; this last variable may be very difficult to control.

There are several shortcomings associated to this survey. First of all the group of women interviewed was not representative of the population of the country, nor of the population of the department. Marital fertility was

measured in a country where only 70% of the unions were legal in 1963. Sixty-four per cent of the women were born in urban areas. The findings cannot be generalized and it was difficult to check the data for accuracy.

The value of the survey is mainly methodological, the results will be presented at the end of the study.

It is very difficult to measure fertility from data available, mainly because data are not reliable. The sources of data will be explored more closely in this work and hypotheses will be tested.

The analysis will focus on the period 1930 to 1961. The reasons for this are that the last census was taken in 1961, vital statistics data are not available prior to 1927, and family planning programmes were introduced after 1962. The census provides the base population to calculate rates and it is difficult to estimate intercensal populations when mortality, fertility and migration rates are not known. Family Planning Clinics and birth control programmes may have had an effect on fertility, this effect is not known. Analysis of fertility levels after 1961 would have to be based on more complex models than the ones used in this study.

Vital statistics and special surveys on fertility would provide the only lead to fertility in the sixties.

CHAPTER III

AGE STRUCTURE AND POPULATION GROWTH AS INDICATORS OF THE CRUDE BIRTH RATE

The population of the countries of the world could be classified as 'young' or 'old'. Young populations are those where the percentage of persons aged 0 - 15 is very close to 50%. Old or aging populations are those populations where the number of people over 60 years of age is increasing and more than 50% of the population are 15 years old or over. Professor W. F. Wertheim[1] showed that there is a close relationship between the proportion of persons under 15 and the crude birth rate.

> Dans une population sans forte immigration ou émigration, il y a une relation entre le taux brut de natalité, le taux d'accroissement naturel, la mortalité des enfants et des adolescents et la proportion des moins de 15 ans.[2]

Furthermore, 'young' populations are characterized by having high fertility rates.

Due to the relationship between demographic variables when one of them is known inferences about the other are possible. It was said that there is a relationship

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1 W. F. Wertheim "La Population de l' Indonésie et le Test des 40%", Population, 9e année, No. 4, 1954, p. 655-674.

2 Ibid., p. 660.

between the crude birth rate and the age structure of a population. The distribution of the population by age is known as age structure.

The age and sex structure of the population affects fertility. If there are more women in the reproductive ages, i.e., 15 to 50 years old, there is a possibility that the number of children born will be higher. But fertility levels also have an effect on the age structure of the population, the higher the fertility level the younger will be the population and the lower the percentage of persons 15 to 64 years old.

As fertility declines the population begins to age. "It was shown by V. G. Valoaras and others that the aging of populations in advanced societies was overwhelmingly due to the decline in fertility rather than the decline in mortality".[3]

Researchers have profited from this relationship to study fertility because "The age distribution of the population can be regarded as a reflection of the past trends in the components of population growth".[4] The

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3 J. R. Rele, Fertility Analysis Through Extension of Stable Population Concepts, Population Monograph Series No. 2, University of California, Berkeley, 1967, p. 1.

4 Idem. ibid., p. 1.

components of population growth are mortality, fertility and migration.

1. Age Structure of the Population of Honduras

The age structure can be represented graphically by means of age pyramids. In Figures 2 to 7 the age structure of the population is shown. Age is scaled vertically and by sex. It is usual to show the males to the left of the centre and females to the right. The age structure of the population was not available by sex in 1887. The 1881 sex ratios were applied to the total population in 1887 to obtain a distribution by sex. The age groups were overlapping for some of the census years. Age group 7 to 15, for example, overlapped with group 15 to 18 in 1881. This was corrected by changing one of the age groups, usually the lower one, i.e., 7 to 15 became 7 to 14.

The shape of the pyramids reflects fertility levels and changes in fertility. The length of the horizontal line built out from the centre for each age or age group indicates the number of males or females in this age group. In a closed population, i.e., a population that is not affected by migration the age groups should diminish due to mortality. The opposite happens when there is a decline in the birth rate and the number of children 0 to 4 is smaller than the number of children aged 5 to 9. Mortality affects

the pyramid by diminishing the numbers in each age group.

> "The age structure likewise is influenced by annual variations in the numbers of births and deaths due to wars, epidemics, famines, business cycles, etc.; their effects in the form of abnormally shrunken or swelled generations may be seen in the charts of age distributions for many decades".[5]

The accuracy or errors in reporting age are also shown in age pyramids by heapings around certain ages. These irregularities are shown in the pyramid by single years of age for 1961.

It can be said that fertility is the main determinant of the age structure. Furthermore the shape of a pyramid tells whether the level of fertility is high or low.

A series of pyramids were drawn to show changes and levels of fertility in Honduras. The proportion of persons under 15 years of age should be a good indicator of the crude birth rate of the population.

The figures indicate that Honduras is characterized by high fertility levels because the base of the pyramids is broad. Births account for the size of the base.

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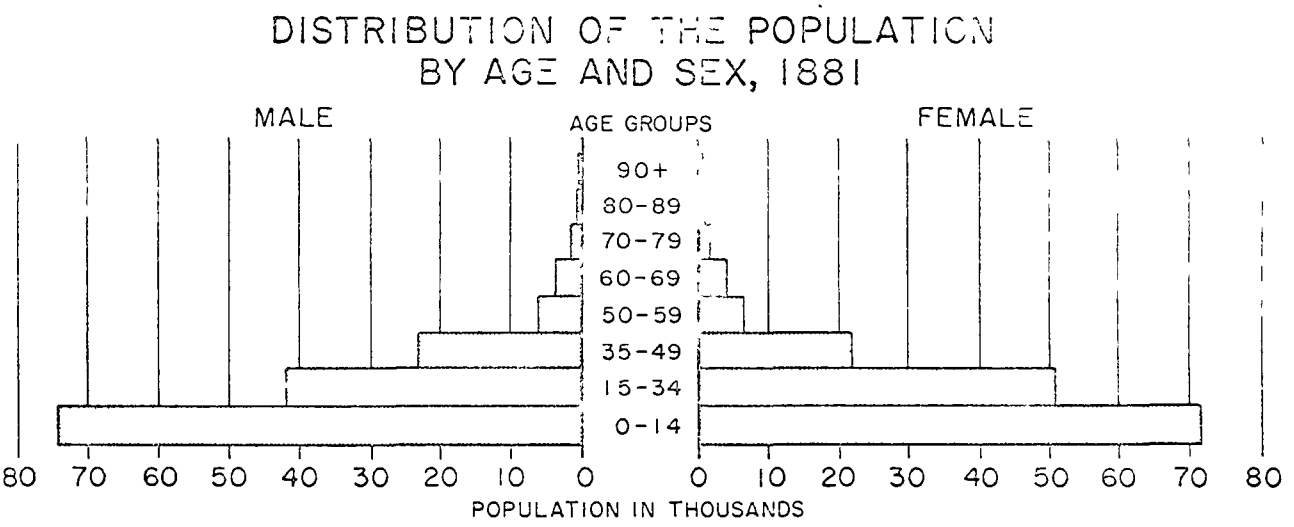
5 United Nations, The Determinants and Consequences of Population Trends, New York, 1953, p. 141.

FIGURE 2



The age pyramids for 1881 and 1887 are not based on the regular 5 year age group breakdown because data were not available by five year age groups. Some ages were grouped in order to have a more even distribution by age in the vertical axis.
See Appendix 6.

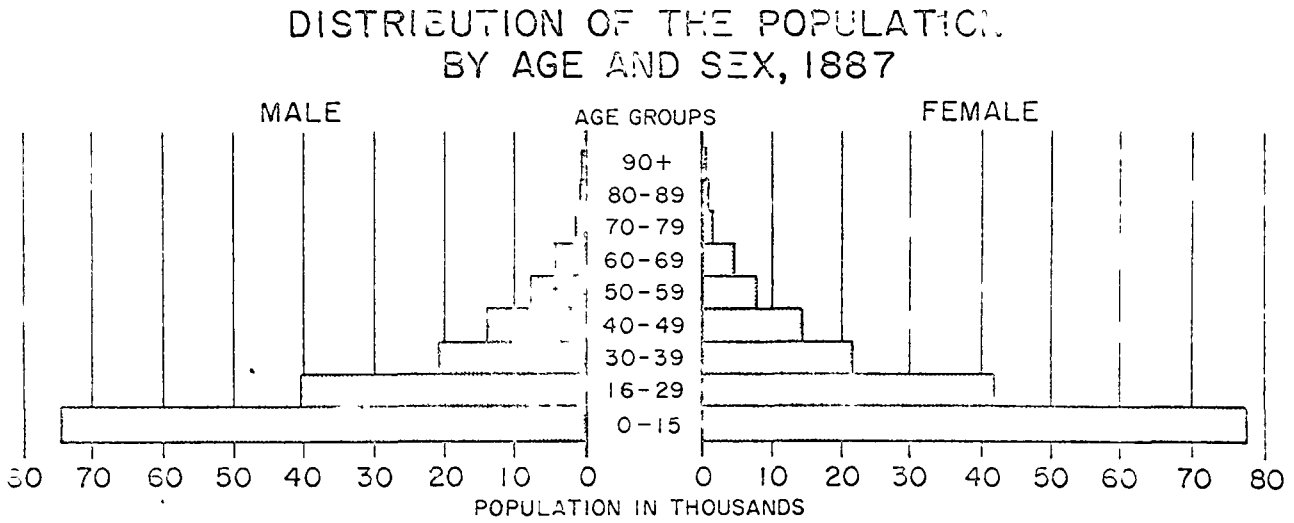


Figure 2. Distribution of the Population by Age and Sex, 1887

The pyramids for 1881 and 1887 indicate high fertility and high mortality. The decrement from one age group to another is sharp. The age and sex structure is even. The number of males is very close to the number of females by age group. The percentage of females in the group 0 - 14, 1881 is smaller by 3.6. A similar pattern occurs in 1930, 1935, 1945, 1950 and 1961.

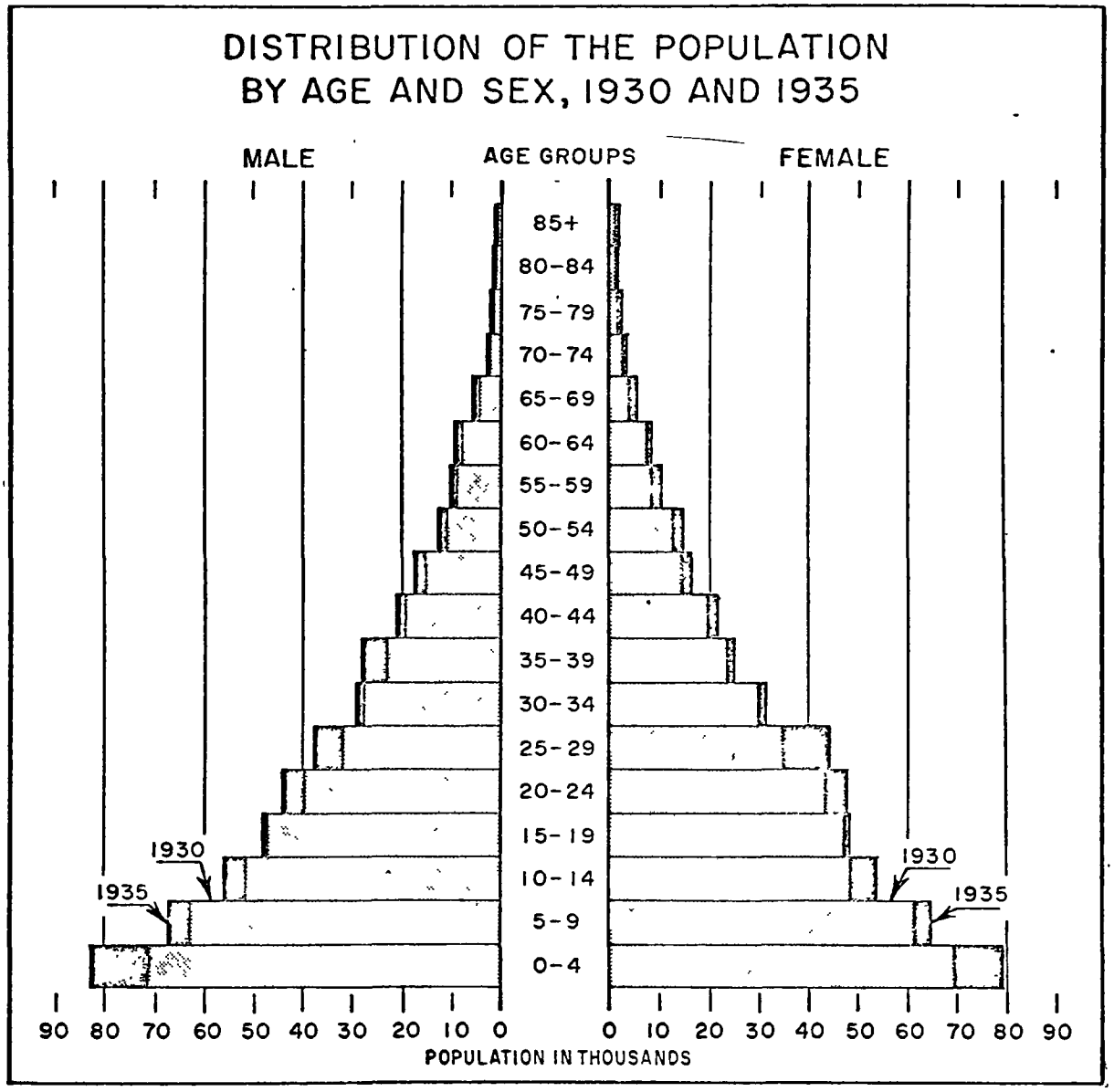
Sex	Age Groups, 1881			Age Groups, 1887		
	%0-14	%15-59	%60+	%0-15	%16-59	%60+
Total	47.4	48.9	3.7	45.9	50.5	3.6
Male	49.2	47.1	3.7	45.9	50.5	3.6
Female	45.6	50.7	3.8	46.0	50.5	3.6

Figure 3. Distribution of the Population by Age and Sex, 1930 and 1935

In figures 3 and 4 two years were drafted together in order to facilitate comparisons. The darker part of the pyramid represents the more recent year. Pyramids for 1930, 1935, 1945, 1950 and 1961 have very similar shapes. This may indicate that fertility has remained high for several decades.

Figures 3 and 4 indicate the increment in population from one year to another. In figure 2 it can be seen that the increment of males aged 0 to 4 and 5 to 9 was higher than the corresponding increment for females. As it was

FIGURE 3


DISTRIBUTION OF THE POPULATION
BY AGE AND SEX, 1930 AND 1935
MALE
AGE GROUPS
FEMALE
85+
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
1930
1935
1930
1935
90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90
POPULATION IN THOUSANDS

mentioned before even when the number of male births is higher, infant mortality for males is also higher and the sex ratio should tend to become close to one.

Sex	Age Groups, 1930			Age Groups, 1935		
	%0-14	%15-64	%65+	%0-14	%15-64	%65+
Total	42.6	55.2	2.2	42.0	55.1	2.9
Male	43.7	54.3	2.1	43.1	54.2	2.8
Female	41.5	56.2	2.3	40.9	56.0	3.1

Figure 4. Distribution of the Population by Age and Sex, 1945 and 1950

Even when the age pyramid for 1945 and 1950 is very similar to the previous one the increment in the 0 to 4 group seems to have slowed down. An unusual increment is noticed in the group 10 to 14 which could mean more births in the years corresponding to that cohort. A peculiarity noticed in 1950 is the sudden increase for the group 65+ and the corresponding decrease for ages 0 to 14. This may be due to reporting errors because in 1961 the pattern is very similar to the one found in other censuses.

Sex	Age Groups, 1945			Age Groups, 1950		
	%0-14	%15-64	%65+	%0-14	%15-64	%65+
Total	41.7	55.5	2.8	40.6	55.4	4.0
Male	42.3	55.1	2.7	41.5	54.8	3.8
Female	41.2	55.9	2.9	39.7	56.1	4.2

FIGURE 4

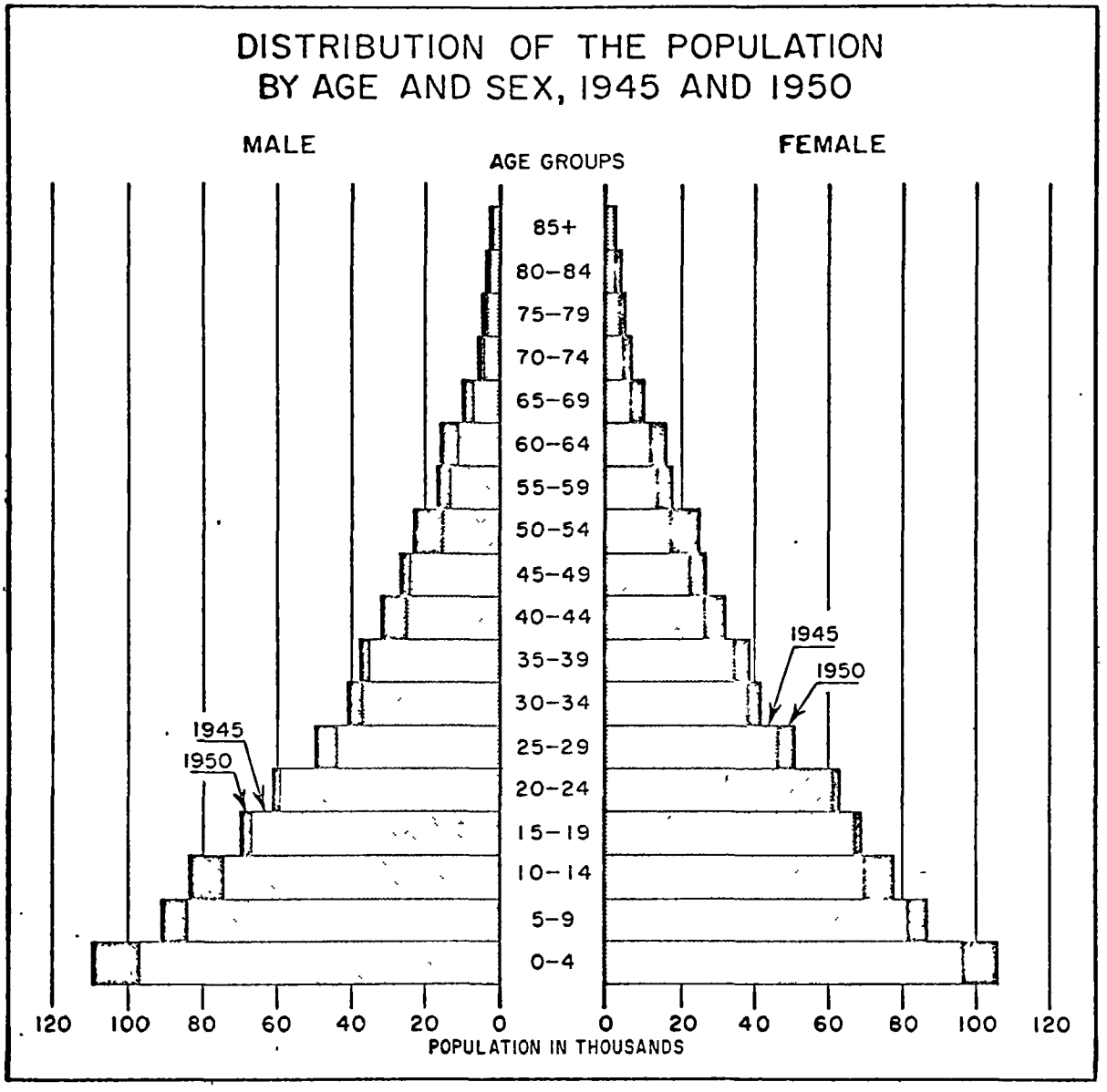
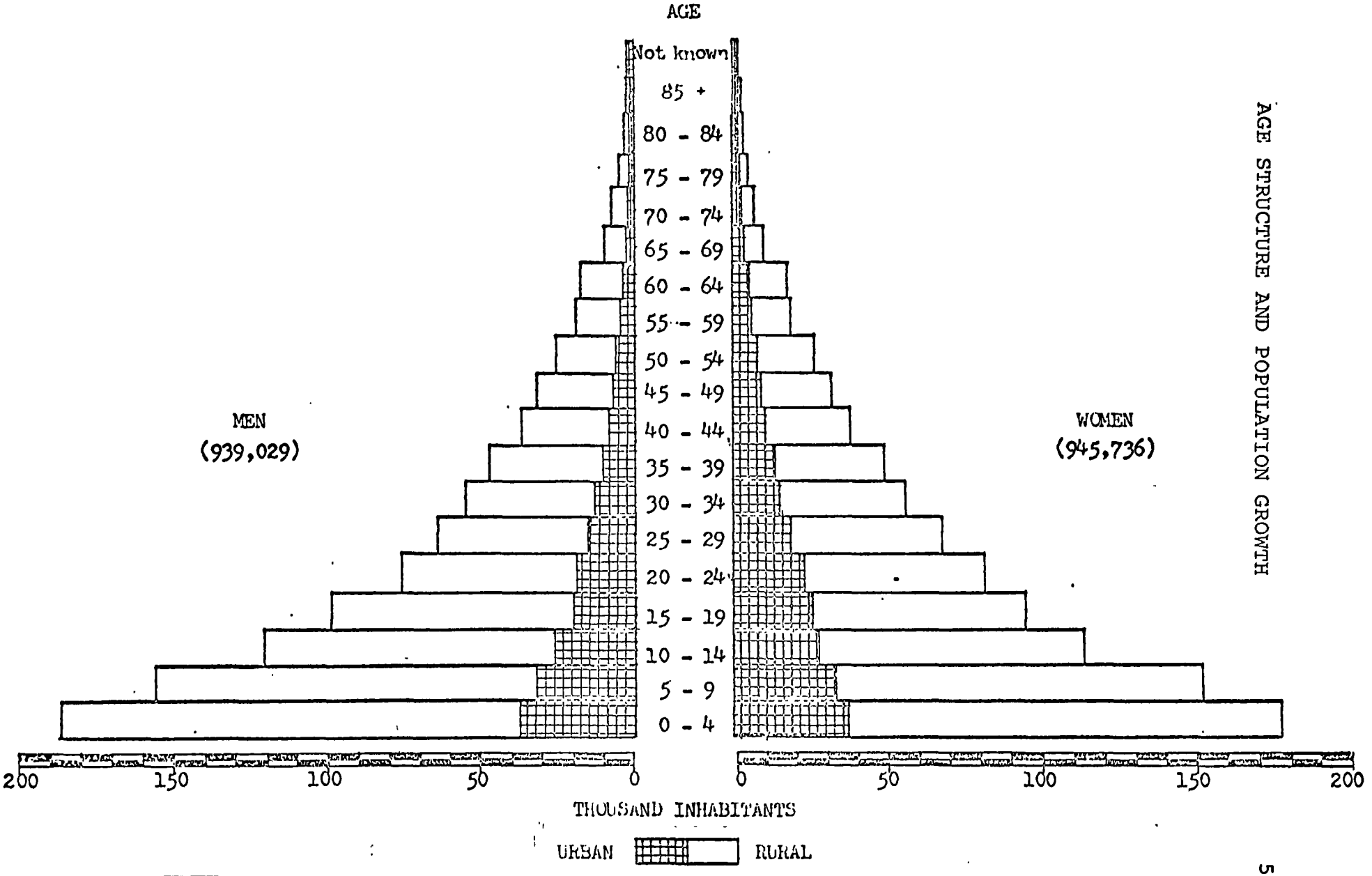

DISTRIBUTION OF THE POPULATION
BY AGE AND SEX, 1945 AND 1950
MALE
FEMALE
AGE GROUPS
85+
80–84
75–79
70–74
65–69
60–64
55–59
50–54
45–49
40–44
35–39
30–34
25–29
20–24
15–19
10–14
5–9
0–4
1945
1950
1945
1950
120 100 80 60 40 20 0
0 20 40 60 80 100 120
POPULATION IN THOUSANDS

FIGURE 5[1]. DISTRIBUTION OF THE POPULATION BY AGE GROUPS, SEX AND PLACE OF RESIDENCE, 1961[6]



AGE STRUCTURE AND POPULATION GROWTH

Honduras, Direccion General de Estadistica y Censos, Caracteristicas Generales y Educativas de la Poblacion, Censo Nacional de Honduras, Tegucigalpa, 1963, p. 62.

FIGURE 6

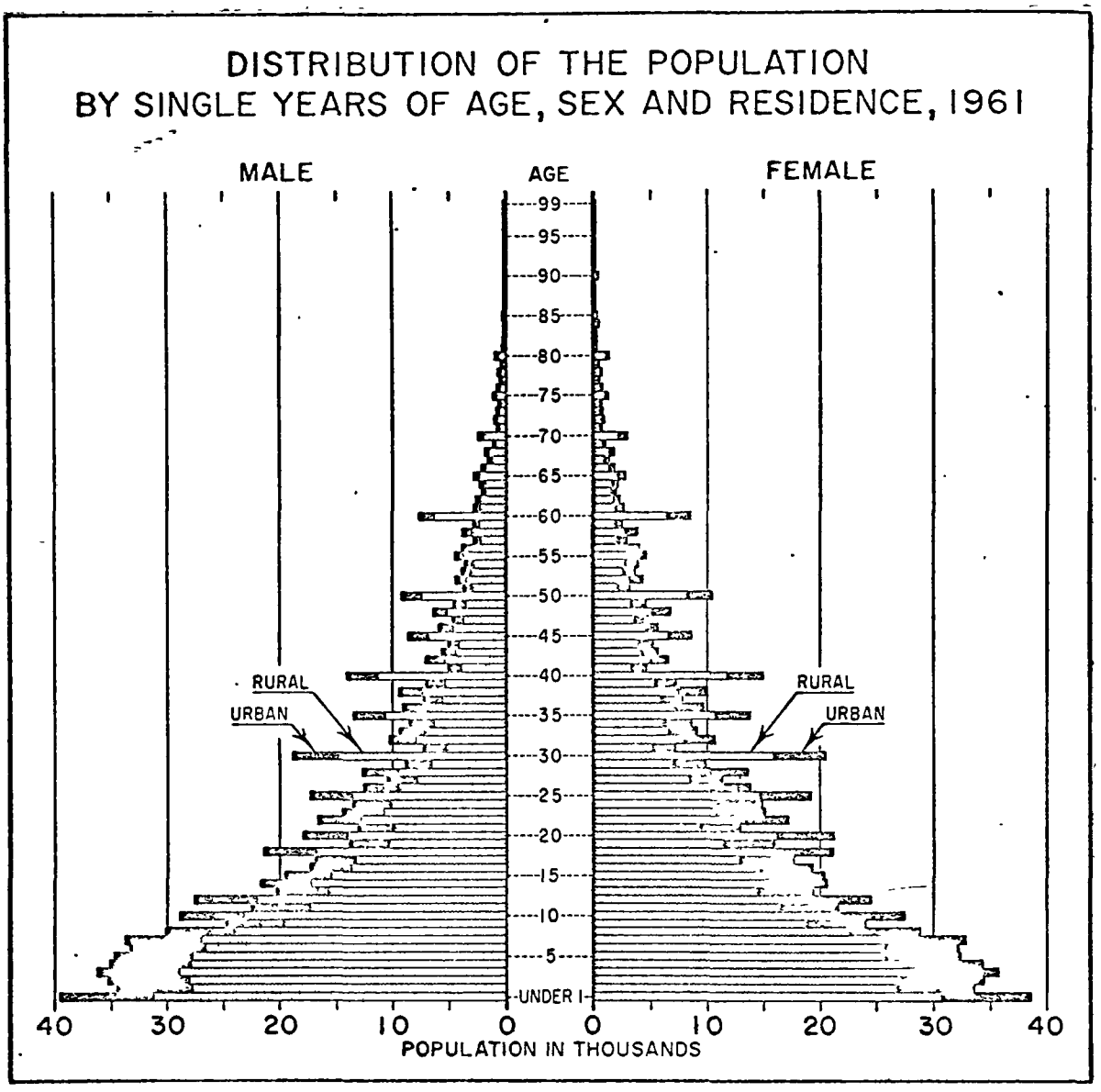

DISTRIBUTION OF THE POPULATION
BY SINGLE YEARS OF AGE, SEX AND RESIDENCE, 1961
MALE
AGE
FEMALE
99
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
UNDER 1
RURAL
URBAN
RURAL
URBAN
40
30
20
10
0
0
10
20
30
40
POPULATION IN THOUSANDS

Figure 6. Distribution of the Population by Single Years of Age, Sex and Residence, 1961

In Figure 6, the population by single years of age is shown with all its irregularities. In Table I measures of age misreporting and heaping for this population were given. This pyramid shows similarities and differences between the rural and urban population of Honduras. It is important to note that 76% of the population is rural and usually rural populations have high fertility rates. Different proportions for the rural population are indicated in the proportions given below.

	%0-14	%15-64	%65+
Rural			
Total	43.8	53.4	2.8
Male	46.2	51.4	2.4
Female	41.7	55.1	3.2
Urban			
Total	49.0	48.7	2.3
Male	49.6	48.1	2.3
Female	48.4	49.3	2.3
Total			
Total	47.8	49.8	2.4
Male	48.8	48.8	2.4
Female	46.8	50.7	2.5

The pyramids for different census years have similar shapes. Urban and rural populations follow a similar pattern.

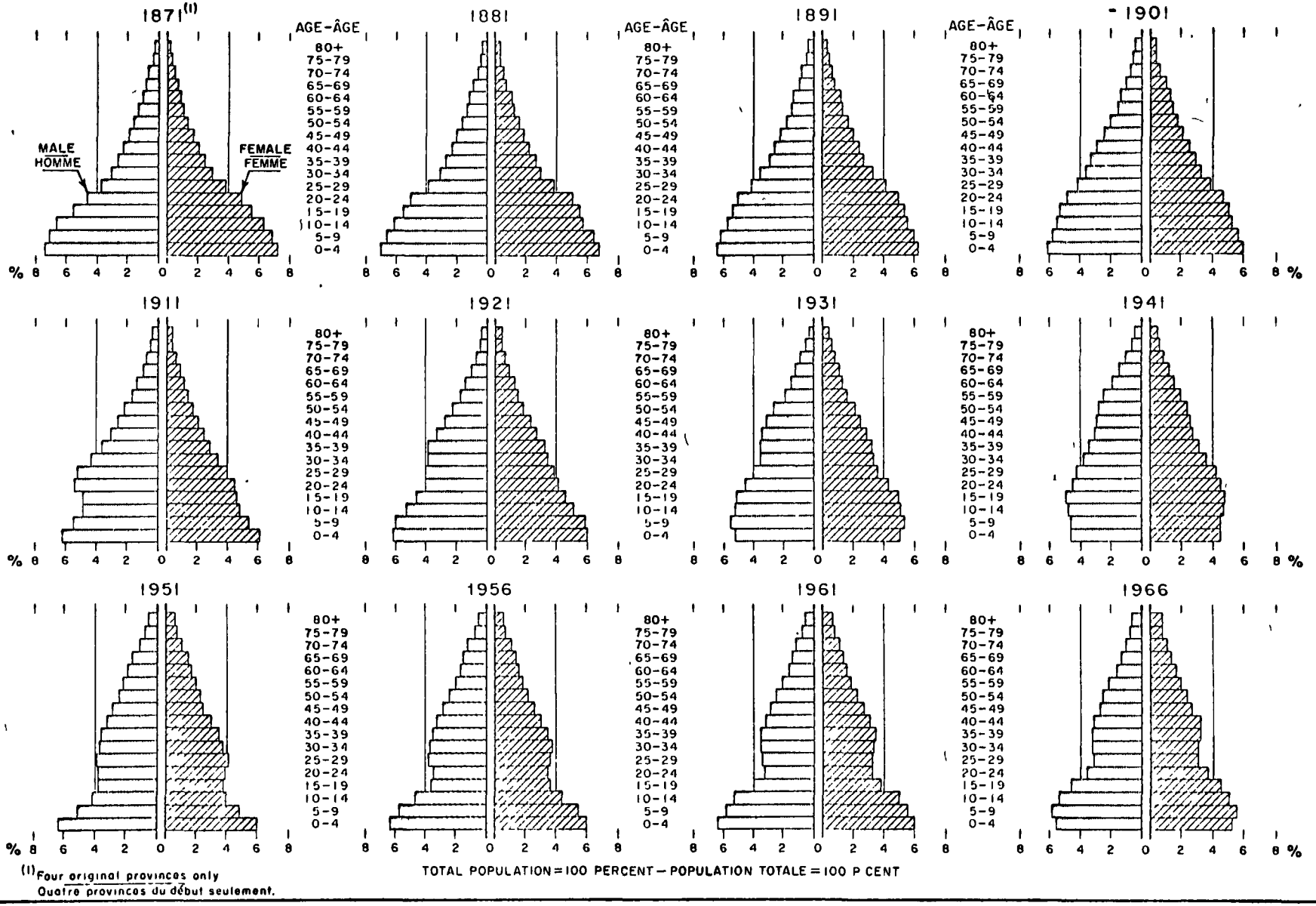
Some countries have more reliable statistics than Honduras. In countries where fertility is declining or has been low for several years the shape of the pyramids, and therefore the age structure of the population, is different. Figure 7 is an illustration of how the interplay of different levels in mortality, fertility and migration give rise to different shapes in the pyramids.

Figure 7 shows age pyramids for Canada, 1871-1966. The Canadian population characteristics are very different from the characteristics of Honduras. In Honduras fertility and mortality may account for most of the population growth, in Canada immigration is an important factor. Canada was affected by the world wars, the depression and the 'baby booms' which followed these events. Honduras has been a more closed or sheltered population. Assuming that age distributions for Canada are more reliable than the age distributions for Honduras, changes in fertility can easily be detected from the pyramids. In Canada fertility seems to have declined from 1921 to 1941. There is an increase in the number of births from 1951 to 1961.

The crude birth rate in Canada remained at an intermediate level for a long time, it was not typical of

FIGURE 7: PERCENTAGE DISTRIBUTION OF THE POPULATION BY 5 YEAR AGE GROUPS AND SEX, CANADA, 1871-1966 [7]

RÉPARTITION PROPORTIONNELLE DE LA POPULATION PAR GROUPE QUINQUENNAL D'ÂGE ET SELON LE SEXE, CANADA, 1871-1966



7 Canada, Dominion Bureau of Statistics, 1966 Census of Canada, Age Groups, Catalogue No. 92-610, Volume I, Chart I, March, 1968.

populations with low or with high crude birth rates. The crude birth rate began to decline after 1962. The 1966 pyramid indicates some of this decline. The 1971 Canadian age pyramid may look like the one for 1941.

Age pyramids represent the evolution of a population. The population of Honduras has always been characterized by high birth rates, hence the broad base. The Canadian age pyramids present more variety in shape, the 1871 pyramid, with its wide base and rapid tapering reflects high natality and high mortality. The shape of the pyramids is determined mainly by fertility. It may therefore be said that without a high birth rate, there cannot be a pyramid that has a wide base and tapers rapidly. The 1881, 1891 and 1901 pyramids have narrowing bases, the Canadian population was beginning to age. There was a slight increase in fertility in 1911 but by 1941 fertility had reached one of its lowest levels. After the war came the 'baby boom' reflected in the age pyramid for 1951. In 1941 the crude birth rate reached a high level of 28.9[8] births per 1,000 population. There is a marked difference between the 1941 and 1951 age pyramids. In recent years fertility in Canada has declined

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8 Canada, Dominion Bureau of Statistics, Vital Statistics, 1967, Catalogue No. 84-202, the Queen's Printer, Ottawa, 1969, p. 69.

and this is clearly indicated by the narrow base of the 1966 age pyramid.

From Figures 2 to 6 it can be concluded that fertility levels in Honduras are high and possibly increasing. It can be said that the crude birth rate should be very close to 40/00 but the exact level cannot be found from the pyramids.

2. Fertility and Population Growth

Fertility or the number of births in a given period of time is one of the elements used to calculate the natural rate of growth of a population. The other two determinants of population growth are mortality and migration. These elements also determine the age distribution of the population. In order to estimate the size of a population the births and immigration gains have to be added, deaths and losses due to emigration have to be subtracted.

If the total population for two different years is available the change in the size of the population and the population growth or increase can be estimated.

There are different ways to calculate the rate of growth. The formulas given below indicate the relationship between fertility and the rate of growth (r). The crude rate of natural increase is given by:

$$r = \frac{B-D}{P} K \qquad I^{9}$$

where B = Births, D = Deaths, P = mid-year population and K is a constant. The formula given before can be expressed as:

$$r = \frac{B}{P} - \frac{D}{P} \qquad II$$

which means that the rate of growth is equal to the crude birth rate minus the crude death rate. In I and II the effect of migration is ignored. To calculate the natural rate of growth data on births and deaths must be available and must be reliable. If these data were not available the growth ratio or rate could be calculated from census data alone (one universe):

$$r = \frac{P_2}{P_1} - 1 \times 100 \qquad III^{10}$$

or

$$r = \frac{P_2 - P_1}{P_1} \times 100 \qquad IV$$

Where P_2 is the population at the end of the period and P_1 is the population at the beginning of the period.

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9 G. W. Barclay, Techniques of Population Analysis, John Waley and Sons, Inc., New York, 1958, p. 35.

10 G. W. Barclay, Op. Cit., p. 207.

"If the rate of growth is assumed to operate continuously, it can be expressed as $\frac{P_2}{P_1} = e^{rn}$." V

Where e is the exponential function, the r derived is an annual rate. V "is also a somewhat more realistic way of representing the effect of r".

Assuming that the rate of growth has remained constant during the intercensal period:

$$\frac{P_2}{P_1} = (1 + r)^n \qquad \text{VI}$$

In V and VI n is the number of years elapsed between censuses. Some of the formulas given above were used to calculate r for Honduras.

Table VI shows that there have been changes in the rate of growth calculated from census data. The rate remained consistently high and ranged from 1.45 for 1916-1926 to 2.91 for 1950-1961. The same rates by sex are similar but the rate of growth for the female population is higher than for the male population. Different methods to calculate r gave similar results. Immigration may have favoured females, but it is doubtful that more females have been born and that the sex ratio keeps changing over the years. It is assumed that the reporting for females has improved and that as more females are counted a higher rate of growth for this group is shown. Because of the irregularities found in data for females it will be assumed that

TABLE VI

Rate of Growth -r- for Honduras
Selected Census Years

Census Dates	n	III	V	VI
1881 - 1887	6	8.01	1.28	1.39
1887 - 1910	23	66.74	2.22	2.33
1910 - 1916	6	9.50	1.52	1.62
1916 - 1926	10	15.65	1.45	1.39
1926 - 1930	4	21.88	4.95	5.20
1930 - 1935	5	12.62	2.38	2.57
1935 - 1940	5	15.16	2.82	2.80
1940 - 1945	5	8.37	1.60	1.62
1945 - 1950	5	14.00	2.62	2.57
1950 - 1961	11	37.71	2.91	3.04

Rate of Growth -r- by Sex for Honduras
Selected Census Years

Census Dates	n	III		V		VI	
		Female	Male	Female	Male	Female	Male
1881-1887	6	8.05	7.98	1.28	1.28	1.39	1.39
1887-1930	43	154.04	160.79	2.17	2.23	2.09	2.33
1930-1935	5	12.21	13.04	2.30	2.46	2.33	2.57
1935-1945	10	24.10	25.50	2.16	2.27	2.09	2.33
1945-1950	5	14.05	13.95	2.62	2.62	2.57	2.57
1950-1961	11	38.53	36.90	2.96	2.85	3.04	2.80

TABLE VI Concluded

Rate of Growth -r- for Honduras and the Departments, 1950 to 1961

Area	III	V	VI
Honduras	37.71	2.91	3.04
Francisco Morazan	49.42	3.65	3.75
Atlantida	46.13	3.45	3.51
Colon	18.16	1.52	1.39
Comayagua	41.47	3.15	3.28
Copan	31.61	2.50	2.57
Cortes	59.15	4.23	4.23
Choluteca	39.06	3.00	3.04
El Paraiso	29.37	2.35	2.33
Gracias a Dios			
Intibuca	23.21	1.90	1.86
Islas de la Bahia	11.21	0.96	0.93
La Paz	18.31	1.53	1.39
Lempira	21.49	1.77	1.86
Ocotepeque	15.04	1.27	1.39
Olancho	31.98	2.53	2.57
Santa Barbara	52.40	3.83	3.75
Valle	23.81	1.95	1.86
Yoro	32.27	2.55	2.57

data for males are more reliable and some of the calculations will be based only on these data.

The rate of growth does not tell much about fertility levels because "a low rate of increase may be found where the birth rate is high, and a fairly high rate of increase may occur when both birth and death rates are low".[11] The rate is a good indicator of changes in the population.

There are regional differences in the rate of growth, different formulas were used to calculate the rate of growth for the departments of the country. There are differences in the rate from one department to the other. These differences may denote real changes in population or may be due to the completeness of the enumeration in each Department.

In Francisco Morazan, the Department with the highest percentage of urban population in 1961, the rate was very low from 1881 to 1926. There is a sudden increase from 1926 to 1930 and by 1950-1961 the rate of growth was higher than the rate for the country as a whole. Only the department of Cortes had a higher rate of growth.

The rates found by formulas V and VI are very similar, this could indicate that the rate of growth has remained constant for some of the intercensal years. The

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11 G. W. Barclay, Op, Cit., p. 210

increase in the rate from 1950 to 1961 may indicate that the population of Honduras is growing faster due to an increase in the birth rate, declines in the death rate could also account for the change.

It is evident that age structure is a better indicator of fertility levels than the rate of growth of the population. The age structure has an effect on fertility because the younger is the population the larger

> the size of reproductive age groups in proportion to the total population. Having a large proportion of people at these ages is favorable to natural increase with a given level of fertility and mortality, they produce more births (and fewer deaths) than there would be with smaller groups of potential parents.[12]

Fertility in turn has a marked effect on the age structure of the population. Fertility is an element of population growth. If it is assumed that the population of Honduras is closed to migration, mortality and fertility would be the only determinants of population growth and of the age structure of the population. The rate of natural increase would be equal to the rate of growth calculated by V and VI. The rate of natural growth will be estimated once the crude birth rate and the crude death rate levels are found.

Age pyramids were compared for selected census years from 1881 to 1961. It was shown that the annual rate of

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12 G. W. Barclay, Op. Cit., p. 223

growth has slowly increased but the shape of the pyramids remains constant: broad base and slow decrements from age group to age group. This is the typical pyramid for a population with high fertility. The increase in the rate of growth could be due to declines in mortality.

The relationship between fertility, age structure and population growth between fertility, has been outlined. These variables are closely related, it should be possible to compute fertility rates from the data available.

In Chapter IV a method to estimate birth rates will be developed. In order to do this, mortality, another element of population growth and age structure will be studied very closely.

CHAPTER IV

AN INDIRECT METHOD TO ESTIMATE THE CRUDE BIRTH RATE

STABLE POPULATION THEORY

The age pyramids indicated high fertility levels and high, maybe declining, mortality rates. The effect of fertility on the age structure of the population seems more 'visible' than the effect of mortality. The effect of mortality, on both the age structure and fertility, is more subtle. This relationship will be discussed later. The relationship between fertility and age structure will be explored further in this chapter.

The stable population theory provides the background to study fertility using vital statistics and census data. Measurements of fertility from the age structure alone would be hazardous. If data are not adjusted the rates may be over or under-estimated.

1. Stable Population Theory

The stable population theory is based on the relationship between demographic variables, on the behavior of the variables and on the social characteristics of the population or populations studied.

If a stable or quasi-stable model is found for Honduras it should be possible to derive not only birth rates bur other demographic measures from the model.

A population is stable when over a long period of time some of its vital rates have tended to become constant. Stable population implies constant mortality and age specific fertility rates as well as a rate of growth that has tended to become constant. The stable population by definition is closed to migration. Populations subject to high migration cannot have constant fertility, mortality and growth rates. The rate of growth, for example, would vary at random because the elements accounting for it would also vary randomly.

The stable population is a theoretical model developed to study populations. Few, if any, of the populations of the world are stable. Assuming that mortality has been declining in Honduras the population would be 'quasi-stable'.

One method to find how close is the population of Honduras to a stable or 'quasi-stable' population is to try to find a model life table for Honduras.

Several methods could be employed to construct a life table. A. Coale (1966) and P. Demeny (1966) have constructed a series of life tables and of stable populations associated with each life table. These tables are based on a series of assumptions around the stable population theory.

The tables are models generated after taking into account a variety of mortality conditions.

> In order to find a model any pair of the following values will suffice, so long as the pair is drawn from two different groupings:
>
> (a) Age distribution measures, such as the relative proportion of two different parts of the age distribution, or of one part to the whole;
> (b) Mortality measures, such as E-life expectancy at any age, the proportion surviving from one age to another, an age-specific mortality rate, or the crude death rate;
> (c) The rate of growth of the total population or of any broad age-groups;
> (d) A measure of the fertility of the population, such as the crude birth rate, the general fertility rate, or total fertility plus the mean age of childbearing.
>
> The estimating process is one of selecting that stable age distribution having two given properties, e.g., the observed proportion under 30 years of age, and the observed rate of increase.[1]

Rele employed the gross reproduction rate (GRR) and the life expectancy at birth to find stable populations used to derive birth rates.

The observed rate of increase (r) suggested by Coale is not an appropriate parameter. Rele stated that "estimates of the measures of fertility and mortality based on the rate of growth are rather too sensitive to variations in the

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1 Milbank Memorial Fund, Emerging Techniques in Population Research, New York, 1963, p. 177.

value of r".[2] In Chapter III, the rate of growth was calculated for the population of Honduras and the values found will be used to calculate life tables. From the life tables the corresponding stable populations will be found. "Associated with any life table is a set of stable age distributions incorporating the life table and alternative rates of increase determined by the specified mortality and various possible fertility schedules".[3]

The assumptions on which a life table is based and its functions will help to understand the relationship between the stable population concept and some of the functions of the life table.

2. The Life Table

The life table is the most complete description of mortality patterns. The main functions of a life table are:

Q(X) - The probability of dying before attaining age X. Or the 'risk' of dying before attaining a given age.

P(X) - The probability of surviving and by definition equal to 1-Q(X).

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2 J. R. Rele, Fertility Analysis Through Extension of Stable Population Concepts, Population Monograph Series No. 2, University of California, Berkeley, 1967, p. 9

3 W. Brass, A. J. Coale, et al., The Demography of Tropical Africa, Princeton, New Jersey, Princeton University Press, 1968, p. 121.

M(X) - The death rate.

D(X) - The total number of deaths by age.

l(X) - The radix of the table is a hypothetical cohort representing the number of survivors at each exact age. Usually l(O) is equal to 100,000.

L(X) - The number of years lived.

T(X) - The total number of persons years lived by the cohort at a given age.

E(X) - Known as the 'life expectancy' is the average number of years lived by the cohort's survivors from age X onwards.

There are several methods to construct a life table. For example, M(X) values, better known as the crude death rate, could be used to construct a life table. This measure was used to calculate life tables for Honduras. In order to do this the average reported number of deaths by age group for a period of three years was divided by the population in each age group.

M(X) values for 1961 are given in Table VII. These values could have been calculated for other census years, data are available from 1927 to 1965. Since mortality data are not reliable the life table based on M(X) values was used to find a model life table. In order to compute the 1961 life tables M(X) values were converted into Q(X) values. The life tables functions are given in Table VIII, these functions were calculated as follows:

TABLE VII

Age-Specific Death Rates[4] M(X), for Honduras, 1961

Age	Females	Males
Less than 1 year	49.16	58.33
1 - 4	13.58	13.68
5 - 9	3.51	3.61
10 - 14	1.81	2.01
15 - 19	2.33	3.07
20 - 24	3.33	4.81
25 - 29	4.23	6.06
30 - 34	5.26	6.45
35 - 39	5.71	7.15
40 - 44	6.77	8.45
45 - 49	7.88	9.93
50 - 54	10.40	12.69
55 - 59	15.21	15.51
60 - 64	22.24	22.96
65 - 69	31.69	31.29
70 - 74	44.24	49.01
75+	87.63	97.62
Total	9.10	10.25

4 Calculations are based on raw figures from the 1961 Census and from Vital Statistics.

$$Q(X) \text{ for age } 0 = \frac{2 \times M(0)}{2 + M(0)} \qquad \text{VII}$$

$$Q(1) = \frac{2 \times 4M(1)}{2 + 4M(1)} \qquad \text{VII-a}$$

$Q(X)$ for 5 year age groups

$$= \frac{10M(X)}{2 + 5M(X)} \qquad \text{VII-b}$$

$$Q(75) = \frac{60 \times M(75)}{2 + 30\ M(75)} \qquad \text{VII-c}$$

$$D(X) = l(X) \times Q(X). \qquad \text{VIII}$$

The death rate for persons under one year is always higher than the other age specific rates. This rate is unusually low for Honduras. The pattern in different countries of the world for 1961 was:[5]

Canada	27.2
Australia	20.5
France	26.4
China	32.7
Austria	34.4
Barbados	83.3
United Arab Republic	162.7
India	190.3

The rate for Honduras should have been closer to that for Barbados, the United Arab Republic and India. Under-reporting of deaths may account for the low rate.

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5 United Nations, Demographic Year Book, New York, 1966, p. 414 - 482.

M(X) values are given in Table VII. Note that M(O) is the M value given for the group 0-1.

$l(X)$ for $l(O) = 100{,}000$ (hypothetical cohort) IX

$l(X) = l(X - 1) \times P(X)$ IX a

$$L(X) = \frac{D(X)}{M(X)} \qquad X$$

$P(X) = 1 - Q(X)$ XI

$T(X) = L(X) + T(X)$ XII

$$E(X) = \frac{T(X)}{l(X)} \qquad XIII^{6}$$

Several adjustments could have been made for these calculations. Coale and Demeny[7] used more refined methods for the above calculations, when the formulas (VII to XIII) were applied to one of the Regional Model Life Tables the results were very close but not identical to the values given in the table. See Appendix 7.

When a life table is constructed using the reported M(X) values several irregularities are found. The functions do not follow an expected pattern and irregularities are more frequent in life tables based on vital statistics and census data prior to 1961. The life expectancy at birth E(O) which

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6 These formulas are explained in G. W. Barclay, Op. Cit., p. 101-116.

7 A. Coale and P. Demeny, Op. Cit., p. 20 and p. 38-39.

summarizes mortality patterns is 62.3 for females and 59.3 for males. These values are too high for the population studied. The General Bureau of Statistics and Censuses published in 1964[8] adjusted age distributions for 1961. When these smoothed values were used E(0) for females was 61.6 and for males 58.9. See Appendix 8. In Canada E(0) was 68.35 for males and 74.17 for females in 1961. The values in India were 41.89 and 40.55 for the same year.[9]

The irregularities and differences are probably due to misreportings. To compute Table VIII data were not adjusted and even when 1961 data may be more accurate it was shown that both population by sex data and above all mortality data were under-reported. There are several ways to get around this problem:

i) to use tables prepared by other researchers,
ii) to adjust the data,
iii) to find indirect ways to calculate the life tables.

Points ii) and iii) will be explored first.

First of all it is assumed that the M(X) values are not correct. In order to adjust these values a reliable point of reference is needed. The M(X) values are irregular,

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8 Direccion General de Estadistica y Censos, Anuario Estadistico 1964, Tegucigalpa, D.C., October 1965, p. 35.

9 United Nations, Op. Cit., p. 562 - 582.

TABLE VIII. Life Table for 1961[10]

Age(x)	Q(x)	D(x)	M(x)	1(x)	L(x)	P(x)	T(x)	E(x)
FEMALES								
0	0.04798	4.79800	.04916	100.00000	97.59967	0.95202	6226.48592	62.26486
1	0.05288	5.03428	.01358	95.20200	370.71281	0.94712	6128.88625	64.37770
5	0.01740	1.56892	.00351	90.16772	446.98575	0.98260	5758.17344	63.86070
10	0.00901	0.79828	.00181	88.59880	441.03867	0.99099	5311.18769	59.94650
15	0.01158	1.01673	.00233	87.80052	436.36481	0.98842	4870.14902	55.46834
20	0.01651	1.43280	.00333	86.78379	430.27027	0.98349	4433.78421	51.09000
25	0.02093	1.78640	.00423	85.35099	422.31678	0.97907	4003.51394	46.90647
30	0.02596	2.16934	.00526	83.56459	412.42205	0.97404	3581.19716	42.85544
35	0.02815	2.29128	.00571	81.39525	401.27496	0.97185	3168.77511	38.93071
40	0.03329	2.63337	.00677	79.10397	388.97637	0.96671	2767.50015	34.98560
45	0.03864	2.95482	.00788	76.47060	374.97716	0.96136	2378.52378	31.10377
50	0.05068	3.72578	.01040	73.51578	358.24808	0.94932	2003.54662	27.25329
55	0.07326	5.11282	.01521	69.79000	336.14859	0.92674	1645.29854	23.57499
60	0.10534	6.81309	.02224	64.67718	306.34397	0.89466	1309.14995	20.24130
65	0.14682	8.49561	.03169	57.86409	268.08488	0.85318	1002.80598	17.33037
70	0.19917	9.83272	.04424	49.36848	222.25859	0.80083	734.72110	14.88239
75	1.13586	44.90709	.08763	39.53576	512.46251	— 0.13586	512.46251	12.96200
MALES								
0	0.05668	5.66800	.05833	100.00000	97.17127	0.94332	5932.15797	59.32158
1	0.05326	5.02412	.01368	94.33200	367.26023	0.94674	5834.98670	61.85586
5	0.01789	1.59772	.00361	89.30788	442.58172	0.98211	5467.72647	61.22334
10	0.01000	0.87710	.00201	87.71016	436.36816	0.99000	5025.14475	57.29262
15	0.01523	1.32247	.00307	86.83306	430.77199	0.98477	4588.77659	52.84596
20	0.02381	2.03601	.00481	85.51059	423.28690	0.97619	4158.00460	48.62561
25	0.02985	2.49172	.00606	83.47458	411.17492	0.97015	3734.71770	44.74078
30	0.03174	2.57040	.00645	80.98286	398.51163	0.96826	3323.54278	41.04008
35	0.03512	2.75385	.00715	78.41246	385.15385	0.96488	2925.03115	37.30314
40	0.04138	3.13075	.00845	75.65861	370.50296	0.95862	2539.87730	33.57023
45	0.04845	3.51397	.00993	72.52786	353.87412	0.95155	2169.37434	29.91091
50	0.06150	4.24435	.01269	69.01389	334.46414	0.93850	1815.50022	26.30630
55	0.07466	4.83569	.01551	64.76954	311.77885	0.92534	1481.03608	22.86624
60	0.10857	6.50702	.02296	59.93385	283.40679	0.89143	1169.25723	19.50913
65	0.14510	7.75223	.03129	53.42683	247.75423	0.85490	885.85044	16.58063
70	0.21830	9.97077	.04901	45.67460	203.44358	0.78170	638.09621	13.97048
75	1.18841	42.43079	.09762	35.70383	434.65263	— 0.18841	434.65263	12.17384

10 Calculations are based on raw figures from the 1961 Census and from Vital Statistics.

this is more evident for the values M(0-4) and M(60). The magnitude of the under-reporting is not known.

Two ways to solve this would be:

> to use more reliable M(X) values for a country which has socio-demographic characteristics similar to those of the population of Honduras,
>
> to use the 'reliable piece' of information available (assuming that some M(X) values are more reliable than other) and to generalize these values to the total population.

These methods would not be useful because there are no accurate life tables or reliable M(X) values for countries similar to Honduras. The socio-demographic similarities between two countries would also be difficult to confirm. And it is known that the mortality patterns for ages 5 to 60 differ considerably from patterns for ages 0 - 5 and for persons aged 60 or more. Even when the "age patterns of mortality vary only within restricted limits",[11] the mortality patterns for ages 0 - 5 and 60 or more may be more important determinants of the life table functions than the more or less constant values found for ages 15 to 59.

In order to smooth the data the properties of the life table will be reconsidered. Even when there is a link between the life table and actual population data the life table is a life history of a hypothetical cohort. It is

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11 Brass et al., Op. Cit., p. 121

hypothetical because every life table is based on several conditions. The life table, for example, is closed to migration, mortality does not change, it is fixed. Deaths are evenly distributed. The life table normally consists of members of one sex only.

The population in the life table is stationary. This population could be stable if the conditions specified were met. In order to find a life table for Honduras the Regional Model Life Tables will be used.

3. Methods of Finding the Family and the Level of Mortality Appropriate for the Mortality Pattern Observed

The model life tables are mortality estimates based on mortality observed in various regions of the world. There should be a model life table that reflects the mortality patterns of Honduras. The Regional Model Life Tables will be the basis to estimate some measures of fertility. The model life tables are based on 'reliable life tables' for different countries of the world; "life tables derived from data with extreme age misreporting, or major omissions of deaths, or extensive underenumeration of the base population were discarded".[12]

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12 Brass et al., Op. Cit., p. 122.

There are four families of model life tables. The families are an attempt to accommodate the models to the diversity of mortality patterns that can be found. Within each family there are different levels of mortality. And

> For each model life table, 26 stable populations were calculated, at growth rates ranging from 0.010 to 0.050 or 1.0 to 5.0 and gross reproduction rates from 0.800 to 6.00. Various parameters - the birth rate, the death rate, rate of increase, gross and net reproduction rates, mean age, etc. - were calculated and printed for each stable population.[13]

These parameters are necessary to study fertility. An attempt will be made to find a family and an appropriate level for the population of Honduras.

There are several indirect methods that could be used to find the family and the level. The first method used was based on a comparison of observed M(X) values given in Table VII to the M(X) values found in different model life tables. The deviations of the reported M(X) for both males and females from the M(X) values for different families at different mortality levels were found. The absolute sum of the differences for ages 5 to 65 is given in Table IX. The observed mortality level appears to be between levels 14 and 18 for all of the four families. It is assumed that 'Family South', levels 14 and 15, was the closest to the

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13 Brass et al., Op. Cit., p. 125

observed mortality pattern for 1961. Family South seems to be the most appropriate because the infant and child mortality patterns deviate less from this model than from the other models and because of the similarities of the Honduran M(X) values to the model South M(X) values.

The second method was to find standardized death rates for Honduras by means of the M(X) values found through the model life tables and the age distribution of the population of Honduras. These standardized death rates were found for the four families of model life tables and for different levels. The Families and levels closest to the mortality patterns of Honduras are given in Table IX. The standardized rate for Honduras was 5.95 and in all cases it laid between the levels of that family which had a better fit when the M(X) values were compared. The standardized death rates show again that family South is very close to the population of Honduras. The M(X) values could be adjusted at this point but this study centers on fertility and not on mortality. Before passing from the model life tables to the Stable Populations associated with them another indirect method to find the appropriate family and level for Honduras will be employed.

TABLE IX. Standardized Death Rates and Absolute Differences from M(x) for selected Age Groups

Age(x)	Proportion in each age group 1961 $\frac{n(x)}{P}$	1961 $\frac{n(x)}{P} \times M(x)$	Model West Level 16 $\frac{n(x)}{P} \times M(x)$	Model North Level 17 $\frac{n(x)}{P} \times M(x)$	Model North Level 18 $\frac{n(x)}{P} \times M(x)$	Model East Level 15 $\frac{n(x)}{P} \times M(x)$	Model East Level 16 $\frac{n(x)}{P} \times M(x)$	Model South Level 14 $\frac{n(x)}{P} \times M(x)$	Model South Level 15 $\frac{n(x)}{P} \times M(x)$
5	16.71	60.39	46.45	71.52	59.32	52.47	44.62	64.50	54.98
10	12.90	25.98	26.44	31.48	26.70	23.74	21.03	28.38	24.90
15	9.54	29.29	30.15	32.05	28.43	29.19	26.24	31.58	27.76
20	8.11	38.99	36.41	39.17	34.87	36.17	32.44	40.79	35.77
25	6.63	40.14	32.16	33.35	29.57	30.03	26.92	33.35	29.30
30	5.83	37.60	32.30	31.48	27.93	29.32	26.24	32.59	29.15
35	4.96	35.47	33.28	30.21	26.78	30.80	27.58	31.40	28.22
40	3.97	33.56	34.26	29.42	26.16	32.20	29.14	32.12	29.22
45	3.27	32.47	37.15	30.15	27.01	36.17	33.32	33.78	31.16
50	2.68	34.02	42.53	34.12	31.20	42.18	39.58	38.30	35.78
55	1.92	29.79	42.85	32.31	29.66	43.49	41.32	38.76	36.52
60	1.88	43.17	61.81	46.94	43.62	62.19	59.50	57.19	53.99
65	1.02	31.91	49.22	38.62	36.21	51.04	49.00	47.02	44.56
Total	79.42	472.78	505.01	480.82	427.46	498.99	456.93	509.76	461.31
Standardized rates(males)		5.95	6.36	6.05	5.38	6.28	5.75	6.42	5.81
Absolute difference from M(x)(males)			42.22	16.14	14.92	45.32	42.79	32.82	29.23
Absolute difference from M(x)(females)			14.88	9.59	18.69	17.30	15.24	13.00	13.37

The method was employed by S. H. Abdel-Aty[14] and applied to the population of Egypt. This method is based on the use of the rate of growth and on the age structure of the population to find a model life table. The method could be less reliable but it is simpler and can be easily applied to the data available. The two parameters used are from the same universe. The method is also useful because life tables for the departments of the country can be found for 1961. The analysis of fertility could be extended to 1881 for the country as a whole. The first method was long and cumbersome. The not stated categories associated to the age distribution and to the death distribution had to be distributed among the different age groups and data on mortality are of borderline quality in Honduras.

The second method was used to produce the l(X) values given in Table X. If the data by age had been correctly reported life tables for Honduras could have been derived from the l(X) values. When P(X) values are calculated from l(X) there are several abnormalities. In some cases the probability of surviving is greater than one. The only solution was to use some of the l(X) values and to find from them other life table functions. This was done in

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14 S. H. Abdel-Aty, "Life-Table Functions for Egypt Based on Model Life - Tables and Quasi-stable Population Theory", The Milbank Memorial Fund Quarterly, Vol. XXXIX, No. 2, April 1961, p. 350 - 377.

TABLE X

l(x) and Other Life Table Functions Derived from the Age Distribution and r, 1961[15]

Pivotal Age ($\bar{x}$)	$\frac{N(\bar{x})}{P\ 1961}$	$e^{r\bar{x}}$	l(x)	T
Females				
2.5	18.7339	1.07897	20.2133	
7.5	15.9584	1.25861	20.0854	
12.5	12.0838	1.46668	17.7231	19.4244
17.5	10.0159	1.70916	17.1188	18.8201
22.5	8.6422	1.99372	17.2301	18.9314
27.5	7.2061	2.32333	16.7421	18.4434
32.5	5.9348	2.70744	16.0681	17.7694
37.5	5.1696	3.00417	15.5304	17.2317
42.5	3.9357	3.66930	14.4413	16.1426
47.5	3.2627	4.05520	13.2309	14.9322
52.5	2.7155	4.95304	13.4500	15.1513
57.5	1.9254	5.47395	10.5395	12.2408
62.5	1.8877	6.68590	12.6210	14.3223
67.5	0.9843	7.38906	7.2731	8.9744
72.5	0.6764	9.02502	6.1045	7.8058
90.0	0.8676	14.87974	12.9097	
L(75+)			14.3418	
T(10)			1018.0938	
E(10)			57.444	

TABLE X (Continued)

l(x) and Other Life Table Functions Derived from the Age Distribution and r, 1961[15]

Pivotal Age ($\bar{x}$)	$\frac{N(\bar{x})}{P\ 1961}$	$e^{r\bar{x}}$	l(x)	T
Males				
2.5	19.2616	1.07466	20.6997	
7.5	16.7057	1.24235	20.7543	
12.5	12.8974	1.43477	18.5048	19.7345
17.5	9.5363	1.65865	15.8174	17.0471
22.5	8.1062	1.91746	15.5433	16.7730
27.5	6.6298	2.21666	14.6960	15.9257
32.5	5.8276	2.55999	14.9186	16.1483
37.5	4.9582	2.71829	13.4778	14.7075
42.5	3.9682	3.32012	13.1749	14.4046
47.5	3.2703	3.6690	11.9997	13.2294
52.5	2.6762	4.48169	11.9939	13.2236
57.5	1.9220	4.95304	9.5197	10.7494
62.5	1.8782	6.04965	11.3625	12.5922
67.5	1.0176	6.68590	6.8036	8.0333
72.5	0.6322	7.38906	4.6714	5.9011
90.0	0.7123	13.46374	9.5902	
L(75+)			9.4159	
T(10)			904.5764	
E(10)			48.883	

15 Where n = Number of persons per age group.
P 1961 = Total population by sex.
$e^{r\bar{x}}$ = exponential function where r = rate of growth

$$l(x) = \frac{n}{P\ 1961} \times e^{r\bar{x}}$$

$$T = l(\bar{x}) - .25\ (l_{(72.5)} - l_{(90.0)})$$

$$L(75+) = l(75) \log 10\ l(75)$$

$$T(10) = 5\{.25\ (17.5 - 112.5) + \sum_{a=10}^{70} l(x + 2.5) - .25(l_{(72.5)} - l_{(90.0)})\} + L(75+)$$

$$E(10) = \frac{T(10)}{l(10)}$$

Table X. From these life table functions model life tables were found. Only data for males, considered to be more reliable, were used. Again the closest model to the population of Honduras was Family South, the levels ranged from 9 in 1930 to 12 in 1961. The results were very similar to the results found after using the first method. This second method seems to be as reliable as the first one and it was used to find families and levels for the departments of the country in 1961 and for Honduras as a whole for different census years. The adjusted life table for Honduras is given in Appendix 8. Some of the life table values were compared to life table values based on other assumptions and on other methods to correct the data. Associated with every life table there is a stable population. Each stable population is characterized by a given level of fertility. Fertility levels will be estimated from the stable populations. The rate of growth will be used once more to find the appropriate stable population.

CHAPTER V

FERTILITY ESTIMATES

Model life tables for Honduras were selected in the preceding chapter. From the model life tables it is possible to choose model stable populations. The life tables, however, indicate that the population of Honduras is not stable and that it has not been stable over any of the intercensal periods. By definition a population is stable when the death rate, the birth rate and the rate of growth have remained constant over a long period of time. In Honduras the life expectancy at birth (E_0) has been increasing, this indicates declining mortality levels. Another indication of changing mortality is that the levels for the family chosen changed over the years.

Changes in the death rate would bring about changes in the rate of growth. The rate of growth calculated in Chapter III for several intercensal periods also fluctuated.

The population of Honduras could be considered quasi-stable. Quasi-stability implies that the death rate has changed but that the birth rate has remained constant. This is a fair assumption because in most countries the death rate has declined; Appendix 2 gives an indication of the declining trend of mortality rates in Honduras.

1. Stable Population and Fertility Levels

From the model stable populations selected for Honduras a base stable population was used to calculate the crude birth rate and the gross reproduction rate (GRR). It is for 1935 when the age distribution observed in Honduras is closer to the age distribution found in the stable population associated with that year. Other years studied showed greater disparities with the stable population models. The test of similarity, to find the age distribution closer to the model, consisted in finding the absolute difference between the age distribution given in the model and the observed age distribution. These absolute differences were found by age and were added, the smallest difference was associated with the year mentioned above. The levels associated with different census years and some model measures are given in Appendix 9. It is assumed that during the period around the year 1935 the population of Honduras approached stability and that the rates fluctuated around that base year.

Assuming stability, Honduras had the following characteristics[1] in 1935:

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1 The characteristics were found by interpolation from Family South, Levels 12 and 9, Coale and Demeny, Op. Cit., p. 702 and 792.

Demographic Characteristic	Female	Male	Total[2]
Birth rate (Intrinsic) . .	41.26	50.85	46.05
Death rate	18.28	25.85	22.07
GRR(27)	2.674	3.277	2.38
Proportion 15-44	43.67	42.76	43.21
Births/population 15-44 .	0.094	0.119	0.107
Dependency ratio	0.872	0.933	0.903

Before and after that period the population of Honduras was quasi-stable due to changes in mortality. If the crude birth rate had remained constant its level from 1930 to 1961 would have been 46.05. Assuming that changes in mortality and fertility produced changes in the natural rate of growth the formula to find this rate:

$$r = \frac{B}{P} - \frac{D}{P} \qquad \text{II}$$

could be employed to find fertility levels because mortality levels are known from the model life tables. The crude birth rate can be calculated by solving the equation given above.

$$\frac{B}{P} = r + \frac{D}{P}$$

where the death rate $\left\{\frac{D}{P}\right\}$ was taken from the model and r is the intercensal rate of growth calculated in Chapter III and used to find the family and levels associated with the population.

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2 The total value is a mean value.

Crude birth rate for selected years:

1930, total 30.50
1935, total 25.89
1945, total 30.28
1961, total 27.23

These values point to a decline in the rate but the estimates given above may not be accurate mainly if the rates found do not represent the true picture of declining mortality in Honduras. Another way of calculating the crude birth rate would be by converting the intrinsic values found from the models to new estimated values. This would be more realistic because mortality, fertility and the rate of growth would be allowed to change over time.

2. The Intrinsic Crude Birth Rate and the Population's Crude Birth Rate

Even when in 1935 the population of Honduras was closer to the model stable population the age structures were not identical. Stable populations tend to have well defined age structures. The pyramids for Honduras given in Chapter III, do not seem to be stable or do not exhibit the characteristics of a stable population because there are slight differences in their shapes.

It is assumed that the population was not quasi-stable and that both the crude birth rate and the crude death rate contributed to changes in the rate of growth. The intrinsic crude birth rate given by the stable

population was converted to the population's crude birth rate by the formula proposed by Rele:[4]

$$b_c = b_i \frac{\text{Honduras (weighted sum} \div \text{Total population)}}{\text{Model (weighted sum} \div \text{Total population)}}$$

where b_c is the estimated crude birth rate for the population and b_i is the intrinsic birth rate reported in the tables.

3. Estimates for Honduras and the Departments

The formula proposed by Rele was applied to the intrinsic birth rates. The estimates given in Table XI will be considered as the true estimates of the crude birth rate. It is very difficult to find a population with natural fertility and it is equally difficult to find a stable population. But the stable population concepts have been very useful to estimate the crude birth rate and the GRR. Calculations based on the intrinsic birth rate were also carried out for the Department of Francisco Morazan, for selected census years and for seventeen Departments of the country. The estimates for the Departments, with the exception of Fransicso Morazan, were done for 1961 only.

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4 J. R. Rele, Fertility Analysis Through Extension of Population Concepts, Population Monograph Series, No. 2, University of California, Berkeley, 1967, p. 59.

TABLE XI

Intrinsic and Estimated Crude Birth Rates for Honduras and the Departments, Selected Years

Area and Year	Intrinsic Crude Birth Rate	Estimated Crude Birth Rate
Honduras		
1930 Total	52.17	57.09
Males	56.89	62.47
Females	47.45	51.72
1935 Total	46.05	54.42
Males	50.85	56.44
Females	41.26	52.40
1945 Total	51.43	51.23
Males	54.00	53.57
Females	48.87	48.89
1961 Total	48.77	52.98
Males	49.02	48.68
Females	48.53	57.27
Francisco Morazan		
1940 Total	52.77	57.68
Males	60.05	65.15
Females	45.50	50.23
1945 Total	62.41	64.56
Males	71.03	69.61
Females	53.79	59.50
1950 Total	56.20	57.28
Males	68.27	66.70
Females	44.14	47.87
1961 Total	41.98	45.84
Males	43.16	46.87
Females	40.81	44.81

TABLE XI Concluded

Intrinsic and Estimated Crude Birth Rates for Honduras and the Departments

Department 1961	Intrinsic Crude Birth Rate	Estimated Crude Birth Rate
Atlantida	44.42	45.136
Colon	71.87	66.330
Comayagua	52.64	51.876
Copan	58.75	57.173
Cortes	45.79	49.865
Choluteca	56.81	55.482
El Paraiso	70.78	69.294
Intibuca	78.19	77.825
Islas de la Bahia	64.23	55.038
La Paz	71.87	70.392
Lempira	76.49	73.064
Octepeque	68.79	62.805
Olancho	67.40	64.232
Santa Barbara	45.12	43.677
Valle	79.79	75.663
Yoro	62.73	60.166

The birth rate values were found under the assumption that the population was not stable. The Department of Gracias a Dios was excluded from the calculations because data on the rate of growth were not available for this area. The calculations for ten other Departments are highly tentative because it was difficult to find model life tables appropriate for these areas. The estimates given for seven of the ten Departments, namely Colon, Intibuca, Islas de la Bahia, La Paz, Lempira, Ocotepeque and Valle should be viewed with caution. These areas have in common rates of growth below the country's average. Islas de la Bahia has a rate lower than the others.

The difficulty in finding a model for these areas could indicate that data are very deficient.

Internal migration could barren the possibility of using stable population techniques for some of the areas. It is assumed that many of the areas with low rate of growth are losing population not only through deaths but through out migration. Areas with rates of growth above 3.50 and above the average for the country are probably gaining population, not only by increasing fertility rates but through in-migration. These Departments were Francisco Morazan, Cortes and Santa Barbara. These three areas are the most urbanized of the country. The influx of people from rural Departments to these areas must be high. The reasons

for this influx will not be discussed here.

The use of stable population techniques for these areas, however, is impaired. This is evident from the estimated crude birth rates for Francisco Morazan given in Table XI.

The calculations for these areas had to be based on the assumption that their populations were not stable. The intrinsic crude birth rate used to calculate the rates could be incorrect.

Table XI gives a good idea of fertility levels in Honduras. The assumption that the levels were high was confirmed. The values found in Table XI could be compared to the values given in Table I. The values estimated for the present study are very similar to the values found by Rele and other authors. It is assumed that the technique used for estimating the rates is valid because the rates found by other methods were very similar, and the levels found follow expected patterns.

The observed crude birth rate is a good indicator of past trends in the crude birth rate.

The null hypothesis stating that 1) there is no significant difference between the trends given by the observed crude birth rate was asserted. The estimated crude birth rate decreased from 1930 to 1935 and from 1935 to 1945. The rate increased again from 1945 to 1961. The observed

crude birth rate was estimated by dividing the reported number of births over the total population. Births have been reported since 1929 and sometimes the average of two or three years was employed to calculate the rate.

Year	Observed Crude Birth Rate
1930	35.58
1935	33.18
1945	37.34
1950	41.49
1961	43.66

It can be seen that the rate decreased from 1930 to 1935, it increased continuously from 1935 to 1961. The trends reported by observed and estimated rates are similar.

The rates were computed for census years only. The reason for this is that the base population used was the one reported from census data. In order to compute the rate for other years it would have been necessary to estimate the population at the mid-point of the period considered. Estimates may lead to erroneous calculations, mainly if the figures for the base year are misreported or incomplete. The crude birth rate is a ratio and unless drastic changes in the rate are taking place it should be sufficient to compare a five year period with a one year period.

Both the observed and the estimated crude birth rate were assigned a rank. The Department with the lowest rate had a rank of 1; the highest rank was assigned to the Department with the highest crude birth rate. The values

given in Table XI and in Appendix 2 were ranked. The ranks are similar even when some of the differences given in Table XII are large.

A test of significance was carried out to find out whether the differences in the crude birth rate were significant or not. This was done in order to test the null hypotheses given in Chapter I.

The following formula was employed:

$$z = \frac{\cdot d - \delta^5}{\sigma d}$$

The results are summarized in Table XII.

The differences were significant in most of the cases. The assumption made is that if z lies between -2.5 and +2.5 the difference is not significant.

The differences from 1950 to 1961 were not significant for two of the Departments only. Table XII indicates that the country is not homogeneous as far as the crude birth rate is concerned.

Other measures of fertility could give further indications on the fertility levels of the country. Unfortunately the censuses of Honduras did not include any questions on fertility and it has been shown that vital statistics are not reliable.

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5 Werner Z. Hirsch, Introduction to Modern Statistics, New York, The MacMillan Co., 1962, p. 207.

TABLE XII

Significance of the Differences in the Observed Crude Birth Rate

Area By Rank in 1951	Difference in Rate 1950-1961		Significance of Differences		
	Actual Change	Percentage Change	1950-1961	Country to each Department 1950	1961
Honduras	+ 3.4	+ 8.4	61.07		
Rank					
1 Colon	+14.5	+49.3	41.56	47.90	6.50
2 Choluteca	+ 8.4	+27.6	43.91	74.90	50.08
3 Olancho	+ 5.9	+16.5	26.41	35.96	24.68
4 Islas de la Bahia	+ 1.7	+ 4.7	2.29	11.06	14.79
5 Valle	+ 6.8	+17.4	26.13	15.70	1.68
6 Intibuca	+ 0.3	+ 0.8	1.11	14.02	31.98
7 Yoro	+ 5.5	+13.8	26.34	12.92	0.00
8 La Paz	+ 2.6	+ 6.3	8.76	3.60	7.79
9 El Paraiso	+ 1.8	+ 4.4	7.86	5.09	15.97
10 Francisco Morazan	+ 8.2	+19.9	55.54	7.45	39.00
11 Lempira	+ 0.9	+ 2.2	4.08	4.14	20.87
12 Comayagua	+ 3.7	+ 8.5	14.85	6.71	9.74
13 Atlantida	+ 2.9	+ 6.2	11.28	23.44	25.10
14 Ocotepeque	- 2.5	- 5.2	7.84	24.69	0.45
15 Santa Barbara	- 5.4	-11.2	26.19	36.45	20.76
16 Cortes	+ 1.8	+ 3.6	10.02	58.93	59.81
17 Copan	- 5.5	-10.7	25.70	57.50	4.14
18 Gracias a Dios	-6	-6	-6	-6	12.34

6 Data were not available for this Department.

It would be possible to obtain more fertility measures from the stable populations but stable populations are hypothetical and there is no way to verify whether the results are accurate or not.

The other way to measure fertility would be by analysing the answers gathered through special surveys.

CHAPTER VI

FACTORS LINKED WITH FERTILITY

In Honduras fertility levels were high from 1930 to 1961. There were regional differences and some of the differences were significant. Several factors could be linked to the fertility levels found, and several factors could explain the differences from one Department to another. A group of women in Tegucigalpa, Department of Francisco Morazan, were interviewed in order to measure their fertility and to find what factors were related to the number of children they had bore.

Although data collected in the field were used the purpose of this analysis was to illustrate the use of some fertility measures and to find factors related to fertility. Any generalizations from these data should be viewed as highly tentative.

1. Characteristics of the population Interviewed

Some of the characteristics studied are related to each other. It is difficult to classify them as biological, social or demographic. This emphasizes the complexity of the study of the factors linked to fertility. The data gathered may not be exhaustive, an attempt was made to collect data on variables that may be closely related to natural fertility.

TABLE XIII

Women Married Once Only by Selected[1] Demographic Characteristics, Teguciagalpa, 1968

CHARACTERISTIC	MEAN
1. Age at first marriage	23.06 years
2. Number of children born alive	4,340 per 1,000 women
3. Age of procreation	25.75 years
4. Number of male births	2.34 per woman
5. Number of female births (GRR)	1.99 per woman
6. Infant mortality	130 per 1,000 women
7. Interval between marriage and first child (protogenesic)	16.44 months
8. Intergenesic interval	30.03 months

Most of the above characteristics follow an 'expected' pattern. The intervals are typical of populations with high, close to natural fertility.[2] The crude birth rate estimated from the total mean average intervals[3] was 39.96. This crude birth rate expresses the experience of a group of women married in 1930, 1931 and 1932, therefore, it should not be comparable to the crude birth rate of a given year. This rate is very close to the observed rate for the country in 1935.

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1 Some of these values were calculated manually from questionnaires completed during the survey. Most of the values are from computer printouts resulting from the factor analysis.

2 R. G. Potter, "Birth Intervals: Structure and Change", Population Studies, London, Vol. 22, No. 2, Nov. 1963, p. 155-162 found that the Hutterites had an intergenesic interval of 25.5 months and J. Henripin, "La Fécondité des Ménages Canadiens au XVIII^{e} Siècle", Population, Paris, No. 1, jan-mars 1954, p. 62-79, found that without lactation the intergenesic interval was 18 to 19 months and with lactation 29 to 30 months for French Canadian women in the XVIII century.

3 This rate was calculated by finding the inverse of the average interval between births.

TABLE XIV

Women Married in 1930, 1931 and 1932
by Age at First Marriage and
Women Ever Married in Honduras by Age at Marriage[4]

Age at First Marriage	% 1968 Sample Tegucigalpa	% Honduras 1951	1961	1962	1963
Total	100	100	100	100	100
15-19	24	42	48	50	50
20-24	42	30	29	29	30
20	9				
21	5				
22	10				
23	8				
24	10				
25-29	26	13	11	10	10
25	5				
26	7				
27	5				
28	8				
29	1				
30 or more	8	15	12	11	10

Mean age at marriage 23.06

Table XIV indicates that the age at first marriage of women married in the 30's and interviewed for this study was higher than the age of women married from 1951 to 1963. This may be another indicator of increasing fertility and another element favouring increases in fertility.

4 Direccion General de Estadistica y Censos, Estadisticas Vitales 1966, Tegucigalpa D.C., Honduras, June 1968, p. 57-59.

TABLE XV

Women married in 1930, 1931 and 1932 by age at first marriage and number of children born, 1968

Age at first marriage	Number of women	Children ever born														
		No answer	None	1	2	3	4	5	6	7	8	9	10	11	12	Total children	Children per 1,000 women
Total	100	1	7	8	8	16	18	12	9	4	7	5	2	1	2	442	4,420
15-19	24	-	-	1	1	5	4	2	2	1	2	3	2	1	-	137	5,708
20-24	42	1	2	3	4	8	8	6	3	2	3	1	-	-	1	174	4,143
20	9	-	-	-	-	3	3	2	-	-	-	-	-	-	1	43	4,777
21	5	-	1	3	-	-	-	-	-	-	-	-	-	-	-	10	2,000
22	10	-	1	-	3	3	1	-	1	1	-	-	-	-	-	32	3,200
23	8	1	-	-	1	1	2	1	-	-	1	1	-	-	-	35	4,375
24	10	-	-	-	-	1	2	3	2	-	2	-	-	-	-	54	5,400
25-29	26	-	3	4	1	3	6	2	4	1	1	1	-	-	-	97	3,730
25	5	-	1	-	1	1	1	-	1	-	-	-	-	-	-	15	3,000
26	7	-	1	1	-	-	2	1	1	-	-	1	-	-	-	29	4,142
27	5	-	-	1	-	2	1	-	1	-	-	-	-	-	-	17	3,400
28	8	-	1	1	-	-	2	1	1	1	1	-	-	-	-	35	4,375
29	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	1,000
30†	8	-	2	-	2	-	-	2	-	-	1	-	-	-	1	34	4,250

TABLE XVI

Distribution of women married once only by selected intergenesic intervals and number of children born, 1968

Selected average intergenesic intervals	Number of cases	Children ever born										Total number of children	Number of children per 1,000 women
		2	3	4	5	6	7	8	9	10	11		
Total	61	7	8	11	9	7	4	7	5	2	1	329	5,393
19.5 months	12	1	1	2	2	2	-	2	1	-	1	71	5,916
23.5 months	12	2	2	2	2	-	2	1	1	-	-	59	4,916
28.5 months	10	2	-	1	3	1	-	1	2	-	-	55	5,500
33.5 months	16	1	1	4	1	2	2	2	1	2	-	97	6,062
36.5 months	5	-	3	-	1	-	-	1	-	-	-	22	4,400
48.0 months	6	1	1	2	-	2	-	-	-	-	-	25	4,166

Table XV indicates the relationship between age at first marriage and the number of children ever born. For age groups 15-19, 20-24 and 25-29 there is a clear pattern. The number of children decreases as the age of the mother at first marriage increases. There are probably relationships between the number of children ever born and the average length in months of the intergenesic intervals.

Table XVI fails to show the possible relationship between length of intergenesic intervals and number of children born. The small sample and multiple births could be some of the reasons. Some of the demographic variables could be labelled biological variables as well. This could apply to birth intervals, when voluntary birth control measures are not employed. The main biological characteristics considered in this study were distributed as follows:

1. Number of pregnancies ..... 5,100 per 1,000 women
2. Never pregnant 7%
3. Ever pregnant 93%
   (a) Normal delivery 91%
   (b) Premature 9%
4. Breast fed children 92%
5. Mean duration of lactation period ... 6.1 months

It could be said that biological and demographic variables cannot be isolated from social variables. In some societies breast feeding is a common practice, in others it is not. Age at first marriage varies with every society and it is difficult to classify place of birth as a social, biological or demographic variable.

Place of birth distributions:

1. Born in Honduras 94%
   (a) Born in rural Honduras 29%
   (b) Born in urban Honduras 65%
2. Born outside Honduras 6%

Even when place of birth is not a social variable norms and values vary with the type of environment. All the women interviewed had been living in or close to an urban center for most of their lives.

TABLE XVII

Women Married Only Once By
Selected Social and Economic Characteristics

CHARACTERISTIC	PERCENTAGE
1. Religion	
(a) Catholic	94
(b) Other	5
(c) Did not answer	1
2. Attendance at religious services	
(a) Attended	96
(b) Did not attend	4
3. Frequency of attendance	
(a) Once or more per week	55
(b) Once or twice per month	12
(c) Seldom	26
(d) No answer	2
4. Level of schooling	
(a) No schooling	13
(b) Elementary	46
(c) Secondary	40
(d) Vocational	1
5. Never worked	80
6. Ever worked	20
Worked:	
(a) During the first 10 years of marriage	30
(b) During the first 20 years of marriage	70

TABLE XVII

Women Married Only Once by
Selected Social and Economic Characteristics, Concluded

CHARACTERISTIC	PERCENTAGE
7. Occupation of Husband:	
(a) Labourer	18
(b) Teacher	5
(c) Professional	47
(d) Farmer	17
(e) Industrialist	3
(f) Real estate operator	4
(g) Other	5
(h) No answer	1

None of the women interviewed had any years of university or university degree. Forty-seven percent of their husbands were professionals. There were twenty-one main characteristics. Some of these characteristics were broken down into categories. An attempt was made to relate the variables to the period of procreation of the women interviewed. For example, to determine participation in the labour force women were asked:

Question 7. Have you worked (outside of the home) since you got married?

Women who answered 'Yes' were asked for how many years they had worked and

Question 9. When did you work?
During the first 10 years of marriage ( )
During the first 20 years of marriage ( )
After 35 years of marriage

Errors were made in the wording of the questions on religion. Question 3: What is your religion? was straightforward, but the questions on attendance to religious services referred to the present. Even if the religion of the women had remained the same during the years, their participation may have changed. In spite of this, all the variables were considered for the analysis.

2. Factor Analysis

Some of the tables and distributions given above were gathered manually from answered to the different questions. Most of the calculations are results of computer runs printed while processing the data for the factor analysis.

In order to factor analyse the data the variables were coded in terms of 0's and 1's or into exact numbers. A zero (0) meant absence of a characteristic, a one (1) meant presence of the characteristic.

One hundred cards were processed. The program[5] used performed a principal component solution and an orthogonal rotation of the factor matrix. Data input was in the form of raw data and they were read from punched cards.

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5 W. J. Dixon, editor, BMD Biomedical Computer Programs, University of California, Los Angeles, January, 1964, BMD03M 'General Factor Analysis' p. 169-184.

Output from the program included:

(1) Means and standard deviations,
(2) Correlation matrix,
(3) Eigenvalues including cumulative proportions of total variance,
(4) Eigenvectors,
(5) Factor matrix,
(6) Factor check matrix,
(7) Orthogonal rotated factor matrix,
(8) Original and successive variances,
(9) Check on communalities.[6]

Standard Deviation for Selected Characteristics

CHARACTERISTIC	σ
Age at first marriage	5.56
Number of pregnancies	3.22
Number of live births	2.85
Mean age of procreation	9.33
Length of lactation period	6.18
Number of infant deaths	0.37
Interval between marriage and first child	14.73
Interval between successive births	18.41

The number of variables was reduced from 49 to 22. Only those variables that had a socio-demographic meaning for the study were kept. Originally all the characteristic breakdowns, even if their value was zero were kept. The population studied was homogeneous from many respects. The variable 'religion' was eliminated. The correlation between this variable and number of children born was low.

Following the calculation of correlation coefficients eigenvalues were calculated. The positive eigenvalues and

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6 W. J. Dixon, ed. Op. Cit., p. 13

eigenvectors were used in the computation of vectors, these vectors were used to compute the factor matrix from which two sets of factor values were obtained. The first set gave factor loadings for two factors only.

TABLE XVIII

Rotated Factor Matrix Showing
Factor Loadings When Two Factors Were Extracted

Variable	Variable Description:	Factor	
		A	B
1	Number of pregnancies	0.61597	0.55540
	Kind of pregnancy:		
2	Normal	0.77122	0.11906
3	Abortion	− 0.21039	− 0.20469
4	Did not have any	− 0.82070	0.03268
5	Mean age of procreation	0.84098	0.08391
6	Number of children ever born	0.66314	0.62742
7	Number of male children born	0.58010	0.47172
8	Number of female children born	0.49736	0.55292
9	Never breast fed	−0.37608	0.11378
10	Ever breast fed	0.86702	− 0.12085
11	Duration of lactation period	0.67454	0.15330
	Place of birth:		
12	Rural Honduras	− 0.07792	0.81206
13	Urban Honduras	0.11274	− 0.78143
14	Outside of Honduras	− 0.07754	0.01783
	Occupation of Husband:		
15	Labourer	0.07780	− 0.14013
16	Teacher	0.09920	− 0.02211
17	Professional	− 0.03869	− 0.41474
18	Farmer	0.06010	0.72883
19	Industrialist	− 0.08644	− 0.00580
20	Real estate operator	− 0.08029	− 0.03993
21	Other	− 0.11959	− 0.06663
22	No answer	0.01774	0.13[illegible]

The second set gave factor loadings for three factors. It can be seen that when three factors are extracted some highly meaningful loadings are found for the third factor. Therefore the analysis of factors in the present study will be based on the next table.

TABLE XIX

Rotated Factor Matrix Showing
Factor Loadings When Three Factors Were Extracted

Variable	Variable Description:	Factor		
		A	B	C
1	Number of pregnancies	0.59017	0.57222	0.13605
	Kind of pregnancy:			
2	Normal	0.84497	0.06763	− 0.19450
3	Abortion	− 0.28545	− 0.15359	0.27723
4	Did not have any	− 0.84804	0.05383	− 0.00167
5	Mean age of procreation	0.87779	0.05648	− 0.04089
6	No. of children ever born	0.65477	0.63243	0.06964
7	No. of male children born	0.61556	0.44677	− 0.09785
8	No. of fem. children born	0.45003	0.58482	0.20391
9	Never breast fed	− 0.21346	0.00424	− 0.68174
10	Ever breast fed	0.79056	− 0.07155	0.41330
11	Duration of lactation	0.58421	0.21319	0.42169
	Place of birth:			
12	Rural Honduras	− 0.07382	0.81113	− 0.08642
13	Urban Honduras	0.02409	− 0.72289	0.41371
14	Outside of Honduras	0.09267	− 0.09796	− 0.66577
	Occupation of Husband:			
15	Labourer	− 0.03078	− 0.07462	0.43855
16	Teacher	0.10764	− 0.02820	− 0.01818
17	Professional	0.07878	− 0.49556	− 0.42569
18	Farmer	0.03648	0.74623	0.04399
19	Industrialist	− 0.03411	− 0.04124	− 0.21182
20	Real estate operator	− 0.13507	− 0.00243	0.20341
21	Other	− 0.15335	− 0.04339	0.11962
22	No answer	0.01054	0.18904	0.01620

Fertility was defined in this study as the number of children born alive to a woman. Factor A indicates that fertility is: number of pregnancies and above all number of normal pregnancies. This means that if a pregnancy ends in a normal birth there will be a positive contribution to the number of children born. It follows that abortions and the absence of pregnancies are negatively loaded. The mean age of procreation has a loading of 0.87779, this is an all important variable. The correlation between age at first marriage and mean age of procreation was -0.12939. It is not the age of entrance into a permanent union what counts but the age around which children are born.

Number of children born has a high loading. Number of male births has a higher loading than number of female births. Breast feeding and the length of the lactation period are the next variables that are highly loaded. Attempts have been made to show that breast feeding may cause amenorrhea and this in turn may give rise to temporary sterility.[7] In this case the high loading of breast feeding means that the woman had some children in order to breast feed them. The length of the lactation period is, surprisingly, less related to fertility.

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7 R. G. Potter, "Birth Intervals: Structure and Change", Population Studies, London, England, Vol. 22, No. 2, November 1963, p. 155-162.

No attempt was made to measure the norms about family size. An indirect measure of these norms would be the loading of the variable number of children born by sex. It is known that in some societies the desire to have children of a given sex may lead to a high number of children born. Populations practising birth control may also be more affected by the norms about family size.

The intermediate variables mentioned by K. Davis and J. Blake may be more important at a national level. These intermediate variables may explain differences in fertility between countries and within areas of the country. Within a small geographic area the norms affecting fertility may be very similar.

Some of the intermediate variables are difficult to measure. This is true for populations like the one of Honduras. For example, it is difficult to measure:

I. Intercourse variables.

A. Governing formation and dissolution of unions in a reproductive period.

1. Age of entry into unions. In a country where close to 50% of the unions are concensual (43.28 in 1961)[8] it would be

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8 Honduras, Direccion General de Estadistica y Censos, Datos Preliminares, Del Censo Nacional de Poblacion, April 1961, Tegucigalpa, Mayo, 1962, p. 2

difficult to determine the age of entry into unions.

2. The proportion of women never entering unions would also be hard to determine. In most societies over 90% of the women aged more than 20 years enter unions.
3. The reproductive period spent after or between unions is also important but this should tend to be a constant in societies where divorce, separation and desertion are not common.

B. Governing the exposure to intercourse within unions should be directly related to the number of pregnancies which was highly loaded in Factors A and B.

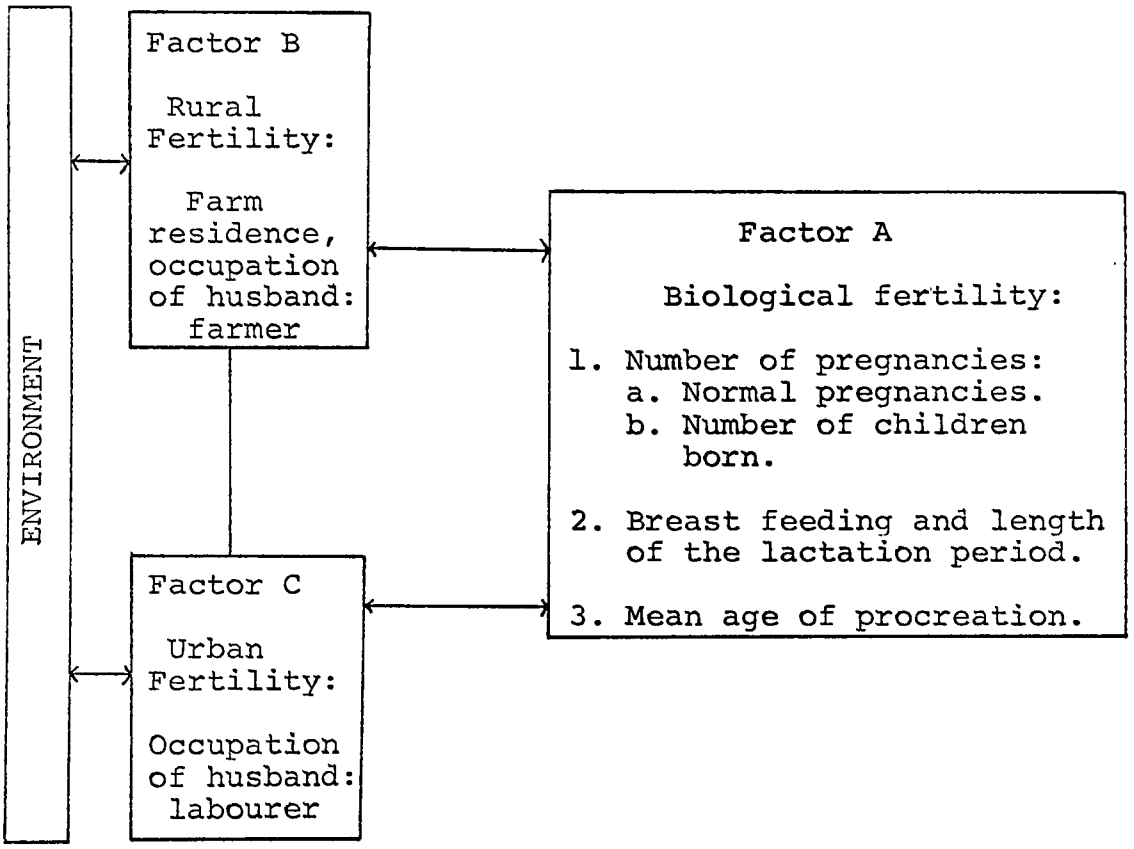
Intermediate variable II and III were not studied. Of these variables the use or non-use of contraception (all means) may be highly loaded with social norms and values. Finally there is fertility itself, fertility as determined by the variables mentioned by K. Davis, J. Blake and R. Freedman. In Figure 1 fertility is determined by a set of variables but it does not have an impact on the variables. This is not really the case because fertility has an impact on demographic variables, these variables in turn have an impact on social norms and values more or less directly. When fertility

increases for example, persons get married younger.

From the three factors extracted in the present study Figure 8 was drawn.

FIGURE 8

FACTORS LINKED WITH FERTILITY



Factor B is more loaded with Factor A elements than Factor C. It is possible that in areas where B elements are predominant fertility will be higher.

3. Review of Assumptions and Hypothese

The crude birth rate is increasing in Honduras. Fertility for the cohort of women studied was very close to natural fertility, no evidence was found of the voluntary use of birth control measures. Hypotheses 6 and 7 were not verified, data available did not provide enough women with different levels of schooling or different degrees of participation in the labour force. The variable that seemed to be dominant in this study was the residence, urban or rural.

The women interviewed for this study were not representative of urban areas because only women married in the municipality of Tegucigalpa during the years 1930, 1931 and 1932 were interviewed, the residence of some of these women was rural and the importance of this factor was clearly indicated in the factor analysis.

SUMMARY AND CONCLUSIONS

The attempt to measure fertility levels was the beginning of an exploration into the problem of human fertility in Honduras. Once fertility levels were estimated, factors linked with fertility were studied. Crude birth rate levels were very high in 1961, remained high over the period studied and seem to have been increasing. The rates within the Departments varied and the crude birth rate for the country did not reflect accurately the rates for its components. This makes the study of factors linked with fertility complex.

Fertility measures for Honduras were estimated directly and indirectly. The stable population theory provided the basis for the indirect study of crude birth rates and gross reproduction rates (GRR). The GRR is a good measure and indicator of fertility because it gives the number of female births in a population. If the number of female births increases fertility would likely increase. Unfortunately, stable populations are theoretical reconstructions and anyone could argue that estimates based on this theory are not accurate. This was, however, the only way to reconstruct the demographic history of Honduras. The estimates provide a good indicator of levels and trends for several demographic variables including fertility.

Fertility is one of the elements affecting population growth; migration was the element ignored in this study. The effect of migration on fertility may be minor but the application of stable population models was hindered by internal migration. The stable population theory implies the study of several variables. The study of fertility is meaningful only when the interplay of variables linked with it is considered. This interplay is better understood through the stable population concepts.

It is said that the study of fertility in less developed areas is not as complex as the study of fertility in more developed ones. This does not seem to be true because usually in less developed areas there are no accurate official statistics on fertility and these societies are 'closer to nature'. Fertility, a highly biological variable, would be of great importance in less developed countries. In countries like Honduras it is necessary to 'know' and understand fertility levels because a series of factors are linked, mixed, with these levels. The problem in this study was to estimate reasonably accurate measures of fertility.

Fertility is the number of children born alive to a woman. The crude birth rate indicates the children born per thousand persons. The age and sex structures are important elements in the study of fertility. The crude birth rate is not an adequate measure of fertility. Honduras, with its

high crude birth rates, could be compared to many of the less developed countries. These countries would also have in common poor statistics. Central American countries have high birth rates and accelerated rates of growth. Although the rates for Honduras are not unique, they point to the fact that the crude birth rate for the country is almost meaningless when measures to improve social conditions are to be considered. The birth rates, throughout the country, are high but probably the factors linked with these rates vary from one region to another.

First of all, fertility is biological because it is the number of children born alive and it is linked with the fecundability of a population and with the number of normal pregnancies. Residence, urban or rural, is linked with fertility. Fertility patterns are determined by the type of the area of residence. The study of fertility therefore, implies the study of the factors linked with fertility.

Special surveys centering on fertility would be very useful but the cost of these surveys at the national level would be prohibitive.

The solution to the problem of insufficient fertility data would be to ask questions on fertility in the census questionnaire of Honduras and to gather more detailed information through vital statistics. The measures derived from these data could be used to validate survey data. Surveys

could be used to test new measures, new techniques and to explore into the factors linked with fertility levels. The problem of human fertility cannot be assessed without accurate measures of fertility. Since fertility measures are based on the number of children born alive to women, one or two census questions on fertility would provide a wealth of information.

These recommendations are based on the results of the present study. The small survey, carried out in the Department of Francisco Morazan, showed that nineteen simple questions can provide the basis for a complete study on fertility levels. The number of variables gathered in a census schedule is large and a factor analysis would be more meaningful if these data were used.

This study ends with the year 1961. Since then several changes could have taken place in Honduras. Family planning clinics were opened in Tegucigalpa after 1962. If contraceptive measures were adopted by the population on a large scale, fertility would decline. Family planning programmes have been directed to the lower income, urban populations of the country. Researchers from Cornell University have carried out studies among these groups and among elite groups during 1968 and 1969. These studies point to very high fertility levels and reluctance in some groups to accept the problem of human fertility. Similar attitudes

have been encountered in other Latin American countries.

The study of fertility can be linked with the study of social change, political instability, economic growth and so forth. But first of all fertility must be measured. Most of the techniques used in the present study could be used again and applied to more recent data and to populations similar to the population of Honduras.

The next census of the country will provide age distributions that will certainly help to establish new fertility levels. A factor analysis could be carried out to study new data. The factor analysis and stable population models take into account the complexity of fertility. Both techniques help to understand fertility in Honduras. Human fertility in the narrow sense of the term is the number of children born alive to women but fertility is a biological manifestation of the health, wealth and mores of a group of people.

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Arretx, Carmen, Proyecciones de la Poblacion de Honduras por sexo y grupos de Edad, 1961-1981, Serie A, No. 70, CELADE, 1967, 66 pages.

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The analysis of fertility in Latin America has been supplemented in the demographic field by analysis of mortality data. The Life Tables computed in this work are, probably, the most accurate set of data on mortality in Latin America available until now. Two main methods were used in preparing these Life Tables; (a) Construction of Life Tables when vital statistics are sufficiently reliable; (b) Construction of Life Tables when vital statistics cannot be utilized. Life Tables were computed for Honduras, 1950 to 1961.

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Brass and Coale have developed the techniques related to the stable population. In this book demographers have applied the techniques to the demographic condition in Tropical Africa. This publication will be a methodological guide for the study on fertility in Honduras.

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This is a report on papers related to human fertility. Most reports deal with biological measures of fertility or with family planning.

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Hauser, P. M., and Duncan, O. D., editors, The Study of Population - An Inventory and Appraisal, The University of Chicago Press, 1959, V-864 pages.
This work is a review of theories and techniques used in Demography. The relationship between demography and other sciences is established and each demographic variable is discussed.

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Henripin used vital statistics records and census data to reconstruct the demographic picture of the Canadian Population. Techniques similar to the one in Chapter VII of this book will be used for our study.

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Several factors such as age at first marriage, duration of marriage, education and participation in the labour force, etc. are studied in relation to fertility. Henripin places fertility in a social context. English and French differences in fertility behavior are analysed. The work is based mainly on 1961 census of Canada data.

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APPENDIX 1

TRADITIONAL FERTILITY MEASURES

APPENDIX 1

TRADITIONAL FERTILITY MEASURES

Births are measured for a given population that usually is defined in terms of geographic boundaries, but within these boundaries the population may consist of all persons, of all women, of persons aged 15 and over, of women married only once, etc. Fertility is "fecundity expressed in performance and therefore measurable; virtually synonymous with natality".[1]

The method used and the population concerned indicates what type of fertility measure is being dealt with. The following are some of the conventional fertility measures:[2]

1. The crude birth rate, or the ratio of the total number of births in a given year or period to the total population during the period.

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1 Henry Pratt Fairchild, ed., Dictionary of Sociology, Littlefield, Adams and Co., Paterson, New Jersey, 1964, p. 120.

2 These measures have been defined by G. W. Barclay, Techniques of Population Analysis, New York, John Wiley and Sons Inc., 1958. By A. J. Coale and M. Zelnik, New Estimates of Fertility and Population in the United States, Princeton, New Jersey, Princeton University Press, 1963 and by R. Pressat, L'Analyse Démographique, PUF, Paris, 1961, p. 5-16, 31-59, 155-211, among other.

> The latter expression is generally approximated by the size of the population at the mid-point of the period multiplied by the length of the period in years ... . Like other rates in which the population at the mid-point of the period is used as the denominator of the fraction this is sometimes called the central birth rate. Where the term 'birth rate' is used without qualification, the live birth rate is generally meant and only live births appear in the denominator.[3]

This rate is available for most countries of the world. Births are collected through vital statistics and the total population from census figures. Intercensal populations can be estimated to find fertility and other rates. The shortcomings of this rate are that it may not reflect fertility levels. More births may be recorded in a year because there were more marriages; because there are more persons in the reproductive ages; because women postponed their children and so forth. The opposite is also true. The base for this rate is the total population and not the population subject to the 'risk' of having children. The rate is computed from data from two different universes and the quality of the data may be different creating spurious values for the rate. The age structure of the population is not taken into account and Chapters III and IV will show that fertility is closely related to the age structure of the population.

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3 United Nations, Multilingual Demographic Dictionary, English Section, U.N., N.Y., 1968, p. 39-40.

2. "The term fertility rate is often used when the denominator of the birth rate fraction is restricted to females",[4] the denomintor is the number of women 'in child-bearing' age. This rate is called the General Fertility rate or General Fertility Ratio.

3. Age specific fertility rates or age-specific birth rates. These are computed as the General Fertility Rate but by age groups of women (usually five year age groups). The total number of children born in a given year to women in a given age are divided by the total number of women in that age group. Differences in this rate may indicate changes in fertility. This rate, however, cannot be calculated in many countries because statistics are not available by age.

4. The Total Fertility Rate (TFR) is the synthesis or sum of the values found through the age specific fertility rates. It is a more refined tool than the crude birth rate. The Total Fertility Rate "represents the number of children than would be born per 1,000 females (or males) if they experienced no mortality and were subject to the age-specific fertility rates of a specified fertility table".[5]

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4 United Nations, Multilingual Demographic..., Op. Cit., p. 40.

5 Idem. Ibid., p. 40

5. The Gross Reproduction Rate (GRR). This measure is important because it yields the number of females that are born to women by the age of these women. This is a measure of the ability of a population to reproduce.

6. Often the rates mentioned from 2. to 5. cannot be calculated because statistics are not available by age. Census data are used to calculate child/woman ratios as a measure of fertility. The total number of children under 5 years of age is divided by the women aged 15 to 45 (or 15-49) in the population.

7. Another measure from census data is the 'average family size' or the number of children born per 1,000 women of a given age, given marital status, etc. In order to get this information there must be in the census questionnaire a question about the number of children born alive to a woman. This question is not always included in census schedules. "The distribution of women by the number of births they have had is called a parity distribution or sometimes a prolificacy distribution...".[6] The term family size "is ambiguous because relatives other than children are included in some studies of family size while other studies do not consider

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6 United Nations, Multilingual Demographic..., Op. Cit., p. 41.

all children but only surviving children or dependent children".[7]

8. "The parity-progression ratio which is the fraction whose denominator is the number of women of parity n in a population whose fertility is complete and whose numerator is the number of women of parity n + 1 in the same population. These ratios reflect all prior childbearing and may also be computed for women of a specified age or cohort".[8]

Most of the measures mentioned above take into account the number of children born in one year. Fertility or childbearing takes place over time, it is a longitudinal experience affected by several demographic, social and cultural factors. Measures 7. and 8. take this into account.

9. Another way to measure fertility is by finding the number of children born to women born in a given year, or married in a given year. "When birth cohorts are considered the term generation fertility is also used".[9] This type of analysis is called cohort analysis.

10. Birth intervals are a measure of fertility or an element in fertility. Birth intervals are computed once the

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7 Idem, Ibid., p. 41.

8 Idem, Ibid., p. 41.

9 United Nations, Multilingual Demographic..., Op. Cit., p. 40.

number of children born to a woman is known. Spacing is important when birth control practices are adopted by the population. "On demontre que, sous certaines conditions, le taux de fecondite des couples fertiles est egal a l'inverse de l' intervalle moyen, exprime en annees, entre les naissances de tous rangs, dans les unions ayant dure suffisamment longtemps".[10]

These variety of measures indicates that researchers have been interested in human fertility and that the notion of fertility has evolved greatly from the crude birth rate, to spacing, to the study of the factors affecting fertility.

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10 Louis Henry, Anciennes Familles Genovoises, Etude demographique: XVI^{e} - XX^{e} siecles, Cahier No. 26. PUF, 1956, p. 133.

APPENDIX 2

OBSERVED CRUDE BIRTH AND DEATH RATES FOR HONDURAS AND THE DEPARTMENTS, 1950 AND 1961

APPENDIX 2

Crude Birth and Death Rates, 1950 and 1961

Country and Departments	Total Population	Live Births	Birth Rate/ 1,000 pop.	Deaths	Death Rate/ 1,000 pop.
1950	1,368,605	57,636	42.1	17,113	12.5
Francisco Morazan .	190,359	7,842	41.2	2,856	15.0
Atlantida	63,582	2,978	46.8	808	12.7
Colon	35,465	1,042	29.4	313	8.8
Comayagua	68,171	2,961	43.4	937	13.7
Copan	95,880	4,949	51.6	1,022	10.7
Cortes	125,728	6,378	50.7	1,620	12.9
Choluteca	107,271	3,265	30.4	858	8.0
El Paraiso	82,572	3,403	41.2	1,103	13.4
Gracias a Dios	-	-	-	-	-
Intibuca	59,362	2,328	39.2	1,111	18.7
Islas de la Bahia .	8,058	290	36.0	57	7.1
La Paz	51,220	2,113	41.3	959	18.7
Lempira	90,908	3,763	41.4	1,630	17.9
Ocotepeque	45,673	2,187	47.9	480	10.5
Olancho	83,910	3,002	35.8	755	9.0
Santa Barbara	96,397	4,636	48.1	1,244	12.9
Valle	65,349	2,551	39.0	506	7.7
Yoro	98,700	3,948	40.0	854	8.7
1961	1,884,765	85,842	45.5	18,045	9.6
Francisco Morazan .	284,428	14,055	49.4	2,984	10.5
Atlantida	92,914	4,617	49.7	986	10.6
Colon	41,904	1,839	43.9	363	8.7
Comayagua	96,442	4,545	47.1	903	9.4
Copan	126,183	5,820	46.1	1,002	7.9
Cortes	200,099	10,507	52.5	2,132	10.7
Choluteca	149,175	5,782	38.8	834	5.6
El Paraiso	106,823	4,590	43.0	990	9.3
Gracias a Dios	10,905	561	51.4	22	2.0
Intibuca	73,138	2,890	39.5	1,158	15.8
Islas de la Bahia .	8,961	338	37.7	60	6.7
La Paz	60,600	2,660	43.9	838	13.8
Lempira	111,546	4,715	42.3	1,564	14.0
Ocotepeque	52,540	2,384	45.4	365	6.9
Olancho	110,744	4,614	41.7	850	7.7
Santa Barbara	146,909	6,274	42.7	1,536	10.5
Valle	80,907	3,705	45.8	362	4.5
Yoro	130,547	5,946	45.5	1,096	8.4

APPENDIX 3

APPLICATION OF MYER's METHOD TO DATA BY SINGLE YEARS OF AGE, HONDURAS 1961

APPENDIX 3

Digit Preference as shown from Age Data by Single Years of Age, 1961
(for persons aged 10-89)

Terminal digit	Number of persons at specified ages								Total 10-89	Coefficient	Product
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89			
0	56,485	39,393	39,421	29,077	19,824	16,261	5,427	2,416	208,304	1	208,304
1	44,323	26,053	14,440	9,642	6,980	5,487	1,582	507	109,014	2	218,028
2	52,258	34,064	20,970	13,894	8,797	5,036	2,069	528	137,616	3	412,848
3	39,692	29,688	18,730	11,493	7,567	4,171	1,693	400	113,434	4	453,736
4	42,504	28,569	17,230	10,337	7,615	4,515	1,556	437	112,763	5	563,815
5	40,088	36,541	27,299	17,332	9,259	5,672	2,507	736	139,434	6	836,604
6	36,803	26,548	18,875	11,788	8,008	4,143	1,548	400	108,113	7	756,791
7	34,601	21,888	15,231	9,577	5,803	3,057	1,086	276	91,519	8	732,152
8	42,783	26,391	19,585	13,527	7,669	3,726	1,398	302	115,381	9	1,038,429
9	29,898	18,969	14,408	9,308	5,498	2,256	796	240	81,373	10	813,730
TOTAL	419,435	288,104	206,189	135,975	87,020	54,324	19,662	6,242	1,216,951		
0		39,393	39,421	29,077	19,824	16,261	5,427	2,416	151,819	9	1,366,371
1		26,053	14,440	9,642	6,980	5,487	1,582	507	64,691	8	517,528
2		34,064	20,970	13,894	8,797	5,036	2,069	528	85,358	7	597,506
3		29,688	18,730	11,493	7,567	4,171	1,693	400	73,742	6	442,452
4		28,569	17,230	10,337	7,615	4,515	1,556	437	70,259	5	351,295
5		36,541	27,299	17,332	9,259	5,672	2,507	736	99,346	4	397,384
6		26,548	18,875	11,788	8,008	4,143	1,548	400	71,310	3	213,930
7		21,888	15,231	9,577	5,803	3,057	1,086	276	56,918	2	113,836
8		26,391	19,585	13,527	7,669	3,726	1,398	302	72,598	1	72,598
9		18,969	14,408	9,308	5,498	2,256	796	240	51,475	0	—
TOTAL		288,104	206,189	135,975	87,020	54,324	19,662	6,242	797,516		

APPENDIX 3

Digit Preference as shown from Age Data by Single Years of Age, 1961
(for males aged 10-89)

Terminal digit	Number of males at specified ages								Total 10-89	Coefficient	Product
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89			
0	28,868	18,031	18,919	14,085	9,231	7,644	2,419	953	100,150	1	100,150
1	22,563	13,101	7,272	5,021	3,763	2,822	817	257	55,616	2	111,232
2	27,547	16,785	10,302	7,184	4,505	2,673	1,074	246	70,316	3	210,948
3	20,265	14,526	9,563	5,813	3,926	2,169	860	202	57,324	4	229,296
4	21,781	13,623	8,628	5,133	3,687	2,316	763	200	56,131	5	280,655
5	19,624	17,314	13,498	8,621	4,528	2,816	1,173	289	67,863	6	407,178
6	17,443	12,667	9,122	6,021	3,969	2,154	766	185	52,327	7	366,289
7	16,945	10,530	7,358	4,785	2,874	1,599	554	112	44,757	8	358,056
8	21,508	12,719	9,520	6,560	3,800	1,809	657	113	56,686	9	510,174
9	13,965	8,982	7,028	4,700	2,864	1,171	384	101	39,195	10	391,950
TOTAL	210,509	138,278	101,210	67,923	43,147	27,173	9,467	2,658	600,365		
0		18,031	18,919	14,085	9,231	7,644	2,419	953	71,282	9	641,538
1		13,101	7,272	5,021	3,763	2,822	817	257	33,053	8	264,424
2		16,785	10,302	7,184	4,505	2,673	1,074	246	42,769	7	299,383
3		14,526	9,563	5,813	3,926	2,169	860	202	37,059	6	222,354
4		13,623	8,628	5,133	3,687	2,316	763	200	34,350	5	171,750
5		17,314	13,498	8,621	4,528	2,816	1,173	289	48,239	4	192,956
6		12,667	9,122	6,021	3,969	2,154	766	185	34,884	3	104,652
7		10,530	7,358	4,785	2,874	1,599	554	112	27,812	2	55,624
8		12,719	9,520	6,560	3,800	1,809	657	113	35,178	1	35,178
9		8,982	7,028	4,700	2,864	1,171	384	101	25,230	0	—
TOTAL		138,278	101,210	67,923	43,147	27,173	9,467	2,658	389,856		

APPENDIX 3

Digit Preference as shown from Age Data by Single Years of Age, 1961 (for females aged 10-89)

Terminal digit	Number of females at specified ages								Total 10-89	Coefficient	Product
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89			
0	27,617	21,362	20,502	14,992	10,593	8,617	3,008	1,463	108,154	1	108,154
1	21,760	12,952	7,168	4,621	3,217	2,665	765	250	53,398	2	106,796
2	24,711	17,279	10,668	6,710	4,292	2,363	995	282	67,300	3	201,900
3	19,427	15,162	9,167	5,680	3,641	2,002	833	198	56,110	4	224,440
4	20,723	14,946	8,602	5,204	3,928	2,199	793	237	56,632	5	283,160
5	20,464	19,227	13,801	8,711	4,731	2,856	1,334	447	71,571	6	429,426
6	19,360	13,881	9,753	5,767	4,039	1,989	782	215	55,786	7	390,502
7	17,656	11,358	7,873	4,792	2,929	1,458	532	164	46,762	8	374,096
8	21,275	13,672	10,065	6,967	3,869	1,917	741	189	58,695	9	528,255
9	15,933	9,987	7,380	4,608	2,634	1,085	412	139	42,178	10	421,780
TOTAL	208,926	149,826	104,979	68,052	43,873	27,151	10,195	3,584	616,586		
0		21,362	20,502	14,992	10,593	8,617	3,008	1,463	80,537	9	724,833
1		12,952	7,168	4,621	3,217	2,665	765	250	31,638	8	253,104
2		17,279	10,668	6,710	4,292	2,363	995	282	42,589	7	298,123
3		15,162	9,167	5,680	3,641	2,002	833	198	36,683	6	220,098
4		14,946	8,602	5,204	3,928	2,199	793	237	35,909	5	179,545
5		19,227	13,801	8,711	4,731	2,856	1,334	447	51,107	4	204,428
6		13,881	9,753	5,767	4,039	1,989	782	215	36,426	3	109,278
7		11,358	7,873	4,792	2,929	1,458	532	164	29,106	2	58,212
8		13,672	10,065	6,967	3,869	1,917	741	189	37,420	1	37,420
9		9,987	7,380	4,608	2,634	1,085	412	139	26,245	0	—
TOTAL		149,826	104,979	68,052	43,873	27,151	10,195	3,584	407,660		

APPENDIX 4

VITAL STATISTICS FORMS FOR REGISTRATION OF BIRTHS AND DEATHS, HONDURAS

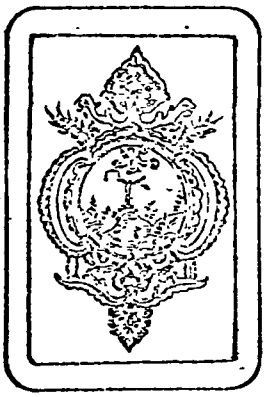
REPUBLICA DE HONDURAS

ESCUDO NACIONAL
Decretado en la Administración CARIAS ANDINO el 5 de Enero de 1935

REGISTRO CIVIL

DEL

DISTRITO CENTRAL



ESCUDO DE ARMAS
de la Real Villa de San Miguel de Tegucigalpa de Heredia aprobado por la Real Audiencia el 13 de Enero de 1770

BOLETA DE INSCRIPCION DE NACIMIENTOS

En esta fecha compareció.....
de Nacionalidad .....de..... .....años de edad, estado
Civil..... ..Profesión u oficio.....
y residente en.....dando cuenta que el día.....
a las.....y en casa de.....
sita en.....nació un.....a quien puso
por nombre..... .....Es hijo
de.....de.....años de edad,
de Nacionalidad..... .....Profesión u oficio.....
y residente en....., y de.....
.....de.....años de edad, de nacionalidad.....Profesión u
oficio..... y residente en.....Son abuelos
Paternos, el señor.....de Profesión u oficio..... .....
.....Nacionalidad....., y la señora.....
.....de Profesión u oficio ....
de Nacionalidad.....y vecinos..... .....
el primero, y de..... .....la segunda, y abuelos maternos, el señor
.....de Profesión u oficio.....
.....de Nacionalidad.....y la señora.....
.....de Profesión u oficio.....
.....de Nacionalidad....., y vecinos.....
.....el primero, y de.....la segunda.

El asiento queda hecho en el folio..... ....del tomo..... ....del Libro de Nacimientos.

Tegucigalpa, D. C., ...de.....de 196....

BOLETA DE DEFUNCION

Compareció don..... edad.....
estado..... profesión u oficio..... nacionalidad
..... y del vecindario de....., dando cuenta
de que a las..... y en casa de.....
....., sita en....., falleció
de....., don.....
edad....., natural de.....,
estado....., profesión u oficio .....,
nacionalidad....., vecino de.....,
desde el año de.....Era hijo..... de
don....., profesión u oficio
.....y doña.....
profesión u oficio.....nacionalidad y vecindario de ambos
.....Tuvo..... hijos
..... hizo testamento.....que autorizó el Notario.....
....., en....., el.....
.....del año de..... El cadáver será sepultado
....., a las....., en el Cementerio..... Lo asistió
el Dr.....

Tegucigalpa, D. C.,.....de.....de 196...

.....
Secretario del Concejo

APPENDIX 5

FERTILITY SURVEY QUESTIONNAIRE, 1968 AND ENGLISH TRANSLATION OF THE FERTILITY SURVEY QUESTIONNAIRE, 1968

E N C U E S T A S O B R E L A F A M I L I A

No.

Para Codificación solamente ( ) ( ) ( )

1. ¿Dónde nació Ud.?_____ (R-H) ( )
(U-H) ( )
(E) ( )
(S-R) ( )

SI EL LUGAR DE NACIMIENTO ES OTRO QUE EL QUE RESIDE ACTUALMENTE

2. ¿Desde cuándo reside en_____ No. de años ( ) ( ) ( )

3. ¿Cuál es su religión? (C) ( )
(O) ( )
Ninguna (N) ( )

SI LA RESPUESTA A LA PREGUNTA ANTERIOR FUE NINGUNA PASE A LA PREGUNTA 6 PAGINA 2

4. ¿Asiste usted a los servicios de su Iglesia?
(SI) ( )
(NO) ( )

SI LA RESPUESTA A LA PREGUNTA ANTERIOR FUE NO PASE A LA PREGUNTA 6 PAGINA 2

APPENDIX 5

			Para Codificación Solamente
5.	Si asiste a dichos servicios lo hace:		
		Una o más veces por semana ( )	( )
		Una o dos veces al mes ( )	( )
		De vez en cuando ( )	( )
		Sin respuesta ( )	( )
6.	¿Qué edad tiene usted? _____ Años Cumplidos _____ Año de nacimiento		
7.	¿Desde que se casó ha trabajado usted fuera de la casa?	(si)	( )
		(No)	( )
	Si la respuesta es NO pase a pregunta 10		
8.	Si ha trabajado fuera ¿por cuánto tiempo lo ha hecho? _____ Años		( ) ( )
9.	¿En qué época realizó dicho trabajo?	Durante los 10 primeros años de matrimonio ( )	( )
		Durante los 20 primeros años de matrimonio ( )	( )
		Después de 35 años de casada ( )	( )
10.	¿Cuál es su estado civil actual?	Casada ( )	( )
		Viuda ( )	( )
		Divorciada ( )	( )
		Separada ( )	( )
		Otro ( )	( )

Para Codificación Solamente

11. ¿Desde cuándo?_____ año

Menos de 15 años	( )	( )
De 15 a 20 años	( )	( )
De 20 a 30 años	( )	( )
De 30 a 35 años	( )	( )
Más de 35 años	( )	( )
Sin respuesta	( )	( )

12. ¿Cuándo se casó usted por primera vez? _____ día mes año ( ) ( )

13. ¿Se ha separado y vuelto a casar desde entonces?

(Si)	( )	( )
(No)	( )	( )

14. ¿Qué cursos completó usted en la escuela?

Ninguno	( )	( )
Primaria	( )	( )
Secundaria	( )	( )
Artes y oficios	( )	( )
Universidad	( )	( )
Otros	( )	( )

15. ¿Cuál es (fué)la ocupación de su esposo?

Manual	( )	( )
Maestro	( )	( )
Profesional	( )	( )
Agricultor	( )	( )
Industrial	( )	( )
Rentista	( )	( )
Sin respuesta	( )	( )

APPENDIX 5

- 4 -

Por favor deme información completa acerca del número y tipo de partos que ha tenido (si ha tenido alguno indicar No.), de la fecha del acontecimiento (parto) y del número de hijos vivos que ha tenido.

COMIENCE POR EL PRIMER PARTO INMEDIATAMENTE DESPUES DE SU MATRIMONIO O SEA POR EL HIJO MAYOR O PRIMER PARTO QUE TUVO.

Para codificación solamente
No escriba nada en estas columnas

No.	Como terminó el embarazo, aborto, prematuro, normal (de edad)	Fecha de dicho acontecimiento o nacimiento del niño	Nació el niño vivo o muerto	Sexo de nacidos vivos	Si nació vivo está vivo	Fecha o edad que tenía la persona al morir	Estado civil al momento del parto	Intervalo	Edad de la madre
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									

¿Está segura de haberme dado datos acertados? REVISEMOS.....

Para Codificación Solamente ___

17. ¿Le ha dado el pecho a sus niños? (si) ( )
(no) ( )

18. ¿A cuántos de sus niños les dió el pecho? _____ Número ( )

19. ¿Por cuánto tiempo más o menos les ha dado el pecho? ___ / ___ meses ▲ años ( ) ( )

0.0 ¿Conoce alguna de las señoras de esta lista?

0.0 Si conoce ¿podría usted darme nombre y dirección exacta de dicha persona?

_____

_____

Firma de la entrevistadora_____

Firma del supervisor_____

Fecha y hora en que se realizó la encuesta_____ (de las .....a....)
día mes año hora

Para uso de la encuestadora:
Validez de la encuesta: Aceptable ( ) Aceptable ( )
Dudosa ( ) Dudosa ( )

APPENDIX 5

F A M I L Y S U R V E Y

Code (Do not use this Section)

Questionnaire Number ( ) ( ) ( )

1. Where were you born? _____ (RH) ( )
(UH) ( )
(F) ( )
(NS) ( )

2. If place of birth is difference from place of present residence, since when do you live in _____

No. of Years ( ) ( ) ( )

3. What is your religion? _____ (C) ( )
(O) ( )
(N) ( )

If the answer was "No Religion", skip to Question 6, Page 2.

4. Do you attend the religious services of your church?
(Yes) ( )
(No) ( )

If the answer to Question 4 was "No", skip to Question 6, Page 2.

			Code		
5. If you attend the services, do you do it					
	once or more per week?	( )	( )		
	once or twice per month?	( )	( )		
	seldom?	( )	( )		
	no answer	( )	( )		
6. How old are you? _____ _____		( )	( )	( )	
Complete years Year of birth		( )			
7. Have you worked (outside of the home) since you got married?		(Yes)	( )		
		(No)	( )		
If the answer is "No", skip to Question 10.					
8. If you have worked, how many years did you work?			( )	( )	
_____ Years					
9. When did you work? During the first 10 years of marriage		( )	( )		
During the first 20 years of marriage		( )	( )		
After 35 years of marriage		( )	( )		
10. What is your present marital status?	Married	( )	( )		
	Widowed	( )	( )		
	Divorced	( )	( )		
	Separated	( )	( )		
	Other	( )	( )		

			Code
11. Since when? _____ Year	Less than 15 Years	( )	( )
	15 to 20 Years	( )	( )
	20 to 30 Years	( )	( )
	30 to 35 Years	( )	( )
	More than 35 Years	( )	( )
	No answer	( )	( )
12. What was the date of your first marriage? _____ Day/Month/Year			( ) ( )
13. Did you remarry since then?	(Yes)		( )
	(No)		( )
14. What level of schooling did you attain?			
	None	( )	( )
	Elementary	( )	( )
	Secondary	( )	( )
	Vocational	( )	( )
	University	( )	( )
	Other	( )	( )
15. What is (was) the occupation of your husband?			
	Labourer	( )	( )
	Teacher	( )	( )
	Professional	( )	( )
	Farmer	( )	( )
	Industrialist	( )	( )
	Real estate operator	( )	( )
	Other	( )	( )
	No Answer	( )	( )

Could you please give me some information about the number and type of pregnancies that you have had? (If you were pregnant, indicate the order of pregnancy, the date of the event or delivery and the number of live births that you have had. Begin by the first pregnancy you had after your wedding or by the oldest son.

Code Only. Do not write anything here.

	How did the pregnancy end? Was it an abortion, premature or on term?	Date of the event or of birth of child	Was it a live birth or a still birth?	Sex of the live-born child	Is the person still alive?	If not alive, date or age of the person at death	Marital status at the moment of the event	Interval	Mothers Age
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									

Code

Are you sure that the information you gave me is accurate and complete? .....

17. Did you breastfeed your children (Yes) ( )
(No) ( )

18. How many of them did you breastfeed? _____ ( ) ( )
Number

19. For how long, more or less, did you breastfeed them? _____ ( ) ( )
Months/Years

0.0 Do you know any of the persons in this list?

0.0 If you do, could you give me the exact name and address of this person?

_____

_____

Enumerator's signature _____

Supervisor's signature _____

Date and hour of the interview _____ (duration
Day Month Year

Comments:

Value of the interview Acceptable ( ) Acceptable ( )
Doubtful ( ) Doubtful ( )

APPENDIX 6

DISTRIBUTION OF THE POPULATION OF HONDURAS BY AGE AND SEX, SELECTED CENSUS YEARS

APPENDIX 6

Distribution of the population by age and sex, 1881 [1]

Age groups	Male	Female
Less than one year	6,768	6,520
1- 6 years	34,947	33,929
7-14 "	32,454	30,890
15-17 "	7,380	9,350
18-34 "	34,415	41,627
35-39 "	10,160	9,109
40-49 "	12,863	12,614
50-59 "	6,123	6,697
60-69 "	3,822	3,946
70-79 "	1,124	1,210
80-89 "	447	476
90-99 "	127	191
100 or more years	49	51
TOTAL	150,679	156,610

Distribution of the population by age and sex, 1887 [2]

Age groups	Male	Female
Less than one year	5,204	5,580
1- 6 years	33,016	34,299
7-15 "	36,431	37,891
16-20 "	16,752	17,457
21-29 "	23,420	24,349
30-39 "	20,493	21,279
40-49 "	13,824	14,341
50-59 "	7,644	7,996
60-69 "	4,229	4,243
70-79 "	1,122	1,169
80-89 "	423	443
90-99 "	114	118
100 or more years	33	47
TOTAL	162,705	169,212

1 Honduras, Direccion General de Estadistica y Censos, Censo General de Poblacion de la Republica de Honduras, Tegucigalpa, D.C., 1882, p. 1.

2 Honduras, Direccion General de Estadistica y Censos, Anuario Estadistico de la Republica de Honduras, Tegucigalpa, D.C., 1889, no page.

Distribution of the population by age and sex, 1930 [3]

Age groups	Male	Female
Less than one year	14,273	14,226
1- 4 years	56,887	55,064
5- 9 "	62,616	60,746
10-14 "	51,442	48,570
15-19 "	47,196	47,019
20-24 "	39,782	43,593
25-29 "	31,292	34,711
30-34 "	27,490	29,873
35-39 "	22,603	23,259
40-44 "	19,574	19,578
45-49 "	15,115	14,277
50-54 "	10,917	12,652
55-59 "	8,600	8,602
60-64 "	7,764	7,986
65-69 "	4,031	3,855
70-74 "	2,185	2,560
75-79 "	1,161	1,320
80-84 "	751	1,151
85-89 "	334	397
90-94 "	167	238
95-99 "	88	110
100 or more years	56	74
TOTAL	424,324	429,861

3 Honduras, Direccion General de Estadistica y Censos, Censo General de Poblacion de la Republica de Honduras, Tegucigalpa, D.C., 1930, p. 38

Distribution of the population by age and sex, 1935 [4]

Age groups	Male	Female
Less than one year	19,580	18,742
1- 4 years	63,350	60,546
5- 9 "	67,445	64,462
10-14 "	56,167	53,693
15-19 "	48,222	48,513
20-24 "	44,437	48,178
25-29 "	38,073	44,366
30-34 "	29,153	31,184
35-39 "	28,220	24,955
40-44 "	21,187	21,872
45-49 "	17,950	16,783
50-54 "	12,844	14,855
55-59 "	10,206	10,417
60-64 "	9,455	8,881
65-69 "	5,808	5,669
70-74 "	2,905	3,734
75-79 "	2,085	2,279
80-84 "	1,285	1,574
85-89 "	726	813
90-94 "	348	499
95-99 "	144	259
100 or more years	62	65
TOTAL	479,652	482,339

4 Ibid, 1935, p. 182.

APPENDIX 6

Distribution of the population by age and sex, 1945 [5]

Age groups	Male	Female
Less than one year	23,331	23,029
0- 4 years	73,682	73,281
5- 9 "	83,614	81,052
10-14 "	73,757	69,375
15-19 "	67,019	66,853
20-24 "	59,206	60,818
25-29 "	44,424	45,902
30-34 "	37,440	37,690
35-39 "	34,737	33,958
40-44 "	25,396	26,418
45-49 "	24,018	22,219
50-54 "	14,848	16,804
55-59 "	13,228	12,853
60-64 "	11,119	10,910
65-69 "	6,867	6,481
70-74 "	3,804	4,458
75-79 "	2,686	2,729
80-84 "	1,490	1,969
85-89 "	781	986
90-94 "	311	421
95-99 "	152	267
100 or more years	53	106
TOTAL	601,963	598,579

5 Ibid, 1945, p. 8

Distribution of the population by age and sex, 1950[6]

Age groups	Male	Female
Less than one year	25,917	24,781
1- 4 years	83,883	81,081
5- 9 "	90,793	86,993
10-14 "	83,774	78,362
15-19 "	69,795	68,841
20-24 "	61,417	62,938
25-29 "	49,818	51,343
30-34 "	41,284	41,980
35-39 "	38,321	39,158
40-44 "	32,157	32,486
45-49 "	26,823	26,895
50-54 "	22,674	24,912
55-59 "	17,492	18,130
60-64 "	15,878	16,299
65-69 "	9,721	10,106
70-74 "	6,379	7,278
75-79 "	4,575	5,123
80-84 "	3,484	3,975
85 years and over	1,750	1,989
TOTAL	685,935	682,670

6 Ibid, 1950, p. 26

APPENDIX 7

LIFE TABLE BASED ON M(X) VALUES FOR MODEL SOUTH, LEVEL 14

APPENDIX 7

Life Table Based on Mx values given for Model South, Level 14(1)

Age(x)	Q(x)	D(x)	M(x)	l(x)	L(x)	P(x)	T(x)	E(x)
FEMALES								
0	0.12355	12.35500	.13169	100.00000	93.81882	0.87645	5273.88471	52.73885
1	0.08726	7.64790	.02281	87.64500	335.28715	0.91274	5180.06589	59.10281
5	0.01882	1.50555	.00380	79.99710	396.19737	0.98118	4844.77874	60.56193
10	0.01129	0.88617	.00227	78.49155	390.38326	0.98871	4448.58137	56.67593
15	0.01617	1.25488	.00326	77.60538	384.93252	0.98383	4058.19811	52.29274
20	0.02078	1.58656	.00420	76.35050	377.75238	0.97922	3673.26559	48.11056
25	0.02318	1.73303	.00469	74.76394	369.51599	0.97682	3295.51321	44.07891
30	0.02464	1.79948	.00499	73.03091	360.61723	0.97536	2925.99722	40.06519
35	0.02722	1.93892	.00552	71.23143	351.25362	0.97278	2565.37999	36.01472
40	0.03067	2.12520	.00623	69.29251	341.12360	0.96933	2214.12637	31.95333
45	0.03560	2.39116	.00725	67.16731	329.81517	0.96440	1873.00277	27.88563
50	0.04869	3.15395	.00998	64.77615	316.02705	0.95131	1543.18760	23.82339
55	0.06805	4.19339	.01409	61.62220	297.61462	0.93195	1227.16055	19.91426
60	0.10919	6.27065	.02310	57.42881	271.45671	0.89081	929.54593	16.18606
65	0.17206	8.80227	.03765	51.15816	233.79203	0.82794	658.08922	12.86382
70	0.27861	11.80077	.06474	42.35589	182.27943	0.72139	424.29719	10.01743
75	0.42705	13.04856	.10860	30.55512	120.15249	0.57295	242.01776	7.92069
80	1.44311	25.26389	.20731	17.50656	121.86527	— 0.44311	121.86527	6.96112
MALES								
0	0.13791	13.79100	.14812	100.00000	93.10694	0.86209	4971.52310	49.71523
1	0.08854	7.63294	.02316	86.20900	329.57427	0.91146	4878.41616	56.58825
5	0.01912	1.50237	.00386	78.57606	389.21503	0.98088	4548.84189	57.89094
10	0.01094	0.84319	.00220	77.07369	383.26818	0.98906	4159.62686	53.96948
15	0.01641	1.25094	.00331	76.23050	377.92749	0.98359	3776.35868	49.53868
20	0.02484	1.86249	.00503	74.97956	370.27634	0.97516	3398.43119	45.32477
25	0.02484	1.81623	.00503	73.11707	361.07952	0.97516	3028.15485	41.41516
30	0.02756	1.96505	.00559	71.30084	351.52952	0.97244	2667.07533	37.40595
35	0.03116	2.16050	.00633	69.33579	341.31122	0.96884	2315.54581	33.39611
40	0.03965	2.66350	.00809	67.17529	329.23362	0.96035	1974.23459	29.38930
45	0.05035	3.24817	.01033	64.51179	314.44046	0.94965	1645.00097	25.49923
50	0.06899	4.22658	.01429	61.26362	295.77187	0.93101	1330.56051	21.71861
55	0.09610	5.48126	.02019	57.03704	271.48390	0.90390	1034.78864	18.14240
60	0.14135	7.28741	.03042	51.55578	239.55983	0.85865	763.30474	14.80542
65	0.20668	9.14939	.04610	44.26837	198.46833	0.79332	523.74491	11.83113
70	0.31508	11.06529	.07480	35.11898	147.93168	0.68492	325.27658	9.26213
75	0.46743	11.24342	.12200	24.05369	92.15918	0.53257	177.34490	7.37288
80	1.46801	18.80560	.22076	12.81027	85.18572	— 0.46801	85.18572	6.64980

(1) The M(x) values were taken from Op Cit Coale and Demeny, Life Tables p. 669.

APPENDIX 8

LIFE TABLE BASED ON ADJUSTED AGE DISTRIBUTION, 1961

Life Table Based on adjusted age distribution

Age(x)	Q(x)	D(x)	M(x)	l(x)	L(x)	P(x)	T(x)	E(x)
FEMALES								
0	0.04906	4.90600	.05029	100.00000	97.55419	0.95094	6157.31862	61.57319
1	0.05300	5.03998	.01361	95.09400	370.31447	0.94700	6059.76443	63.72394
5	0.01715	1.54443	.00346	90.05402	446.36705	0.98285	5689.44996	63.17819
10	0.00896	0.79305	.00180	88.50959	440.58333	0.99104	5243.08291	59.23746
15	0.01124	0.98593	.00226	87.71654	436.25221	0.98876	4802.49958	54.75022
20	0.01676	1.45360	.00338	86.73061	430.05917	0.98324	4366.24737	50.34263
25	0.02093	1.78485	.00423	85.27700	421.95035	0.97907	3936.18820	46.15768
30	0.02606	2.17581	.00528	83.49215	412.08523	0.97394	3514.23785	42.09064
35	0.02849	2.31670	.00578	81.31634	400.81315	0.97151	3102.15262	38.14919
40	0.03358	2.65281	.00683	78.99964	388.40556	0.96642	2701.33947	34.19433
45	0.03816	2.91340	.00778	76.34683	374.47301	0.96184	2312.93391	30.29509
50	0.05092	3.73923	.01045	73.43343	357.82105	0.94908	1938.46090	26.39753
55	0.08259	5.75604	.01723	69.69420	334.07081	0.91741	1580.63985	22.67965
60	0.10467	6.69241	.02209	63.93816	302.96107	0.89533	1246.56904	19.49648
65	0.14471	8.28403	.03120	57.24575	265.51378	0.85529	943.60797	16.48346
70	0.19311	9.45500	.04275	48.96172	221.16959	0.80689	678.09419	13.84948
75	0.25693	10.15046	.05896	39.50672	172.15841	0.74307	456.92460	11.56574
80	0.30727	9.02030	.07261	29.35626	124.22944	0.69273	284.76619	9.70036
85	1.21058	24.61831	.15335	20.33596	160.53675	— 0.21058	160.53675	7.89423
MALES								
0	0.05689	5.68900	.05856	100.00000	97.14822	0.94311	5892.38385	58.92384
1	0.05266	4.96642	.01352	94.31100	367.33876	0.94734	5795.23563	61.44814
5	0.01779	1.58944	.00359	89.34458	442.74095	0.98221	5427.89687	60.75239
10	0.01000	0.87755	.00201	87.75514	436.59204	0.99000	4985.15592	56.80757
15	0.01528	1.32749	.00308	86.87759	431.00325	0.98472	4548.56388	52.35601
20	0.02435	2.08314	.00493	85.55010	422.54361	0.97565	4117.56063	48.13040
25	0.03087	2.57662	.00627	83.46696	410.94418	0.96913	3695.01702	44.26922
30	0.03242	2.62246	.00659	80.89033	397.94537	0.96758	3284.07284	40.59908
35	0.03411	2.66972	.00694	78.26787	384.68588	0.96589	2886.12747	36.87500
40	0.04205	3.17890	.00859	75.59815	370.06985	0.95795	2501.44159	33.08866
45	0.04797	3.47395	.00983	72.41925	353.40285	0.95203	2131.37174	29.43101
50	0.06094	4.20153	.01257	68.94530	334.25060	0.93906	1777.96889	25.78811
55	0.07540	4.88168	.01567	64.74377	311.53031	0.92460	1443.71829	22.29895
60	0.10732	6.42440	.02268	59.86209	283.26279	0.89268	1132.18798	18.91327
65	0.14733	7.87297	.03181	53.43769	247.49984	0.85267	848.92519	15.88626
70	0.26847	12.23276	.06202	45.56472	197.23896	0.73153	601.42535	13.19936
75	0.27924	9.30762	.06491	33.33196	143.39270	0.72076	404.18639	12.12609
80	0.29096	6.99012	.06810	24.02434	102.64493	0.70904	260.79369	10.85539
85	1.07158	18.25353	.11542	17.03422	158.14876	— 0.07158	158.14876	9.28418

APPENDIX 8

Life Table Based on adjusted age distribution — Concluded

Age(x)	Q(x)	D(x)	M(x)	l(x)	L(x)	P(x)	T(x)	E(x)
TOTAL								
0	0.05306	5.30600	.05451	100.00000	97.33994	0.94694	5987.74789	59.87748
1	0.05285	5.00458	.01357	94.69400	368.79735	0.94715	5890.40795	62.20466
5	0.01745	1.56508	.00352	89.68942	444.62500	0.98255	5521.61060	61.56368
10	0.00950	0.83718	.00191	88.12434	438.31414	0.99050	5076.98560	57.61162
15	0.01316	1.14870	.00265	87.28716	433.47170	0.98684	4638.67146	53.14266
20	0.02039	1.75636	.00412	86.13846	426.30097	0.97961	4205.19976	48.81907
25	0.02557	2.15765	.00518	84.38210	416.53475	0.97443	3778.89879	44.78318
30	0.02917	2.39849	.00592	82.22445	405.15034	0.97083	3362.36404	40.89251
35	0.03130	2.49855	.00636	79.82596	392.85377	0.96870	2957.21370	37.04576
40	0.03782	2.92452	.00771	77.32741	379.31518	0.96218	2564.35993	33.16237
45	0.04305	3.20304	.00880	74.40289	363.98182	0.95695	2185.04475	29.36774
50	0.05594	3.98292	.01151	71.19985	346.03997	0.94406	1821.06293	25.57678
55	0.07882	5.29804	.01641	67.21693	322.85436	0.92118	1475.02296	21.94422
60	0.10597	6.56154	.02238	61.91889	293.18767	0.89403	1152.16860	18.60771
65	0.14600	7.72029	.03150	55.35735	245.08857	0.85400	858.98093	15.51702
70	0.22514	10.16697	.05074	47.27518	200.37387	0.77486	613.89236	12.98551
75	0.26810	9.38121	.06192	36.63165	151.50533	0.73190	413.51849	11.28856
80	0.29918	7.66208	.07036	26.81070	108.89824	0.70082	262.01316	9.77271
85	1.14690	20.58477	.13444	18.78947	153.11492	— 0.14690	153.11492	8.14897

APPENDIX 9

MODEL LIFE TABLES AND STABLE POPULATION MEASURES ASSOCIATED WITH THE POPULATION OF HONDURAS FOR SELECTED CENSUS YEARS

APPENDIX 9

Model Life Tables and Stable Population
Measures Associated with the Population of Honduras
for Selected Census Years[1]

Area	Year	T_{10}	E_{10}	Family Level(s)	South E_{10}	Intrinsic Crude Birth Rate	Gross Reproduction Rate
			Females				
Honduras	1930	736.04274	49.67891	9	49.479	47.45	3.081
	1935	804.90002	54.21297	12	53.516	41.26	2.674
	1945	745.54280	49.10604	8	48.078	45.35	3.169
	1961	951.64062	54.39780	12	53.516	48.53	3.196
			Total Population, 1961				
Francisco Morazan		1306.01880	70.81821	24	70.495	41.98	2.758
Atlantida		1152.04105	61.73910	18	61.551	44.42	2.955
Colon		536.47192	36.38751	1	37.590	71.87	4.679
Comayagua		980.62331	51.21733	11	52.168	52.64	3.504
Copan		771.13539	44.50446	6	45.221	58.75	3.864
Cortes		1642.80191	80.11305	24	70.495	45.79	3.071
Choluteca		924.76597	48.69691	(8)(9)	(48.078)(49.479)	56.81	3.781
El Paraiso		714.19300	41.07709	3	42.269	70.78	4.102
Intibuca		600.40516	38.78098	1	37.590	78.19	5.187
Islas de la Bahia		460.98388	32.94775	1	37.590	64.23	4.114
La Paz		536.07893	35.89933	1	37.590	71.87	4.679
Lempira		578.08737	37.84580	1	37.590	76.49	4.971
Ocotepeque		491.76865	32.15561	1	37.590	68.79	4.453
Olancho		769.85726	42.36461	4	42.269	67.40	4.483
Santa Barbara		1322.14418	63.29807	20	64.363	45.12	3.040
Valle		586.43438	33.54744	1	37.590	79.79	5.318
Yoro		750.44304	43.48491	5	43.758	62.73	4.147

1 The measures were calculated from A. J. Coale and P. Demeny, Regional Model Life Tables and Stable Populations, Princeton University Press, Princeton, New Jersey, 1966, p. 656-871.