EFFECTS OF DECLINING FERTILITY ON INFANT MORTALITY LEVELS: A STUDY BASED ON DATA FROM FIVE LATIN AMERICAN COUNTRIES

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Report to the Ford Foundation and The Rockefeller Foundation

*/ The views expressed in this work are the sole responsibility of the author and do not necessarily coincide with those of CELADE.

82-2-222

This research was conducted with financial assistance from the Ford and Rockefeller Foundations and in co-operation with the Latin American Demographic Centre (CELADE).

CONTENTS

/I. INTRODUCTION

I. INTRODUCTION

Downward trends in infant mortality frequently coincide with downward trends in fertility. This fact has given rise to studies of their reciprocal relationships, without ignoring that there are socioeconomic factors which may simultaneously contribute to the changing level of both variables. The influence of the decline in infant mortality on fertility is of special concern in countries where the population policies are aimed at reducing fertility through family planning programmes. In these, the research has centered on determining whether the reduction in infant mortality is a prerequisite for the decline in fertility.

The effect of the decline in fertility on the level of infant mortality, however, which is the approach followed in this paper, is of greater interest in Latin America. In many of its countries, where high infant mortality is a serious problem, high fertility, on the contrary, is not considered an obstacle to economic progress, and in some it even appears desirable in order to attain higher population growth. In such circumstances, the family planning activities which are developed in these countries with official support often have as their only explicit objectives to improve the health of mothers and children and sometimes, specifically, to reduce infant mortality. These objectives, however, also appear in the countries of the region where family planning programmes are openly oriented towards the reduction of fertility. It is obvious that the expected health effects of family planning should come about through the reduction in fertility levels.

An investigation of whether the decline in fertility has a reductive effect on infant mortality will be useful not only for determining the validity of that objective of contraception. If it can be demonstrated that this effect exists, it will also serve as a justification for revising policies in countries where it is desired to reduce infant mortality but where family planning services are not available, and where it is primarily the population with the least resources who are deprived of the chance to avoid unwanted children, since the middle or high social sectors usually can go to a private physician for this purpose.

/The mechanism

The mechanism by which the decline in fertility may influence the level of infant mortality is the modification of the structure of births with respect to at least three variables related to infant mortality: birth order, the mother's age and the length of the previous birth interval. It has been observed that infant mortality increases with birth order, behaves in a U-shaped curve with respect to the mother's age and decreases as the length of birth interval increases. In conditions of decreasing fertility, the structure of births moves towards lower birth orders and maternal ages, and the proportion of births with longer previous intervals probably increases. These changes tend to produce an increase in the proportion of births with less risk of infant mortality. In addition, changes can also occur in the composition of births according to social strata. If the decline in fertility occurs at the expense of the higher strata, the relative weight of births with greatest risk of death will increase. The opposite will occur if a family planning programme allows the lower social strata access to contraception at times when the women of the higher social level are already controlling their fertility.

The basic problem, however, is that of the nature of the infant mortality differentials with regard to birth order, age of the mother and length of birth interval. If they are primarily of a biological nature, the policy to reduce infant mortality should tend to keep any kind of women whose children have the higher risk of death from becoming pregnant. On the other hand, if the differentials originate in the more unfavourable socioeconomic structure of the higher risk groups, the limiting of family size would be relatively useless in comparison with policies aimed at decreasing social class differentials by means of a more appropriate distribution of income and equal access to food, health, housing and other basic elements of the standard of living.

This study was structured around two working hypotheses:

(1) Changes in the structure of births with respect to birth order, age of the mother and length of birth interval, due to the decline in fertility and the relatively greater reduction in the fertility of the lower socioeconomic classes, lead to an increase in the relative weight of births with less risk of death and thus contribute to the decline of the overall infant mortality rate.

(2) The infant mortality differentials with respect to birth order, age of the mother and length of birth interval are primarily of biological origin.

From these hypotheses were derived specific objectives of the research which gave rise to the analyses presented below.

/II. DATA

II. DATA

1. Data sources

Two types of data sources were used: national fertility surveys from Costa Rica, Mexico, Paraguay and Peru carried out under the World Fertility Survey (WFS) and the vital statistics of Chile for 1972 and 1978.

The reason for using these two sources was that, although the infant mortality differentials in both could be studied with respect to birth order, age of the mother, and a socioeconomic variable, the surveys made possible the study of the birth intervals and of completed families, which is not possible with vital statistics data. The latter, on the other hand, provide data on causes of death which cannot be obtained from the surveys, and they also permit the analysis of neonatal and post-neonatal mortality which, because of the small number of cases, is not suitable with data from the surveys.

The criterion for choosing the four countries among those for which standard recode tapes of the World Fertility Survey were available was to contrast situations of low and high fertility. Costa Rica, a country for which reliable vital statistics information is available, experienced a sharp decline in fertility in the past 15 years. It would thus be useful to compare it with Mexico, Paraguay and Peru, where it was assumed that the level is higher.

The reason for using the vital statistics of Chile is that it is the only Latin American country where data is recorded on birth order, age and level of education of parents and occupation of the father, both on the death certificate of those under one year of age and on the birth certificate. This makes it possible to calculate specific rates of infant mortality according to these variables, relating the data from the cells of cross-tabulations of deaths with those of birth tabulations. The choice of years to be compared was due to the fact that 1972 was the first year in which the vital statistics were processed by computer, and 1978 was the last year for which data were available at the time the research was done. In addition, in this period a sharp decline was observed in the crude birth rate, which, according to statistics published by the Ministry of Health, decreased from 28.6 per thousand in 1972 to 21.8 per thousand in 1978.

/2. Quality

2. Quality of the data

In the national fertility surveys the data were obtained from birth historie in which it was also noted whether the child was still living, on the date of the survey and the age of death if it had died.

Without counting the children born the year previous to the survey, since they still could die at an age under one year, infant mortality was analysed in the births which occurred the 20 previous years. This period was chosen after analysing infant mortality levels in various five-year periods previous to the survey and by reconciling a relative regularity in the infant mortality levels with the need to have a sufficient number of births in order to analyse subgroups. For this reason, the possibilities for verifying the quality of the data on the infant mortality level were very restricted. Even in Costa Rica, the comparison of the infant mortality rate obtained from the survey with that obtained from vital statistics was impossible, since for previous periods, much earlier than the date of the survey, the births declared in the survey correspond to children of younger mothers on the average than the mothers for whom the vital statistics were recorded in the same period.

It was only possible to make a comparison between the proportion of deaths under age one in the total number of deaths of children under age five between the countries, in order to avoid gross errors in the declaration of age at death of the children. The results obtained were satisfactory, showing that the proportions were consistent between countries.

The data from the vital statistics of Chile were used without correcting for registration omission. Officially it is estimated that births have an under-registration of about 5% and that the death registration is complete. According to a study by Legarreta 1/ this latter does not appear to be true for deaths of children under one year. However, the means are not available to determine the omission with greater precision, nor to know whether for both births and deaths it could be differential with respect to the characteristics of the mother. Supposing that if it exists, the omission has not varied with time and that it is not differential, the comparative analysis would not offer any mayor problems.

1/ Legarreta, A., et al., "Omisión del Registro de Defunciones de Niños Fallecidos en Maternidades". Boletín de la OPS, Vol. 76, No. 4, 1973.

/With regard

With regard to the study of infant mortality differentials by various characteristics, the advantage of the data from surveys is that they come from the same informant for both births and deaths. In the vital statistics, on the contrary, the birth and death data come from different registries. Thus, in the latter, in order to avoid in part the lack of correspondence of the data on births and deaths in respect of birth order, mother's age and eduction and occupation of the father, the precaution was taken to ensure that the deaths of those under one year old in Chile corresponded to the births in the years 1972 and 1978. For this purpose, from the recode tapes of deaths in 1972 and 1973 and of 1978 and 1979 deaths were selected of children who, because of their age at death and date of death, must have been born in those years.

The greatest problem in calculating mortality differentials by using vital statistics was the lack of data on some variables. The occupation of the father had to be eliminated as a socioeconomic indicator for this reason: in 1972 this information was lacking in 4.9% of births and 26.4% of deaths. In 1978 these percentages rose respectively to 10.7 and 34.2.

Although the level of education of the mother was not always recorded, its omission is much less frequent than that of the occupation of the father. In 1972 this information was lacking in 0.6% of births and 8.5% of deaths. In 1978 it was not recorded in 0.7% of births and 11.4% of deaths. Assuming the omissions are non-differential with respect to the categories of the other variables, corrections were made in order to arrive at the total of births and deaths recorded. The same measure was taken for the omission by birth order, which was very small. The age of the mother was not missing in any registry.

Another fact of concern in the vital statistics is that for births, the rank order of the child was noted, whereas for deaths, the number of children ever born to the women was noted. This could mean that the deceased child of a mother who had had another child before the death occurred would have a higher birth order by one than that which actually corresponded to him on the death certificate, but that the actual order would appear on the birth certificate. The frequency of this occurrence, investigated in the fertility survey of Peru, was less than one per cent, which was considered negligible. The error which could be produced by twin births in the information on birth order was not taken into account. These births do not exceed 1.5% in both years studied.

/The cause

The cause of death appeared in all the deaths recorded by the vital statistics, but there is an appreciable percentage of ill-defined causes, which rose from 12.8% in neonatal deaths and 14.4% in post-neonatal deaths in 1972 to 16.1% and 22.6% respectively in 1978.

The stability of rates in relation to the number of vital events available for their calculation, especially those for studying differentials, is greater for the vital statistics. The number of births and deaths of children under age one, according to the fertility surveys of the four countries and in Chile, is shown in table 1, and this number determined the greater or lesser detail in the number of categories of the variables with respect to which mortality differentials were studied.

Table 1

NUMBER OF BIRTHS AND OF DEATHS OF INFANTS UNDER ONE YEAR IN COSTA RICA, MEXICO, PARAGUAY, PERU AND CHILE

Country	Births	Deaths
Costa Rica	11 093	751
Mexico	22 720	1 782
Paraguay	9 319	474
Peru	20 706	2 266
Chile 1972	256 097	19 081
Chile 1978	218 581	8 948

3. Choice of variables, categories and definitions

The division of infant mortality into neonatal and post-neonatal was made by taking as a limit the age of one month. This was done because it was estimated that the advantages of using the code which appears on the tape, of less than one month and one month and over, offset the disadvantages of changing the classic definition by two or three days.

The birth order by simple or grouped categories and the mother's age in five-year age groups were used in the analysis of differentials with data both from the fertility surveys and from the vital statistics.

/The socioeconomic

The socioeconomic variable selected from the vital statistics data to control the effects of supposedly biological nature, was the level of education of the mother. This decision was made, as explained earlier, because this information was omitted fewer times from the registry than the level of education of the father or his occupation. The data is recorded in four categories: none, primary, secondary and higher and was regrouped according to the number of other classifications of infant mortality, in order to obtain enough cases in each cell.

In order to choose the socioeconomic variable from the fertility survey data, the infant mortality differentials were analysed with respect to mother's level of education and current spouse's level of education and occupation. The behaviour of the differentials was also studied with respect to each of these variables within the categories of the others. Finally, composite indexes were constructed by categories of the different variables. The analysis revealed a consistent association of infant mortality with each one of these variables separately. The mother's level of education determined the more regular behaviour within categories of other variables. On the other hand, the composite indexes did not yield satisfactory results. With all this background information the mother's level of education was chosen in order to study cross-tabulations whereby comparability with the vital statistics data was also ensured, although its categories differ from those of the latter because the datum is registered in the surveys in terms of years of formal instruction. For some simpler analyses, the occupation of the current spouse was also used, categorizing it as white collar, transitional, mixed or traditional.1/

The interval between the birth studied and the previous birth, which was only obtainable from the survey data, was grouped into six-month categories.

Another classification variable used was that of large and small completed family. The definition of a woman with a completed family will be given in the corresponding chapter. These data can also be obtained only from surveys. Families are considered large when there are five or more children, and small when there are four or fewer.

1/ According to: "A proposed occupational classification system for women to be used in the international comparative analysis of WFS data". UN/UNFPA/ WFS.IV/3, presented at the 4th meeting of the U.N. Working Group on Comparative Analysis of WFS data, Geneva, 18-21 November 1980.

/The causes

The causes of death obtained from the vital statistics are grouped differently for deaths of those under one month, and one month and over, because of the difference observed between them. The classification criteria are detailed in the corresponding chapter.

III. RESULTS

1. Relations between infant mortality levels and fertility

According to the working hypothesis a positive association was expected between infant mortality and fertility levels in the different countries studied.

Among the difficulties encountered in analysing this association in the countries where data from the fertility surveys were used is that the women interviewed at that date were between 15 and 49 years of age, except in Costa Rica where the women interviewed were between 20 and 49 years of age. Thus, in studying data on births which occurred in periods previous to the survey, the direct information corresponds to increasingly younger women, and it becomes necessary to extrapolate from them the specific fertility rates by age for the older groups in order to obtain a measure of total fertility. The problem has less effect on the rates of infant mortality, but these refer, as one goes back in time, to births at younger maternal ages and also of lower birth order.

In any case, the study analysed what occurred in a 15-year period for which estimates had been made of the total fertility rate using the data from these same surveys, although the latter did not correspond exactly to equivalent periods previous to the survey, since the dates of these surveys did not coincide in all countries. However, direct information was obtained in this way for women under 35 years of age, when the majority of births had already occurred. For the same periods the infant mortality rates were calculated. In Chile the data for calculating the rates came from vital statistics. The figures are presented in table 2.

/Table 2

Table 2

INFANT MORTALITY RATES (IM) AND TOTAL FERTILITY RATES (TFR) IN FOUR FIVE-YEAR PERIODS IN CHILE, COSTA RICA, MEXICO, PARAGUAY AND PERU

Period	Chile a/		Costa Rica		México		Paraguay		Peru	
	IM	TFR	IM	TFR	IM	TFR	IM	TFR	IM	TFR
1961-1965	107.8	5.0	78.6	7.2	86.9	7.4	45.7	6.6	116.6	6.8
1966-1970	90.2	4.1	72.1	5.5	76.4	6.9	51.4	6.1	105.0	6.4
1971-1975	69.8	3.7	51.8	3.8	67.0	6.2	52.4	5.3	100.9	5.5

Sources: Chile. IM: Ministerio de Salud, Anuario 1978, Defunciones y Causas de Muerte, June 1979.
TFR: Oficina de Planificación Nacional, Proyección de la Población por Sexo y Grupos Quinquenales de Edad, 1950-2000, May 1975.
All other countries. IM: Special tabulations of the World Fertility Standard Recode Tapes.
TFR: Bocaz, A., Niveles y tendencias de la fecundidad en nueve países de América Latina. Un análisis comparativo a través de un método de coherencia interna con datos del programa WFS. CELADE, 1981, unpublished.

a/ Chilean data correspond to quinquennia 1960-1964, 1965-1969 and 1970-1974.

It can be seen that the association of levels of infant mortality and fertility is not sufficiently strong to offset the differences between countries. With very similar total fertility rates, very different infant mortality rates are found. On the other hand, within countries, except in Paraguay, the more the fertility rate drops, the more the infant mortality rate declines.

The table also shows that it is not easy to categorize the countries according to their fertility level. Chile and Costa Rica, for example, have definitely lower rates than the rest of the countries in the past five years, but between 1961 and 1965, Costa Rica had a higher total fertility rate than Paraguay and Peru. For these reasons, the study will henceforth concentrate more on the analysis of the infant mortality differentials of each country than on the relationship of infant mortality with their fertility levels. In Chile, however, it will also be possible to study what happened to the level and differentials of infant mortality with the decline in fertility between 1972 and 1978.

/2. Influence

2. Influence of the structure of births on infant mortality levels

According to the first working hypothesis, the structural changes in births which accompany the decline in fertility, favour a lower total infant mortality because the relative weight of the birth groups with less risk of death increases. We will thus study, first, the infant mortality differentials according to categories of single variables, and in categories of cross-tabulations with these variables, in all the countries considered in this research in order to identify the groups with a higher risk of death and to determine if they coincide in all countries. This will allow us to predict the effects which a particular change in the composition of births would have on the levels of infant mortality. Second, we will analyse the structure of births in the different countries in order to investigate whether it is true that a lower fertility rate corresponds to a more favourable structure in terms of the variables analysed. Finally, an attempt will be made to quantify the influence of the structural differences in births on the level of infant mortality.

2.1 Infant mortality differentials by country

Infant mortality differentials by birth order, mother's age, birth interval, mother's educational level and spouse's occupation appear for each variable and for cross-tabulations of two, three and four variables in tables A 1 to A 9 in the Annex, for Costa Rica, Mexico, Paraguay and Peru. In tables A 10 and A 11 of the Annex are also presented the infant mortality differentials and their components, neonatal and post-neonatal mortality for Chile in 1972 and 1978 in relation to birth order, mother's age and mother's level of education. The differentials with respect to one variable are presented in figures 1 to 5, and with respect to two or three variables in figures 6 to 10.

Findings of other research and what appears in the literature were confirmed: that infant mortality increases as birth order increases, that it has a U-shaped curve with respect to the mother's age, that it decreases as the interval since the previous birth becomes longer and that it is inversely related with socioeconomic level as measured by the mother's education or father's occupation.

/Figure 1

Figure 1

INFANT MORTALITY BY BIRTH ORDER
AND BY COUNTRIES

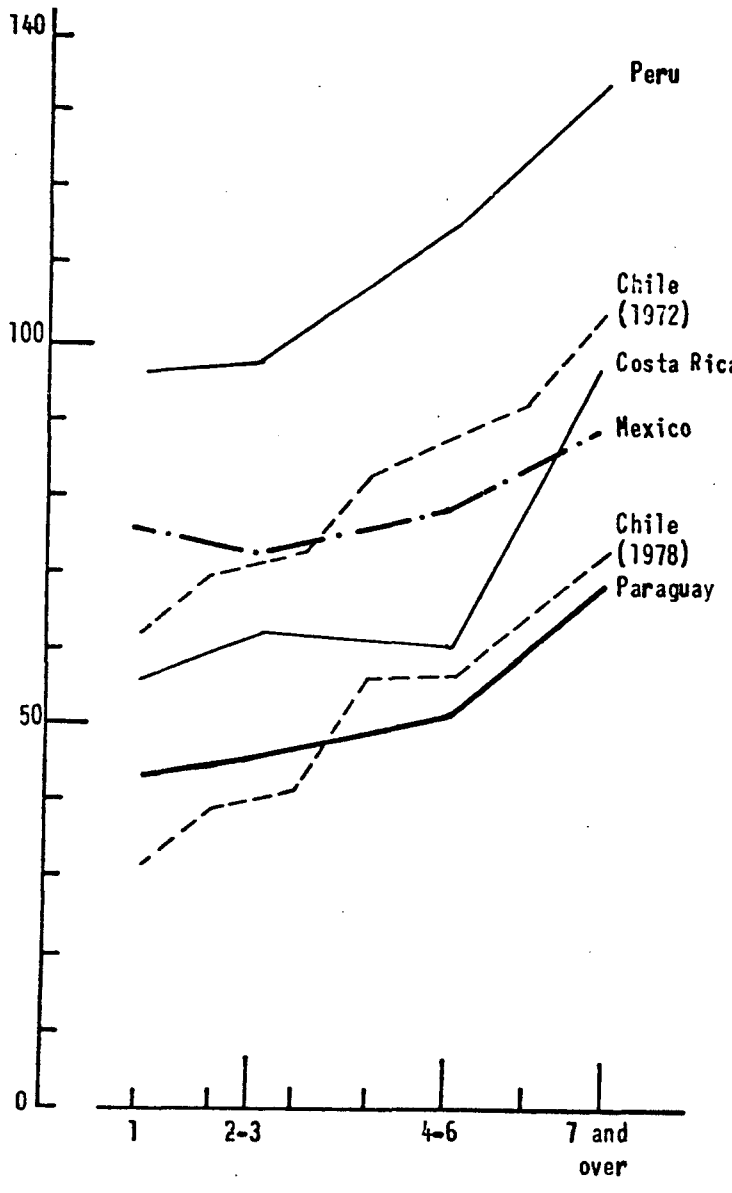


Figure 2

INFANT MORTALITY BY AGE OF MOTHER
AND BY COUNTRIES

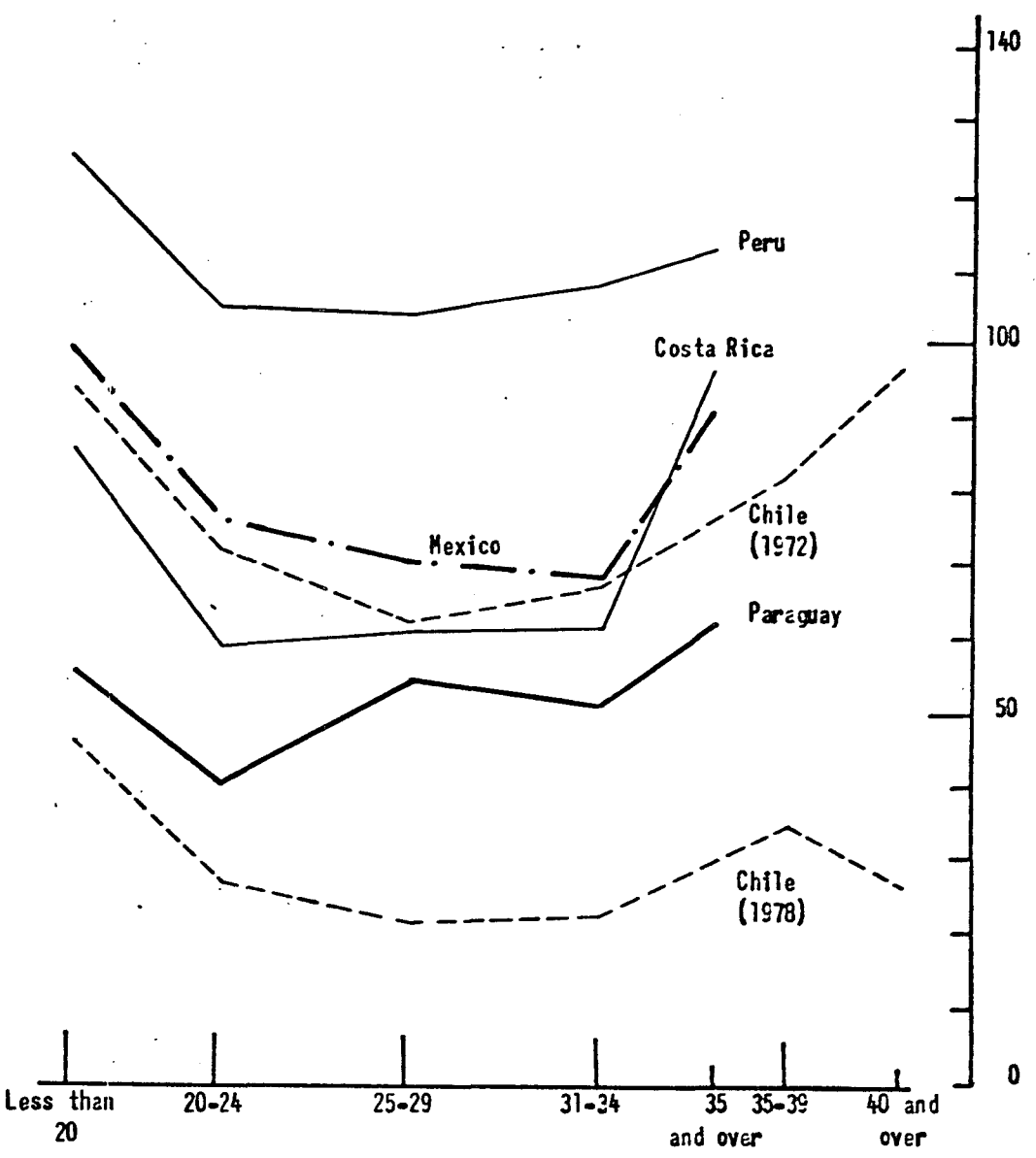


Figure 3

INFANT MORTALITY BY LENGTH OF BIRTH INTERVAL AND COUNTRIES

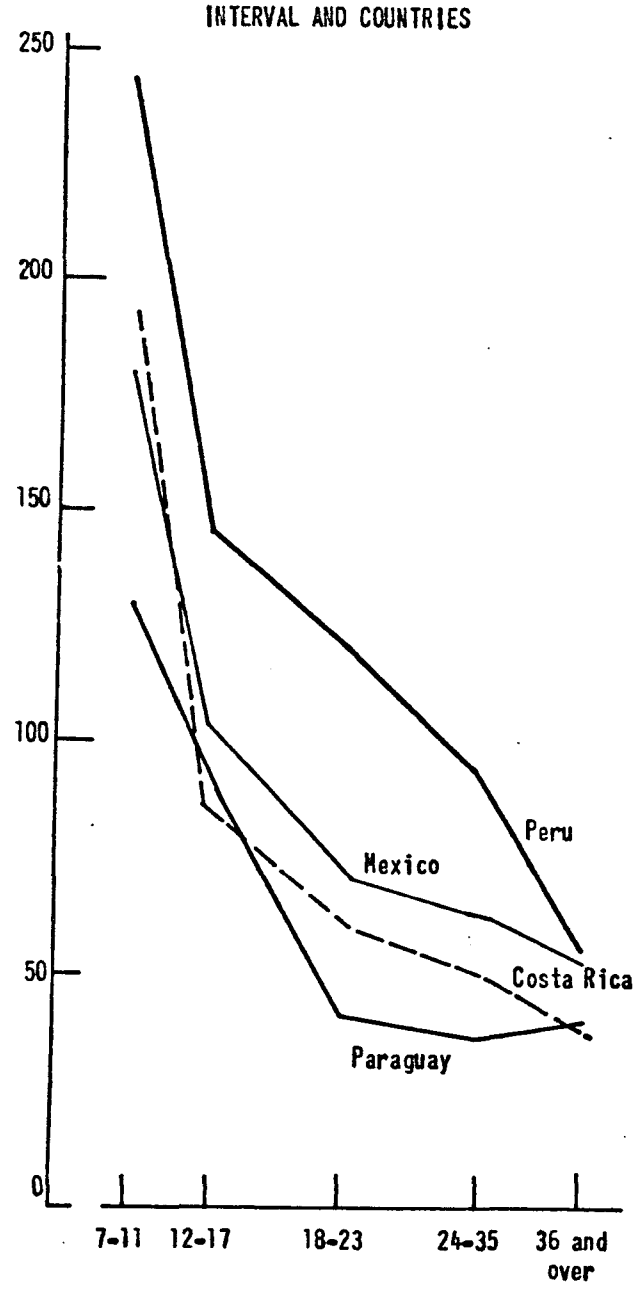


Figure 4

INFANT MORTALITY BY EDUCATIONAL LEVEL OF MOTHER AND COUNTRIES

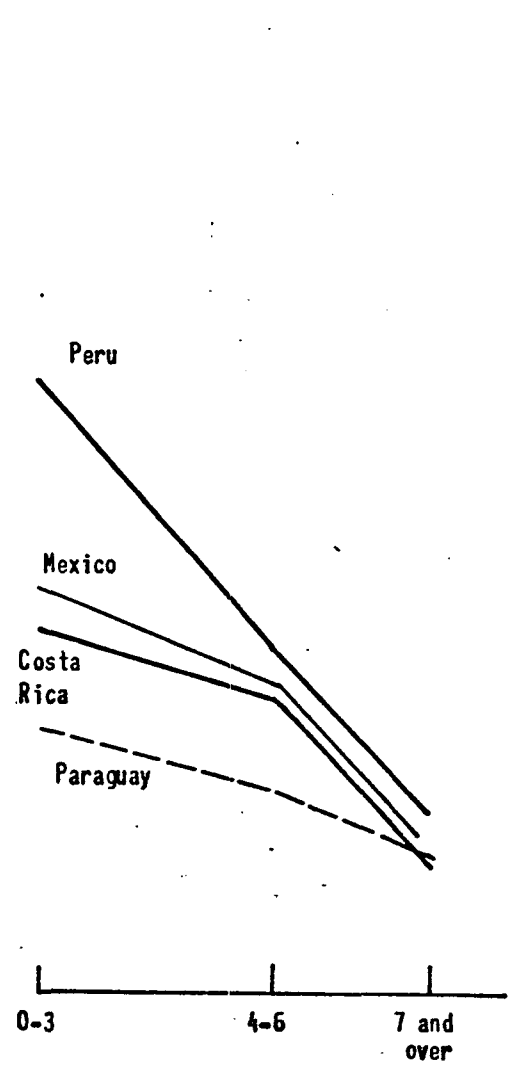


Figure 5

INFANT MORTALITY BY OCCUPATION OF HUSBAND AND COUNTRIES

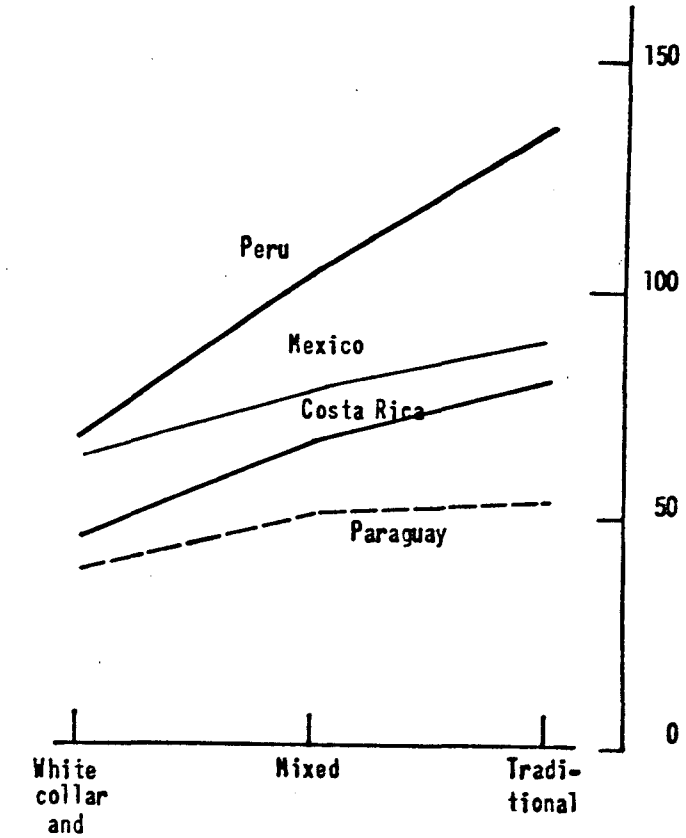


Figure 6

INFANT MORTALITY RATES BY BIRTH ORDER AND AGE OF THE MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU

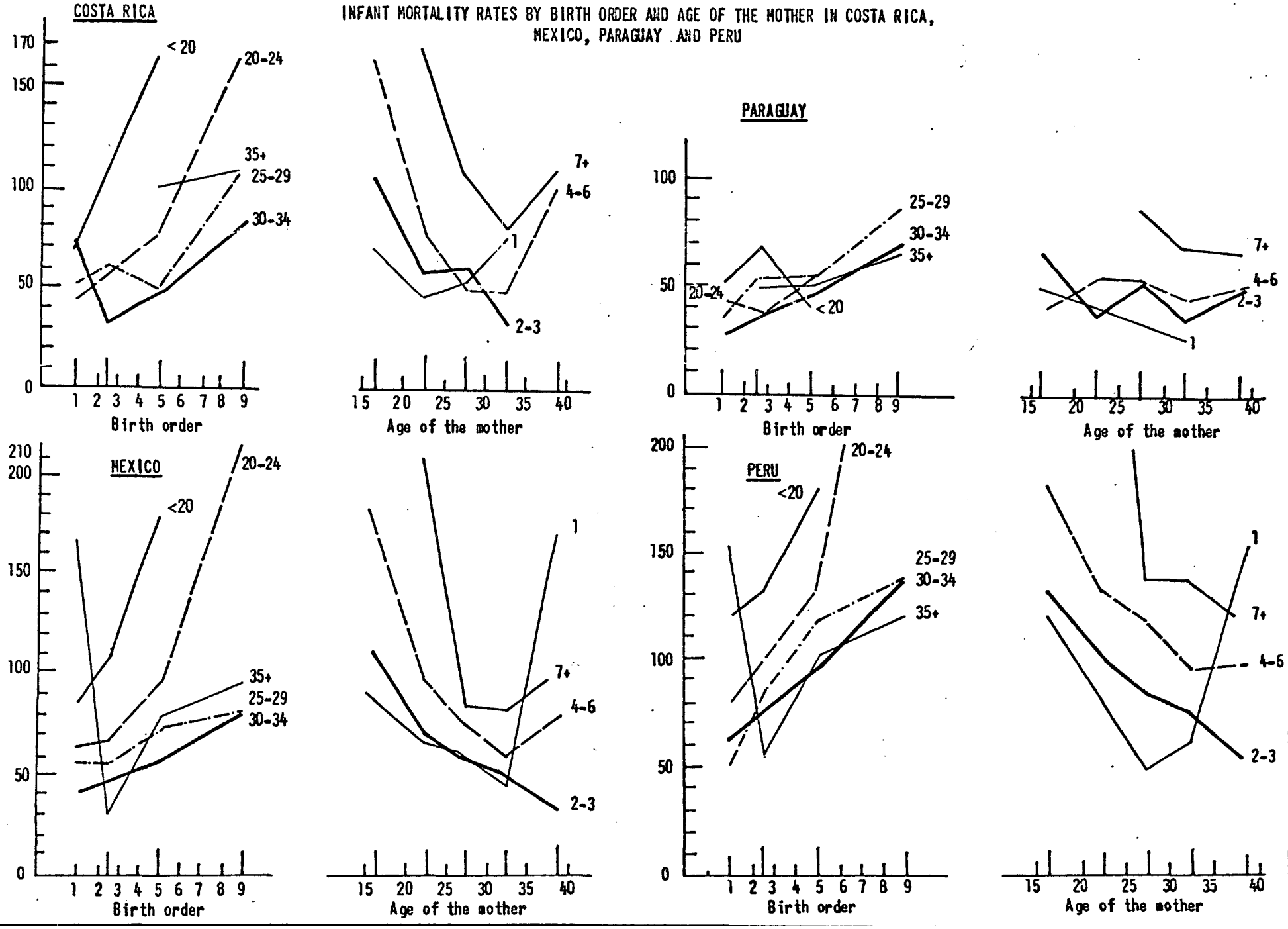


Figure 7

INFANT MORTALITY RATES BY BIRTH ORDER AND AGE OF THE MOTHER IN CHILE, 1972 AND 1978

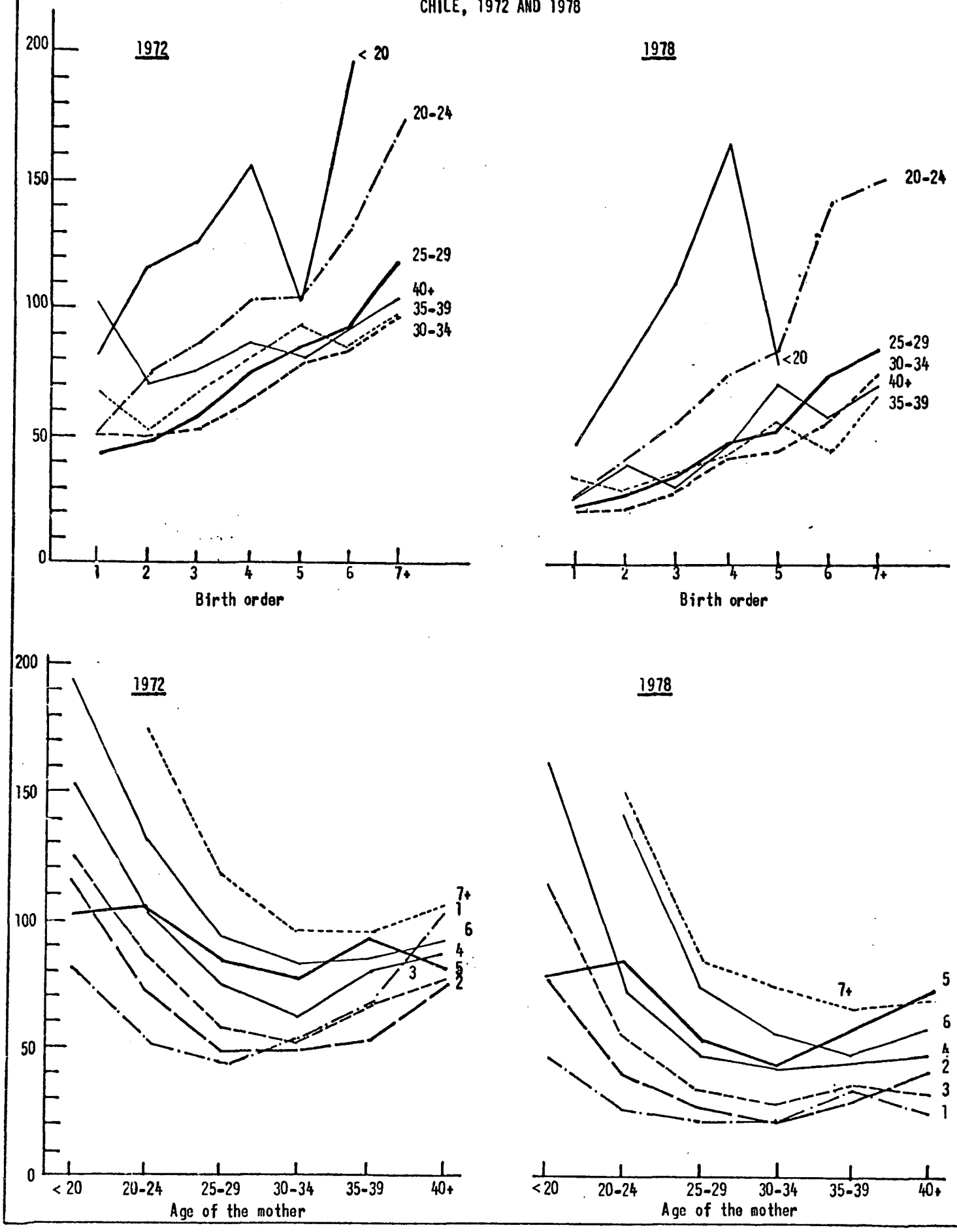


Figure 8
INFANT MORTALITY RATES BY BIRTH ORDER AND BIRTH INTEVAL IN COSTA RICA, MEXICO, PARAGUAY AND PERU

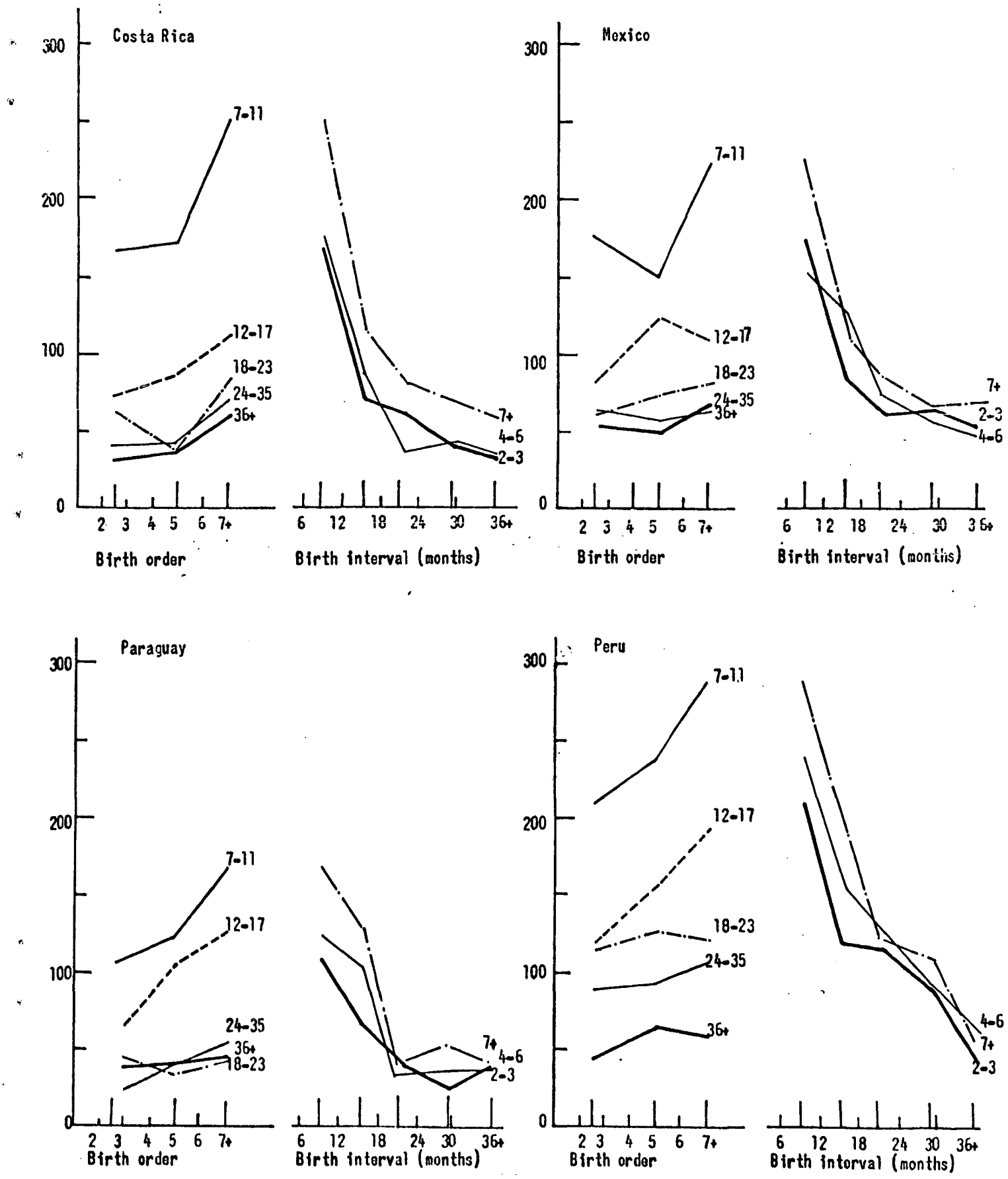
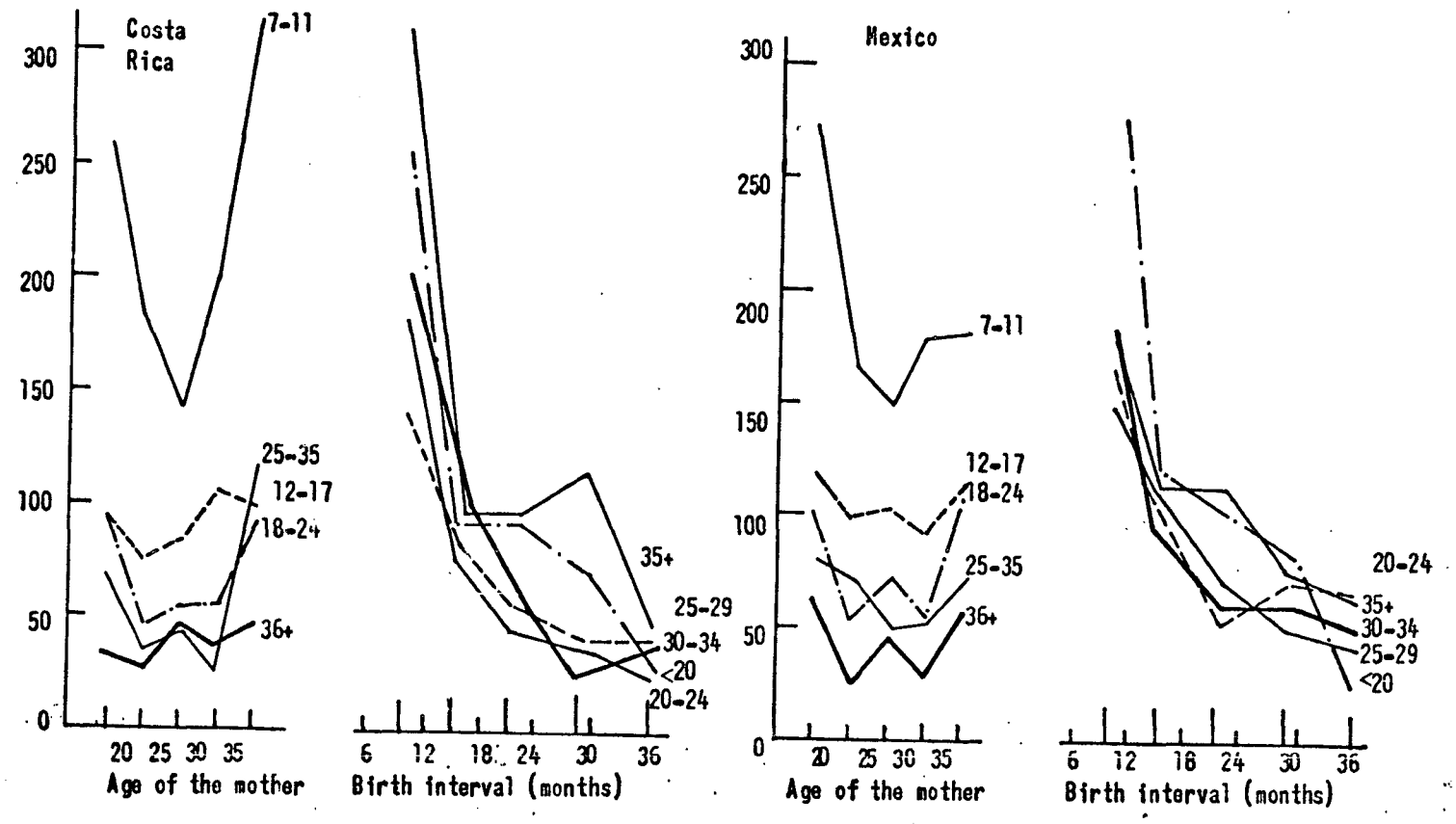


Figure 9

INFANT MORTALITY RATES BY AGE OF THE MOTHER AND. LENGHT OF PREVIOUS BIRTH INTERVAL IN COSTA RICA, MEXICO, PARAGUAY AND PERU



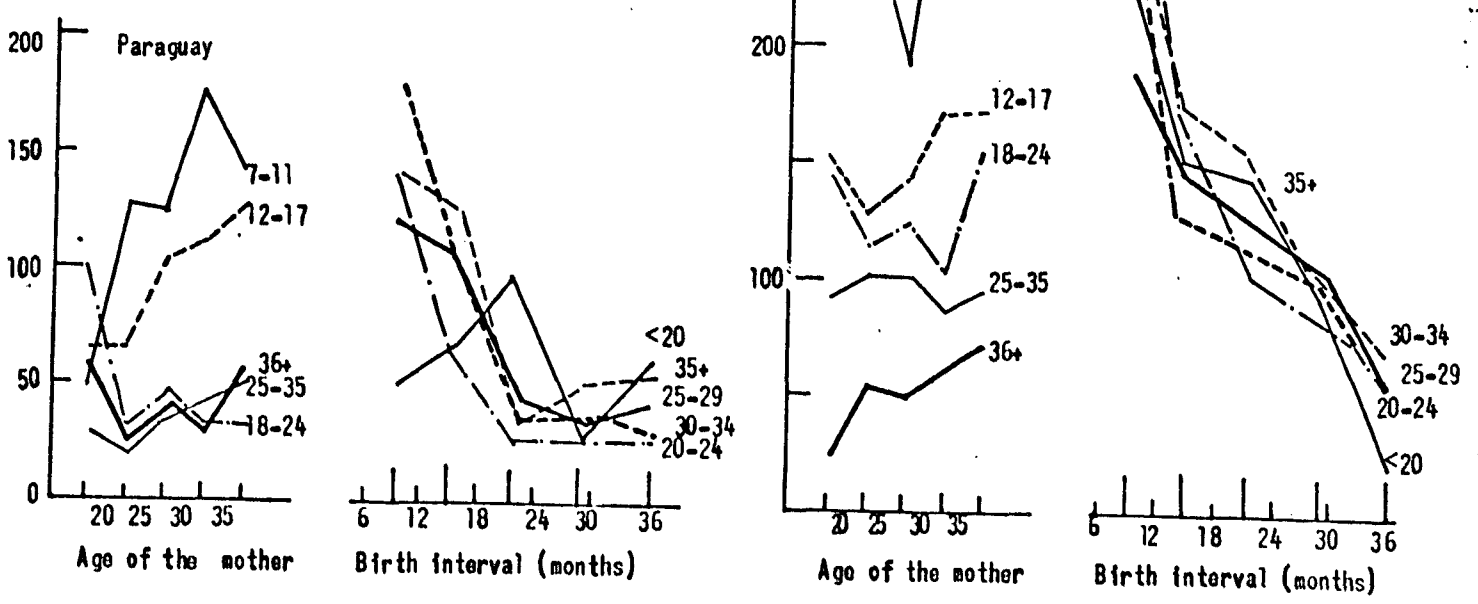
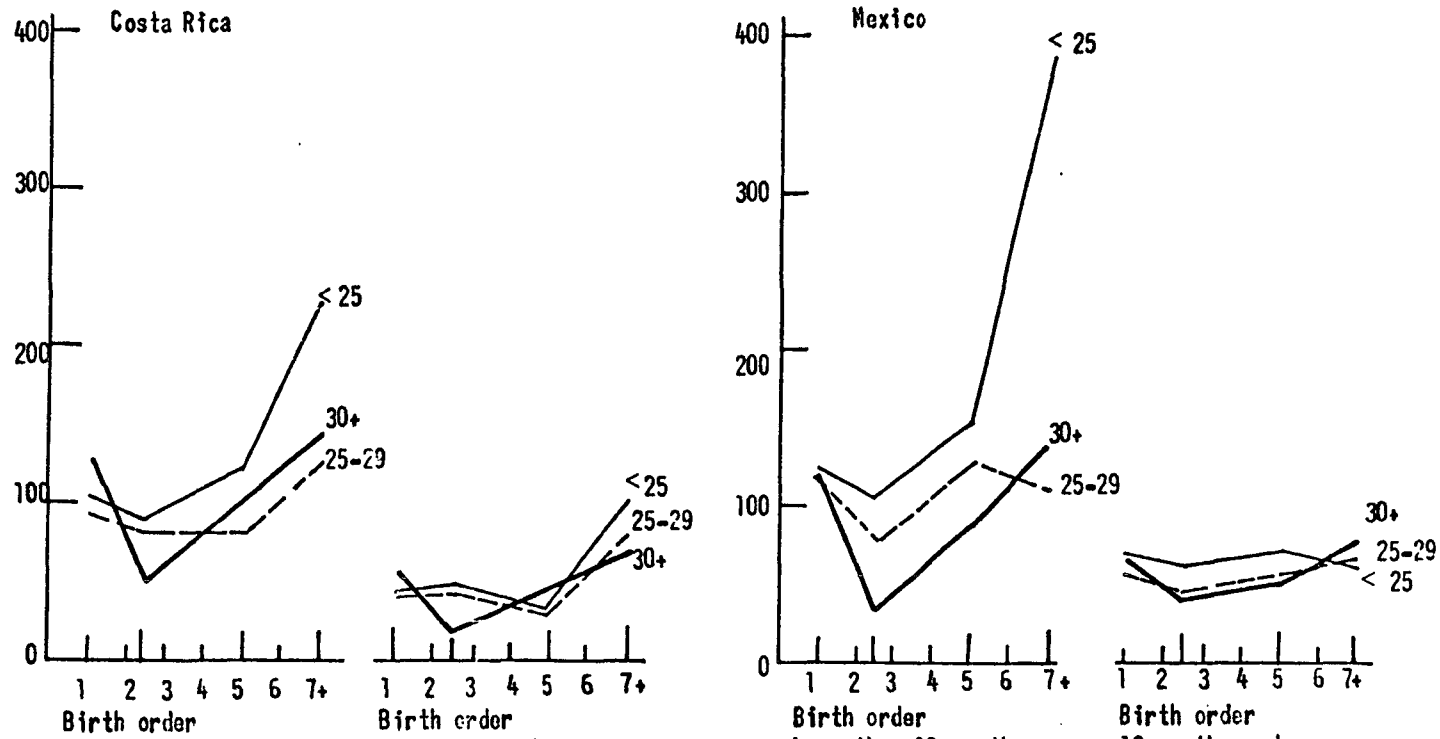


Figure 10

INFANT MORTALITY RATES BY BIRTH ORDER, AGE OF MOTHER AND BIRTH INTERVAL IN COSTA RICA, MEXICO, PARAGUAY AND PERU



2.1.1 Differentials by birth order

With regard to the influence of birth order, the mortality is lowest for order 1 in all countries except Mexico (figure 1). If we analyse what happens with respect to birth order within the different age groups of the mother (figures 6 and 7) it is seen that as the mother's age increases, order 1 birth has a higher mortality rate than that of the following order. In addition, mortality curves of the children of young mothers, in which the increase of the order is strongly associated with an increase in mortality, reach higher levels than those of children of older mothers. Thus, for example, the higher mortality rate of order 1 observed in Mexico is explained because these births largely correspond to mothers under 25 years of age, where the mortality rate of the first child is greater than in the group of 25- to 34-year-old mothers. No importance is attached in this case to the high mortality of the first child in mothers age 35 and over, since out of 4 244 first order births, only 30 occurred in this age group.

The lower mortality rate of order 4 to 6 births than order 2 to 3 in Costa Rica may be interpreted, however, as an effect of the instability of the rates due to the small number of vital events. The same limitation exists for the rates by birth order within the groups of previous birth intervals presented in figure 8 and within the groups by previous birth intervals and mother's age, in figure 10. However, there is a tendency in all these for mortality to increase with the number of birth order.

Tables A 4, A 10 and A 11 of the Annex also show that the behaviour with respect to birth order is maintained within the groups of mother's educational level. This will be analysed in more detail further on, in relation to the exploration of the fulfilment of hypothesis 2.

2.1.2. Differentials by mother's age

In analysing the infant mortality rate according to mother's age, it is found that in all countries the behaviour is very similar. The fact that the mortality of children of mother's age 25 to 29 is greater than that of mother's age 30 to 34 in Paraguay may be attributed to the scarcity of vital events. When we examine figure 6 we see that the U-curve with respect to mother's age, when it is the only classification variable, is the result of different behaviours within each group by birth order. The part of the U-curve corresponding to older ages is higher for order 1 births. However, in order 4 births or more, it is the se

/segment corresponding

segment corresponding to lower ages which is the highest. The lower mortality rate in births of order 2 to 3 in mothers over 35 is a fact which is repeated in 3 of the 4 countries in which the fertility survey was analysed. In 1972 the rates in Chile clearly show the rise in mortality at lower maternal ages as the order of birth increases. In 1978 some irregularities and gaps appear in the curves because of lack of vital data in some subgroups (figure 7).

Within groups according to the length of the previous birth interval, the effect of the mother's age on mortality, as presented in figure 9, becomes difficult to interpret because of the irregularities probably caused by the scarcity of vital events in some groups. There appears to be a general trend towards U-shaped behaviour, which could be interpreted as meaning that the length of the interval would not interfere with the interaction between order and age which was seen in the previous analysis. Nor is there any clear behaviour with respect to maternal age when the rates are calculated within groups classified simultaneously by birth order and birth interval.

All the above may indicate that the mother's age does not have an independent action of its own, but that the mortality level related to a given age depends more on the birth order occurring at that age and on the interval between that birth and the previous one.

The typical U-shaped curve of infant mortality by mother's age is not affected by socioeconomic level, as it remains the same within the groups by level of mother's education and spouse's occupation.

2.1.3. Differentials by length of previous birth interval

The association of infant mortality with the length of the previous birth interval is the strongest of all the relations studied in this paper. The higher mortality rate after a short interval is shown in all groups of birth orders, mother's age or cross-classifications of both, as well as in the different socioeconomic groups. The very high mortality rate observed in births which occur less than one year after the previous one are surely influenced to a large extent by the proportion of premature births and thus low birth weight, a phenomenon which could not be shown from the data utilized.

/2.1.4. Conclusions

2.1.4. Conclusions

In summary, of the three variables for which the infant mortality differentials among their categories presumably are of biological origin, the length of the previous birth interval is the one which produces the greatest differences. Birth order determines a rising trend, both in the totals and in subgroups of births classified by other variables. It is highly correlated with the mother's age, since it may be observed that at older ages children of order 1 are subject to a greater risk of death. The mother's age, however, is not an independently strong factor and shows different behaviours according to the subgroup in which it is studied.

According to the levels of infant mortality observed in subclassifications of births, the most favourable conditions for a child to survive the first year are that it should be of a low birth order, with a mother between 20 and 34 years of age and, for those of birth order 2 or more, with a previous birth interval of 18 months or more. Its probability of survival will increase if it also belongs to a high socioeconomic group, as defined by a mother's education of 4 or more years of schooling or by a high occupational category for the mother's spouse.

In the following point the structure of births with respect to these variables will be analysed.

2.2. Structure of births by country

Of the four countries in which data from the fertility surveys were analysed, the composition of births in Costa Rica and Paraguay, where fertility is lower, should be more favourable to a low infant mortality than in Mexico and Peru, where the fertility rate is higher. It would also be expected that in Chile in 1978, when fertility had experienced a sizeable reduction compared to 1972, the structure of births would be more favourable to low infant mortality.

Before comparing the structure of the four countries in which survey data were analysed, it should be recalled that in Costa Rica the women interviewed were between 20 and 49 years of age at the time of the survey, while in the other three countries the women interviewed were between 15 and 49 years of age. This means that in Costa Rica information is lost on births from women under 20 years old corresponding to the last five-year period previous to the survey, births which probably were of order 1 or very low. The fact has no importance in the study of mortality differentials but should be taken into account in analysing

/birth structures,

birth structures, although because of the small number of births which occur before the age of 20 the bias may be of little importance.

In table A 12 of the Annex and in figure 11 the data are shown which compare the structure of births in Costa Rica, Mexico, Paraguay and Peru, and in table A 13 of the Annex and in figure 12 those corresponding to Chile in 1972 and 1978.

The proportion of first order births and that of births under order 4 is greater in Costa Rica and Paraguay than in Mexico and Peru, coinciding with what was expected. In this case the bias affecting the data of Costa Rica did not distort the effect of the lower fertility rate in this country. The differences between countries with different fertility rates, however, are not as pronounced as those observed in Chile between 1972 and 1978, when the percentage of order 1 births increased from 33.5 to 40.4, and that of order 4 births or higher decreased from 28.5% in 1972 to 18.4% in 1978.

There is very little difference among the four countries in the structure of births according to mother's age, and the differences are not associated with the fertility level, since Costa Rica with low fertility and Mexico with high fertility are the countries with the youngest structure. In Costa Rica the younger age of mothers is even underestimated, because of the different ages of the women interviewed, as was mentioned above. In Chile the slight shift of the age composition towards younger ages is consistent with the expected results.

In respect of the birth interval, it is noteworthy that there is a high proportion of intervals between 12 and 17 months in Costa Rica, which is associated with a higher proportion of intervals of less than 12 months than in other countries. In Paraguay, on the other hand, the structure deviates towards longer intervals than in the other countries. The interpretation of these facts is difficult. On the one hand, it may be thought that in Paraguay, where contraceptives are used relatively little (43.2% are currently using some method or are sterilized,1/ the high proportion of long intervals could be due to the

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1/ ECLA/CELADE: Fertility and Family Planning. Document UN/UNFPA/IV/20 presented at U.N. Working Group on Comparative Analysis of World Fertility Survey Data. Fourth Meeting. 18-21 November 1980.

/Figure 11

Figure 11.

BIRTH STRUCTURE BY BIRTH ORDER, LENGHT OF BIRTH INTERVAL AND EDUCATIONAL LEVEL OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU

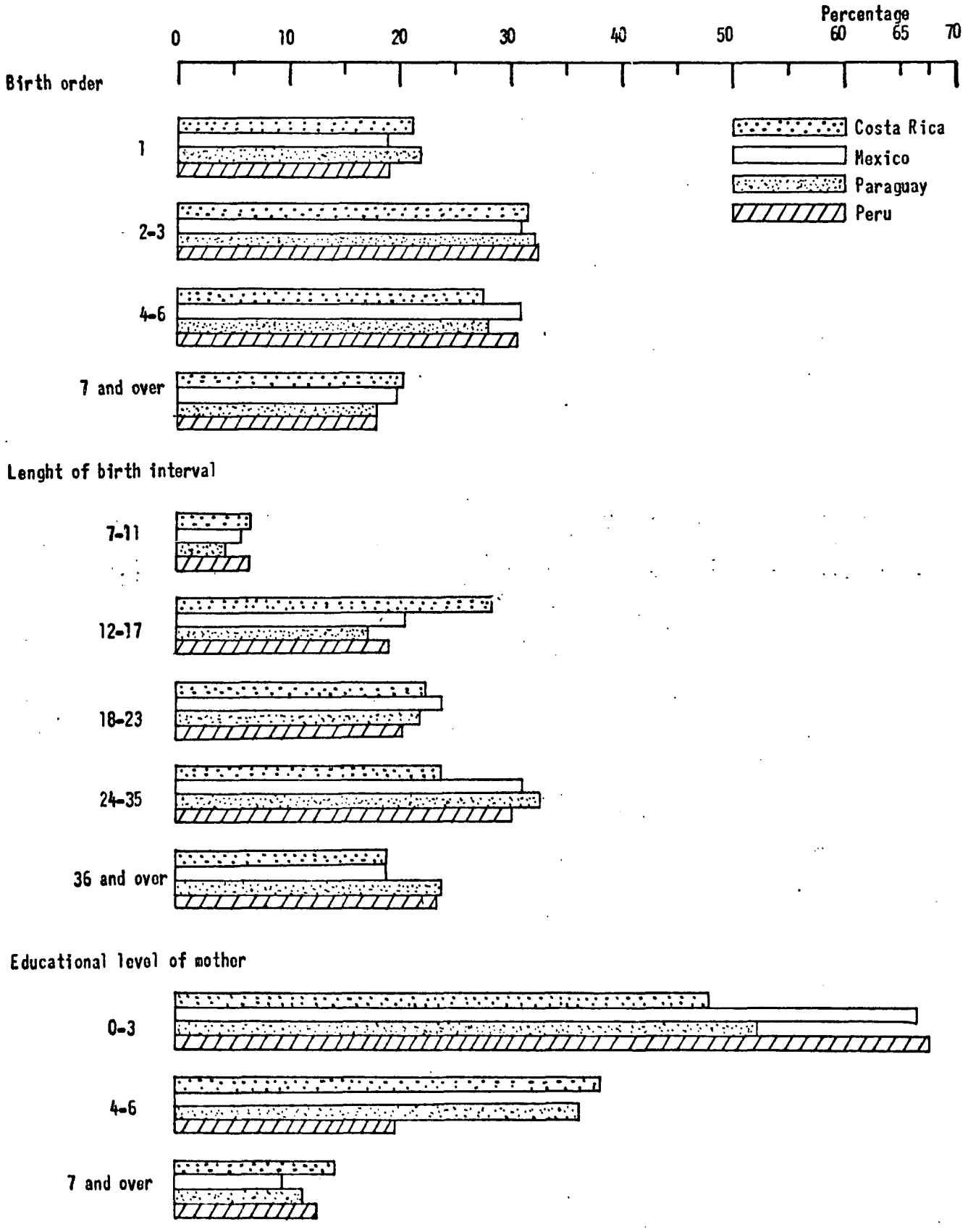
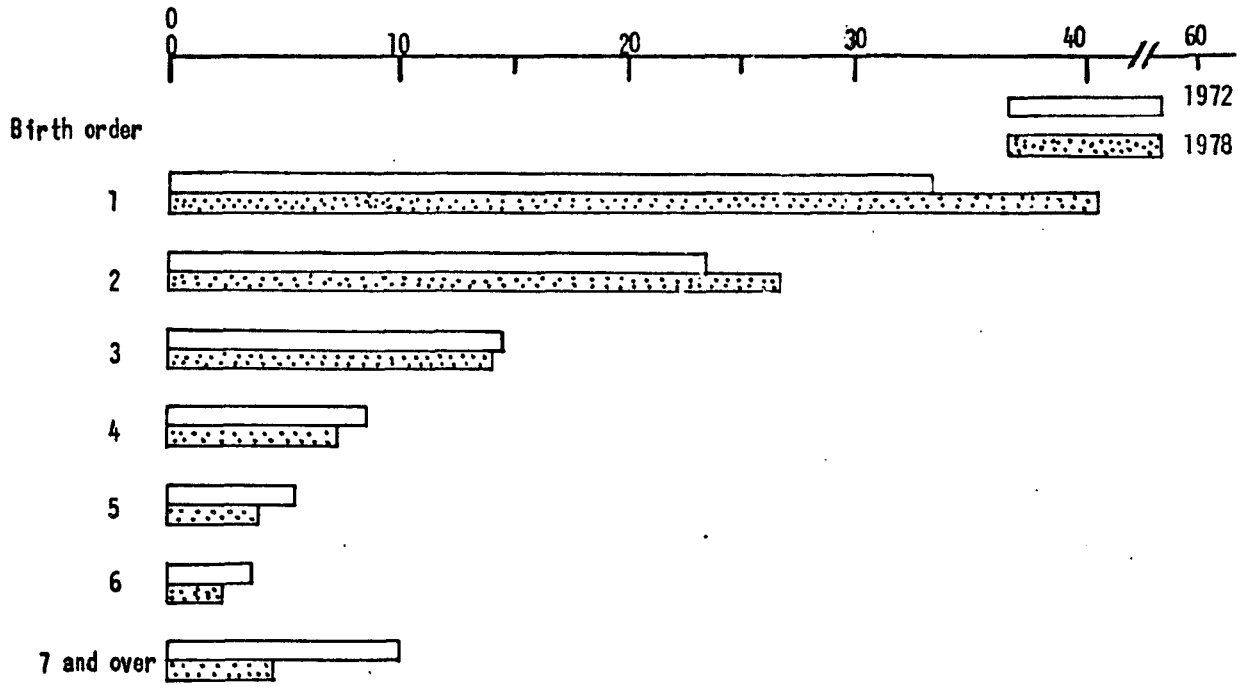
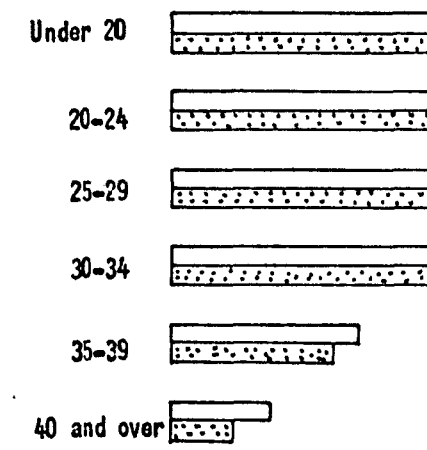
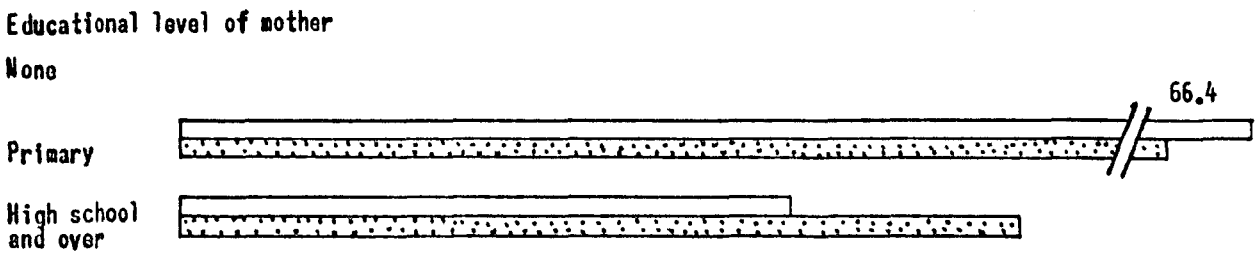


Figure 12

BIRTH STRUCTURE BY BIRTH ORDER, AGE OF THE MOTHER AND EDUCATIONAL LEVEL OF MOTHER, CHILE
1972 AND 1978







more widespread practice of a prolonged nursing period by the mother. In Costa Rica, however, where 70.3% are current users,1/ such a high proportion of short intervals was unexpected. When we examine the detailed cross-tabulations, we see that in Costa Rica the short intervals are specially frequent in young women: 55% of order 2 or higher births in women under age 20 occur within 18 months of the previous birth. For women from 20 to 24, the corresponding percentage is 43.6. In Paraguay, however, the percentages are 37.8 and 24.4 for births where the mother is under 20 and 20 to 24 years of age. It is possible that in Costa Rica these high percentages correspond to births to young mothers in the years when fertility was very high. This supposition cannot be verified by using the tabulations analysed here.

The truly differential factor in the structure of births in the four countries is the mother's level of education. Whereas in Mexico and Peru around 67% of births are to mothers with 0 to 3 years of education, in Paraguay and Costa Rica these percentages are nearly 50%. This difference in the educational level of mothers may be considered of an approximate reflection of what occurs in the population of women with respect to their level of education and could be an explanatory factor both of the greater fertility rate and of the greater infant mortality rate observed in Mexico and Peru.

In Chile, the percentage of births with a secondary or higher level of mothers' education rose from 26.7% in 1972 to 36.5% in 1978. This is probably due to an increase in the level of education of the female population but also to a relatively greater reduction in fertility in the lowest levels of education. In the absence of recent census data, it was impossible to establish the fertility differential according to mothers' level of education.

Defining favourable births from the point of view of the so-called biological determinants, that is, birth order under 4 and maternal ages under 30, it can be seen in table A 12 of the Annex that in births of women with 0 to 3 years of education the percentage of favourable births fluctuates around 40%, while in women with 4 or more years of education it is around 60%. The highest association is observed in Costa Rica, where the respective percentages are 37 and 59.

1/ Ibidem.

/In Chile

In Chile the favourable births defined in the same way constitute 55.8% of those of mothers without education or with primary education and 73.3% of those with secondary or higher in 1972. In 1978 the percentages of favourable births rose to 64.1% in the lowest level of education and to 75.4% in the highest (see table A 13 of the Annex). This is an indication that in Chile there was a relatively more important change in fertility in the group with the lowest educational level.

2.3. Relationship between infant mortality level and structure of births in Costa Rica, Mexico, Paraguay and Peru

The above analyses of the infant mortality differentials and structure of births in the four countries now make it possible to bring together the findings in order to point out the way in which the differences in structure would act on the level of total infant mortality in each country.

In order for the composition of births by a given variable to influence the level of infant mortality two conditions must be fulfilled: the mortality differentials between categories must be clearly perceptible and there should be considerable differences in the composition of births with respect to it.

Of the four variables analysed, a higher birth order is associated with an increase in mortality in all the subgroups, by other variables, in which it is studied. The differences between countries in the composition of births with respect to their order are small but consistent with their level of fertility. Thus, Costa Rica and Paraguay have a somewhat higher proportion of births of low order, which is favourable to a lower mortality rate.

The age of the mother does not appear to determine differentials in mortality in itself, but rather depending on the group in which it acts. However, in the total there are always higher levels of mortality for children of very young or of older women. Therefore the most favourable situation would be a lower proportion of births with mothers under 20, or 35 and over, and a greater percentage of births with mothers between 20 and 34. Such conditions exist at slightly higher levels in Costa Rica and Peru than in Mexico and Paraguay.

The length of the birth interval is the variable which shows the highest correlation with the mortality level, but the structure of births in relation to it is fairly similar among countries, except in Costa Rica where, as mentioned earlier, there is an extraordinary proportion of births preceded by short intervals.

/Finally, the

Finally, the mother's level of education, because it determines very pronounced mortality differentials and because the composition of births with respect to it varies greatly among countries, is the variable, among those studied, which is the best predictor of the infant mortality level expected in each country. In this respect, Costa Rica and Paraguay are clearly in a better position than Mexico and Peru.

As a way of more objectively demonstrating the relationship between the differences in the structure of births among countries and the infant mortality level, standardized rates were referred to. As a standard population the sum of the births in the four countries in each category of the different variables was used. Table 3 shows for each country the rates for the total of births and for births of order 2 and higher, the standardized rate for the common structure according to birth order, mother's age, interval between successive births and mother's level of education. Finally shown are the differences between the observed and standardized rates, which in the case of the interval between successive births referred to births of order 2 or higher. When a negative difference is recorded in a country, this indicates that its structure of births is comparatively favourable compared to the variable under study, and the opposite is true when the difference is positive.

It should be recalled that the size of the differences between observed and standardized rates are influenced not only by the extent of the difference between the structure of births in each country and that of the standard population but also by the size and direction of their mortality differentials. However, since the countries show very similar relationships between infant mortality and the categories of each variable, it can be accepted that the differences observed here show rather the influence of the different structure of births.

It should also be recalled that the stability of the specific rates as influenced by the number of vital events available in each cell of the subclassifications, determines the degree of reliability of the results of the standardization.

/Table 3

Table 3

INFANT MORTALITY RATES OBSERVED AND STANDARDIZED BY STRUCTURE OF BIRTH COMMON TO THE FOUR COUNTRIES a/ WITH RESPECT TO BIRTH ORDER, AGE OF MOTHER, LENGTH OF BIRTH INTERVAL AND EDUCATIONAL LEVEL OF THE MOTHER AND DIFFERENCES BETWEEN OBSERVED AND STANDARDIZED RATES IN COSTA RICA, MEXICO, PARAGUAY AND PERU

	Costa Rica	Mexico	Paraguay	Peru
Denominator		Rates observed		
All births	67.7	78.4	50.9	109.4
Births of order 2 and higher	70.7	78.8	52.9	112.6
Standardized by:		Standardized rates		
Birth order	67.3	78.3	51.3	109.6
Age of mother	68.2	78.1	50.7	109.6
Birth interval	66.5	79.1	56.4	114.1
Educational level	70.8	77.0	51.9	106.5
Standardized by:	Difference between observed and standardized rates			
Birth order	+0.4	+0.1	-0.4	-0.2
Age of mother	-0.5	+0.3	+0.2	-0.2
Birth interval b/	+4.2	-0.3	-3.5	-1.5
Educational level	-3.1	+1.4	-1.0	+2.9

a/ Standard population for standardization by each variable: sum of births in each category of the variable over the four countries.

b/ Difference with rate observed for births of order 2 or higher.

The two variables responsible for the greatest differences are the previous birth interval and the mother's level of education. This coincides with the very pronounced mortality differentials which have been seen with respect to the categories of these variables and also with the difference between the structure of births of the countries, especially in relation to the mother's level of education, since with respect to the birth interval a considerable deviation was observed only in the general structure of Costa Rica.

/Analysing the

Analysing the situation for each country, it may be seen that Paraguay, with the lowest infant mortality rate, is in a comparatively favourable position with respect to all the variables except that of mother's age, which, on the one hand, determines very small differentials and, on the other, brings about a different behaviour in Paraguay from that of the other countries.

It is noteworthy that Costa Rica, which follows Paraguay in infant mortality levels, is in an unfavourable position with regard to the composition by birth order and by length of birth interval with respect to which it is assumed that Costa Rica, because of its low fertility, would have a more favourable composition. The explanation could also be that the births largely corresponded to the high fertility period in Costa Rica. In any case, Costa Rica has an advantageous position in regard to the level of mother's education. The unfavourable composition with respect to the latter, on the contrary, appears to be what is aggravating the situation in Peru, where births have a favourable structure with respect to the other variables, and which would be expected to have a lower infant mortality rate than Mexico, where the structure, on the contrary, is unfavourable in three variables.

In summary, it may then be said that of the four variables analysed only the structure by mother's level of education is consistently related to the infant mortality level in the four countries.

2.4. Contribution of the change in structure of births between 1972 and 1978 to the decline of infant mortality in Chile

Chile is the most appropriate case, among those analysed in this paper, for studying the influence of the changes in the structure of births, due to the decline in fertility, on the level of infant mortality. We have already mentioned the important changes which took place between 1972 and 1978 in the composition of births according to birth order, mother's age and mother's level of education, data which may be examined in table A 13 of the Annex.

Using as a standard population the births in 1978, the infant mortality rate in 1972 was standardized for the three variables under consideration and their combinations. The percentages of the total reduction which are attributable to the effects of the change in structure were then determined,

/considering each

considering each main effect as well as its interactions, following the methodology described in Bocaz, 1976.1/ The results are presented in table 4 for the neonatal, post-neonatal and total infant mortality rates. The table shows that the changes in the composition by level of mother's education contributed most to the decline, followed by the changes in composition by birth order. However, the variations in the structure by mother's age made practically no contribution. As a whole, the main effects and their interactions account for between 25% and 31% of the total decline in rates, which means that the rest are due to decreases which have another explanation, whether because of changes in the structure of births by variables not explored here or because of factors such as health, supplementary food or other programmes which were able to decrease the risk of death in children under one year.

Table 4

CHILE: PERCENTAGE OF DECLINE OF NEONATAL, POST-NEONATAL AND INFANT MORTALITY BETWEEN 1972 AND 1978 ATTRIBUTABLE TO CHANGES IN BIRTH COMPOSITION WITH RESPECT TO BIRTH ORDER (O), AGE OF MOTHER (A) AND EDUCATIONAL LEVEL OF MOTHER (E)

Effects of	Percentage of decline		
	Under 1 month	1-11 months	Under 1 year
O	7.5	10.9	9.7
A	1.0	-0.5	0.0
E	12.6	19.8	17.3
O x A	1.2	-6.1	-3.6
O x E	3.1	6.4	5.3
A x E	1.7	1.0	1.3
O x A x E	4.2	-6.8	-2.9
Total	31.3	24.7	27.1

1/ Bocaz, A., Métodos de Tipificación y de Protección Anual de la Pareja (Aplicación a Chile, 1960-1974), CELADE, Serie A, No. 146, October 1976.

/An examination

An examination of the data in tables A 10 (a) to A 10 (c) and A 11 (a) to A 11 (c) of the Annex shows that, effectively, within each cell of the table there is a decline in infant mortality between 1972 and 1978 for the same categories of birth order, mother's age and mother's level of education, which must be explained by those other factors.

2.5. Conclusions

If the study of the influence of the structure of births related to the level of fertility on infant mortality had been limited to the analysis of the data in the fertility surveys of the four countries, there would have been few arguments to be made on the subject. Although the standardization of rates made it possible to see the direction of their change under the influence of a common structure, the standardized rates were maintained within a range typical for each country. In other words, the differences in mortality among countries could not be explained merely by differences in the structure of births with respect to the variables explored here. However, due to the sizeable mortality differentials observed within each country with respect to the four variables considered, it may be inferred that a change in the structure of births within each country associated with a decline in fertility would most probably have favourable effects on total infant mortality in all countries, as long as the changes with respect to composition by mother's education were to diminish the proportion of low level births.

The case is seen most clearly in Chile, where the changes in the composition of births associated with the decline in fertility between 1972 and 1978 can be estimated as responsible for 31% of the decline in neonatal mortality and 25% of that of post-neonatal mortality, which means that 27% of the reduction in infant mortality is attributable to structural changes. Of these, the most important are those which occur with respect to the mother's level of education and to birth order.

/3. Nature

3. Nature of the differentials in respect of birth order, age of the mother and length of birth interval

Under the second working hypothesis, it is assumed that the infant mortality differentials that occur with respect to different categories of birth order, age of the mother and length of previous birth interval are predominantly biological in nature. If this is true, those differentials should be more evident when infant mortality is low, as the distorting effect of socioeconomic factors that might adversely affect births in any category of the variables is not so great. Therefore, the magnitude of the differentials when mortality is high and when it is low will be studied first.

In addition, if the hypothesis is true, the differentials should be more pronounced in cases of neonatal mortality, when the causes of death are primarily endogenous, than in cases of post-neonatal mortality, when the causes are primarily exogenous.

In a study of mortality by causes, there should also be a relationship between the magnitude of the differentials and endogenous or exogenous nature of the causes.

One of the arguments used to refute the hypothesis that the differentials in question are biological is that in those groups having higher mortality rates there would be a higher proportion of births in the lower socioeconomic strata. That would explain the higher mortality in respect of high birth order, extreme maternal age or short birth intervals. In order to investigate the validity of this argument, an analysis will be made of the composition of births by socioeconomic level and their influence on the differentials with respect to the different variables. Also, a comparison will be made between what happens with the differentials in large and small completed families and the characteristics of the mothers in each type of family will also be studied.

Finally, a multivariate analysis will be made to determine the influence of each variable on the infant mortality level.

3.1 Infant mortality differentials in situations of high and low mortality: between countries, between two points in time, between socioeconomic groups

The mortality differentials in respect of birth order and age of the mother for Costa Rica, Mexico, Paraguay and Peru, and for Chile in 1972 and 1978, may be seen in figures 1 and 2. It will be noted that the form of the relationship

/between infant

between infant mortality level and the categories of these variables is similar in situations of high and low mortality, but it is difficult to ascertain whether the magnitude of the differentials increases as the infant mortality level decreases. The same may be said with regard to the birth interval differentials shown for the first four countries in figure 3.

In analysing different alternatives for expressing the magnitude of the differentials in a quantitative, summarized and relative manner, it was decided to use the coefficient of variation, i.e., the ratio between the standard deviation and the simple average of the specific rates in the categories of each variable. The most important limitations of this measure in the present case are that there are only a small number of rates within each variable and that it does not show the form of the relationship. Nevertheless, as a measure of relative variability, it does allow for an approximate quantification of the magnitude of the differentials. The values obtained are shown in table 5.

Table 5

COEFFICIENTS OF VARIATION OF RATES SPECIFIC FOR CATEGORIES OF BIRTH ORDER, AGE OF THE MOTHER, BIRTH INTERVAL, EDUCATIONAL LEVEL OF MOTHER AND OCCUPATION OF HUSBAND AND OVERALL INFANT MORTALITY RATES IN COSTA RICA, MEXICO, PARAGUAY, PERU AND CHILE

Variables	Costa Rica	Mexico	Paraguay	Peru	Chile 1972	Chile 1978
	Coefficients of variation					
Birth order a/	0.277	0.092	0.228	0.162	0.177	0.277
Age of mother b/	0.230	0.164	0.142	0.077	0.181	0.224
Birth interval c/	0.728	0.541	0.605	0.524	-	-
Education d/	0.412	0.327	0.282	0.552	0.611	0.639
Occupation e/	0.275	0.181	0.163	0.337	-	-
	Infant mortality rates					
	67.7	78.4	50.9	109.4	74.6	40.9

	Categories in survey data	Categories in Chile
a/	1, 2-3, 4-6, 7 and above	1, 2, 3, 4, 5, 6, 7 and above
b/	Under 20, 20-24, 25-29, 30-34, 35 and over	Under 20, 20-24, 25-29, 30-34, 35-40, 40 and over
c/	7-11, 12-17, 18-23, 24-35, 36 months and over	
d/	0-3, 4-6, 7 and more years of schooling	None, primary, secondary and higher
e/	Modern and transitional, mixed, traditional	

/A comparison

A comparison of the coefficients of variation for the different variables in Paraguay and Peru, the countries with the lowest and highest mortality of the four for which survey data were analysed, shows that they are higher for Paraguay than for Peru as regards birth order, age of the mother and birth interval. This is to be expected, according to hypothesis No. 2, since the differentials of biological nature should be more pronounced when mortality is low. Also, the coefficients of variation for educational level of the mother and occupation of the husband are higher in the country having higher infant mortality.

A comparison between Peru and Costa Rica, the other country with a low infant mortality rate, would have led to similar conclusions. The association between the magnitude of the differentials and the mortality levels becomes complicated, however, when the four countries are compared, because there is no regular relationship between the increase in the magnitude of the coefficients of variation and the infant mortality level.

In Chile, the decline in infant mortality between 1972 and 1978 coincides with a rise in the magnitude of the differentials in respect of birth order and age of the mother, but at the same time there is also an increase in the differentials with regard to educational level of the mother. This is not the direction followed by this differential in the four countries studied above.

If the differentials in respect of birth order, age of the mother and birth interval are biological in nature, they should also be greater at the higher socioeconomic level, where infant mortality rates are lower and the effect of biological factors is more likely to be evident. Moreover, the mere fact that the differentials are maintained within socioeconomic groups supports the hypothesis that they are biological in nature.

Table A 14 in the Annex shows the coefficients of variation for the specific rates of each variable within the categories of educational level of the mother. The coefficients tend to increase as educational level rises, although this is not always the case, probably because the rates used to calculate the coefficient of variation are unstable because of the small number of vital events in some cells. In Chile, the greater magnitude of the birth order and maternal age differentials in the category of secondary and higher education is very pronounced and provides further support for hypothesis 2.

/Another method

Another method used to research whether the birth order and maternal age differentials were primarily biological in nature, was to calculate specific infant mortality rates for favourable and unfavourable groups of these variables and establish the ratio between the unfavourable and favourable rates in countries having high and low mortality and within groups where mother's educational level was high and low. "Favourable" was defined in the same way as for the analysis of structure, i.e., a birth order of 4 or under and a maternal age of under 30; "unfavourable" was defined as a birth order of 4 or over and a maternal age of 30 or over.

Table A 15 shows that the ratios between rates of unfavourable and favourable births are greater for the two countries having lower infant mortality rates: Costa Rica and Paraguay. Within each country, they are also greater among mothers with an educational level of 4 years or more than among those having an educational level of from 0 to 3 years of schooling.

In table A 16, which shows the aforementioned ratio for neonatal, post-neonatal and total infant mortality in Chile in 1972 and 1978, it will be seen that the ratio is greater for neonatal mortality than for post-neonatal mortality at both educational levels and for the two years considered. Moreover, the ratios are higher in 1978, when mortality is lower.

It follows from the above that the behaviour of the ratios analysed is that which is to be expected of biological determinants: relative differences are greater when mortality is lower.

With respect to the relationship between infant mortality and birth order, which is more or less linear, other measures for quantifying the intensity of the relationship were also used. The coefficients of linear regression, the ratio between these and the average rate, the coefficients of correlation and the square of these, were calculated for each of the four countries and for Chile in 1972 and 1978, with respect to total infant mortality and its components and for these within categories of mother's educational level. The results are shown in table A 17 of the Annex. The relationship between the magnitude of the slope and the average of the rates is consistently higher in countries having lower mortality and vice versa. The value of r^2, on the other hand, shows no relation with mortality level. The data for Chile show that in both neonatal and post-neonatal mortality, the decline of mortality that is observed as educational level rises

/is accompanied

is accompanied by sharper slopes and correlations; this supports the hypothesis that birth order differentials are of biological origin.

3.2 Differentials for neonatal and post-neonatal mortality

It is an accepted fact that the causes of death during the first month of life are predominantly biological or endogenous.1/ This expression is used to differentiate them from the exogenous 1/ causes that are predominant between the ages of one and 11 months, which are linked with unfavourable environmental, nutritional and other factors. Obviously, when socioeconomic conditions are negative, there may also be a high proportion of exogenous deaths during the first month.

Thus, it is to be expected that the mortality differentials for variables such as birth order and age of the mother, which are presumed to be biological in nature, should be more clearly evident in cases of neonatal mortality, unless the environment is one of conditioning high mortality.

In this paper, infant mortality was analysed with respect to the neonatal and post-neonatal components in Chile only, since there were enough cases in that country that the subdivision did not present a problem. The birth order and maternal age differentials are shown in figure 13 and the corresponding coefficients of variation in table 6.

Table 6

CHILE: COEFFICIENTS OF VARIATION (C.V.) OF NEONATAL AND POST-NEONATAL MORTALITY RATES SPECIFIC BY BIRTH ORDER AND BY AGE OF MOTHER AND REGRESSION COEFFICIENTS (b) AND COEFFICIENTS OF DETERMINATION (r^2) FOR BIRTH ORDER-SPECIFIC RATES. 1972 AND 1978

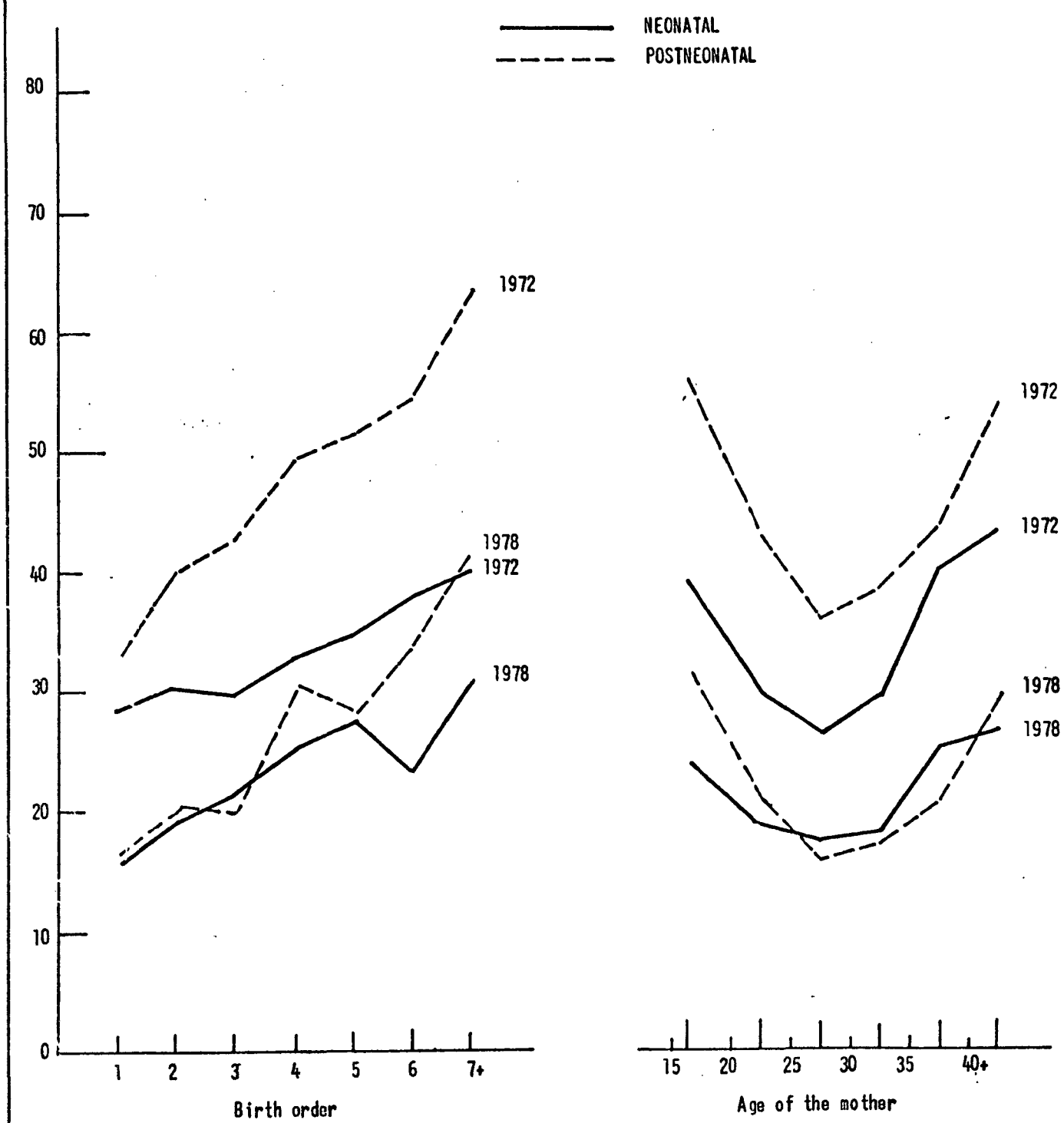
	Neonatal		Post-neonatal	
	1972	1978	1972	1978
Birth order				
C.V.	0.1288	0.2325	0.2130	0.3259
b_2	1.56	2.00	3.76	3.21
r^2	0.93	0.88	0.96	0.93
Age of mother				
C.V.	0.1977	0.1840	0.1833	0.2877

1/ The terms used by Bourgeois-Pichat, J. "La mesure de la mortalité infantile II. Les causes de décès", Population, 6e année, numéro 3, July, September, 1951.

/Figure 13

Figure 13

NEONATAL AND POSTNEONATAL MORTALITY DIFFERENTIALS BY BIRTH ORDER AND AGE OF THE MOTHER IN CHILE, 1972 AND 1978



Contrary to what might be expected, the latter are greater with respect to post-neonatal mortality. The regressions and correlations are also the opposite of what would be expected.

Next we shall study whether the causes of death at one or another age and their relationship with birth order and age of the mother might explain this anomalous behaviour under the assumptions made in hypothesis 2.

3.3 Mortality by causes as related to birth order, age of the mother and educational level of the mother

The best way to discover the nature of the mortality differentials for birth order and age of the mother should be by analysing mortality by causes in different categories of these variables. According to hypothesis 2, it would be expected that the greater risk of death in certain groups would be explained by a high rate of deaths from endogenous or biological causes.

The first problem that arises in this respect is to define adequately what is understood to be an endogenous cause, which is presumably linked to biological deficiencies and not to external factors of a socioeconomic nature. Because of the complexity of the process that leads to death, it is very difficult to find causes of such a nature as to be classified as purely endogenous or purely exogenous Thus, for example, the congenital anomalies that appear to be the prototype of endogenous causes might be due to genetic mutations or disturbances in the development of the embryo caused by drugs, radioactivity or infection, all of which are essentially exogenous factors. At the same time, diarrheas that are attributable mainly to poor sanitation and hygiene, and are thus exogenous, will usually lead to death only in the case of children who are biologically deteriorated or weakened by malnutrition or repeated infections. The same might be said of respiratory or infectious diseases. In all of these, access to timely and efficient medical care is also important. Because of the above, there is a limit to how much can be explained by analysing the causes of death with respect to the nature of the differentials. Nevertheless, it would be interesting to observe whether there are differences between the differentials for different causes and to try to interpret the findings.

/3.3.1 Data

3.3.1 Data used and classification criteria

The data used are for Chile in 1972 and 1978. Between those two years, the proportion of deaths certified by a physician rose from 69% to 86%, which suggests that there was an improvement in the quality of information regarding causes of death which cannot be quantified. It was decided to analyse the total number of deaths rather than only those that were certified by a physician, since it was felt that the structure by causes of the latter was probably different from that of the deaths attested to by witnesses, not only because of the quality of the information but also because of other factors relating to access to medical certification.1/

Following the classical division of infant mortality into neonatal and post-neonatal, the categories of causes common to both, were as follows (the codes appearing in the OMS International Classification of Diseases, 8th edition, 1965 revision, are noted in parentheses): diarrhea (001 to 009), septicemia (038), respiratory diseases (460 to 519), congenital anomalies (740 to 759) and ill-defined causes (778 to 796). As regards neonatal mortality, three other groups of diseases peculiar to the newborn were added to the above: injury at birth (772), anoxia and hypoxia (776), both directly related to birth, and immaturity (777), which although sometimes causing death at a later stage occurs mostly during the first month of life. As regards post-neonatal mortality, the following two groups were added: malnutrition (260 to 269) and accidents (800 to 999), these causes being very infrequent during the first month.

The groups comprising diarrheas, respiratory diseases, congenital anomalies, malnutrition and accidents involve causes of death having etiological factors and prevention or treatment possibilities that are common to the diseases within individual groups but which vary from one group to another. Septicemia, injury at birth, anoxia or hypoxia and immaturity are frequent causes, the etiology and prevention and treatment possibilities of which are specific, and they were therefore considered separately.

1/ Taucher, E. Chile: "Mortalidad desde 1955 a 1975. Tendencias y Causas". CELADE, SER.A, No. 162, September 1978.

/3.3.2 Changes

3.3.2 Changes in mortality by causes in Chile between 1972 and 1978

Before analysing the behaviour of mortality by different causes in relation with birth order and age of the mother, we will discuss the changes in mortality by causes between 1972 and 1978. Table 7 shows the mortality levels and the changes between the two years, as well as the number of deaths avoided in each group of causes.

In both absolute and relative terms, post-neonatal mortality was reduced more than neonatal mortality. Thus, 4 764 deaths were avoided in 1978 because of the decline in post-neonatal mortality, compared with 2 574 deaths avoided because of the reduction of neonatal mortality, assuming that 1972 rates had prevailed among 1978 births.

Of the different groups of causes, the sharpest drop in neonatal mortality occurred with respect to respiratory diseases, followed by immaturity and injury at birth. As regards post-neonatal mortality, 51% of the reduction in total mortality may be attributed to the decline in mortality caused by respiratory diseases and 26% to the decline in mortality caused by diarrheas. A slight increase in mortality caused by congenital anomalies was noted in both neonatal and post-neonatal mortality. This could be due inter alia to improved certification of the cause of death. It also provides an argument for assuming that the drop in infant mortality noted between 1972 and 1978 was not due to a deterioration of the integrity of death statistics, since if that were the case there would also have been a reduction in the rates of deaths from unavoidable causes, given the current status of scientific knowledge, such as congenital diseases.

Because of the different degrees to which mortality was reduced in the different groups of causes, the relative importance among necnatal deaths of those caused by anoxia and hypoxia increased as a result of the decline in the proportion of deaths caused by respiratory disease. Nevertheless, since both causes involve the respiratory system, one cannot exclude the possibility that the criteria used for classifying causes might have changed from one year to another.

/Table 7

Table 7

CHILE: NEONATAL AND POST-NEONATAL MORTALITY RATES BY CAUSE OF DEATH IN 1972 AND 1978, ABSOLUTE AND RELATIVE REDUCTION OF RATES BETWEEN 1972 AND 1978 AND DEATHS AVOIDED IN 1978 ASSUMING PREVALENCE OF 1972 RATES AMONG 1978 BIRTHS

Causes of death	Rates a/		Reduction of rates		Deaths avoided	
	1972	1978	Absolute	Relative b/	No.	%
			Neonatal			
Diarrheas (001-009)	186.6	50.8	135.8	72.8	297	11.5
Septicemia (038)	238.2	118.9	119.3	50.1	261	10.1
Respiratory diseases (460-519)	560.3	162.0	398.3	71.1	871	33.8
Congenital anomalies (740-759)	171.0	201.8	-30.8	-18.0	-67	-2.6
Injury at birth (772)	286.6	121.2	165.4	57.7	362	14.1
Anoxia and hypoxia (776)	766.1	729.7	36.4	4.8	80	3.1
Immaturity (777)	299.1	100.2	198.9	66.5	435	16.9
Ill-defined (778-796)	411.2	338.5	72.7	17.7	159	6.2
Others	250.3	168.8	81.5	32.6	178	6.9
Total	3 169.4	1 991.9	1 177.5	37.2	2 574	100.0
			Post-neonatal			
Diarrheas (001-009)	879.7	311.1	568.6	64.6	1 243	26.1
Septicemia (038)	133.9	119.4	14.5	10.8	32	0.7
Malnutrition (260-269)	212.0	124.9	87.1	41.1	190	4.0
Respiratory diseases (460-519)	1 695.1	572.3	1 122.8	66.2	2 454	51.4
Congenital anomalies (740-759)	144.5	172.9	-28.4	-19.7	-62	-1.3
Accidents (800-999)	123.8	111.2	12.6	10.2	28	0.6
Ill-defined (778-796)	553.3	405.8	147.5	26.7	322	6.8
Others	538.9	284.1	254.8	47.3	557	11.7
Total	4 281.2	2 101.7	2 179.5	50.9	4 764	100.0

a/ Rates per 100 000 live births.
b/ Percentage of absolute reduction with respect to 1972 rates.

/As regards

As regards post-neonatal mortality, despite the fact there was a tremendous reduction in mortality caused by respiratory disease and diarrhea, these diseases still occupied first and second place in 1978; nevertheless, the two causes together accounted for only 42% of the deaths in that year as compared with 60% in 1972. The decline in the relative importance of these two groups of causes was offset by very even increases in the weight of the remaining groups.

As regards the central problem dealt with in this paper, neonatal and post-neonatal mortality rates were calculated by cause and by birth order and by age of the mother. The cause and birth order-specific rates were also obtained for two groups of educational level of the mother. These data are shown in tables A 18 to A 23 of the Annex and in figures 14 and 15.

3.3.3 Mortality by cause and birth order according to educational level of the mother in 1972 and 1978

Two facts stand out in figure 14. First, mortality dropped in almost all groups of causes between 1972 and 1978, and second, the increase of mortality with birth order that had been noted with regard to neonatal and post-neonatal mortality persists within groups of causes in both years analysed.

A more detailed study of the behaviour of neonatal mortality shows that, of all causes, only congenital anomalies increased between 1972 and 1978. Moreover, whereas in 1978 neonatal mortality rose with birth order in all groups of causes, in 1972, mortality caused by septicemia and injury at birth departed from that pattern and mortality caused by respiratory disease is slightly higher in first births than in second and third births. It is also interesting to note that there is very little relationship between mortality caused by congenital disease and birth order; because of the nature of the cause, it had been expected that this relationship would be closer.

Except in the case of accidental deaths, there is a close association between post-neonatal mortality and birth order in all groups of causes, both in 1972 and in 1978.

Tables A 20 and A 21 in the Annex show that, in both years studied neonatal mortality in the different groups of causes is most closely associated with birth order in the groups where the mother has a higher level of education. In the case of diarrhea, septicemia and respiratory disease, mortality tends to be lower

/when the

when the mother has a high educational level than when the mother has a low educational level. The opposite is true in the case of congenital anomalies; this may be explained by the fact that diagnoses of cause of death are more accurate at the higher social level because this group has better access to medical care and certification and hence it does not necessarily mean that mortality caused by congenital anomalies is really higher.

Mortality from birth-related causes, such as injury at birth and anoxia and hypoxia, is lower among children of mothers having a higher educational level in the case of first children, while in the case of birth orders of four or more, it is much higher than among children of mothers having a lower educational level. This phenomenon occurs in both years studied and is difficult to explain, especially for deaths caused by anoxia and hypoxia, the estimates for which are based on a sufficient number of cases to provide stability.

With regard to post-neonatal mortality, except in the case of deaths caused by accidents and violence, the level increases with birth order for all groups of causes and at both educational levels of the mother.

3.3.4 Mortality by cause and by age of the mother in 1972 and 1978

As shown in tables A 22 and A 23 in the Annex and in figure 15, for both neonatal and post-neonatal mortality in both years, the mortality rates in almost all groups of causes follow the typical U-curve, with figures being high for children of very young mothers, lower for children of women between 20 and 30 years of age and high again for children of older women. Only mortality caused by septicemia and by accidents is not related to maternal age. Mortality caused by congenital anomalies increases with maternal age and death caused by immaturity is greater among children of young mothers. Both data reflect the greater risk of older women giving birth to children with congenital deficiencies or of younger women giving birth to underweight babies.1/2/

1/ Mütter-und Säuglingssterblichkeit. Band 67, Schriftenreihe des Bundesministers für Jugend, Familie und Gesundheit, December 1978.

2/ Puffer R. Ruth, Serrano, C., El peso al nacer, la edad materna y el orden de nacimiento: Tres importantes determinantes de la mortalidad infantil, OPS/OMS, 1975.

/Figure 14

Figure 14

CHILE: CAUSE-SPECIFIC NEONATAL AND POSTNEONATAL MORTALITY RATES BY BIRTH ORDER, 1972 AND 1978

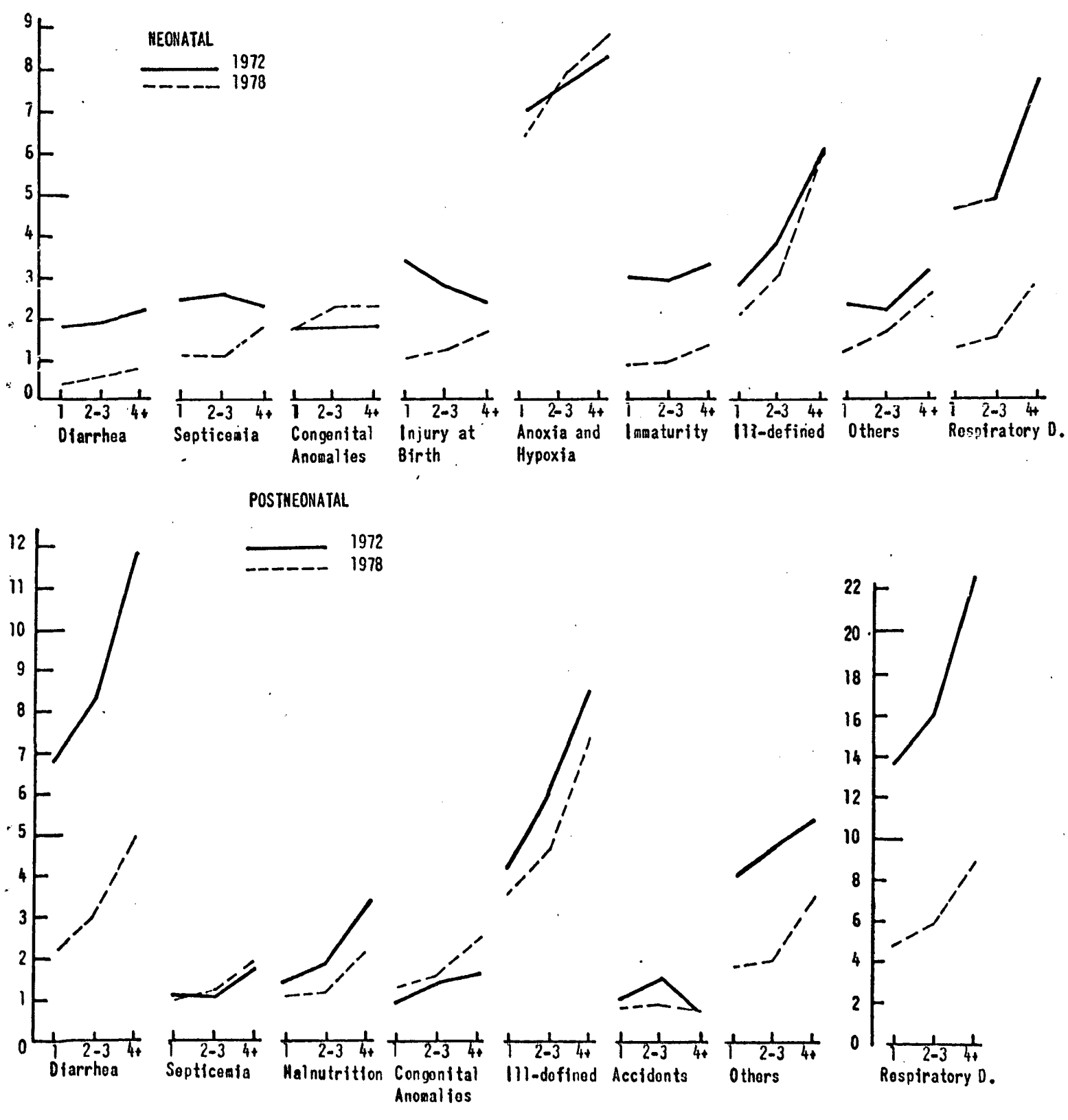
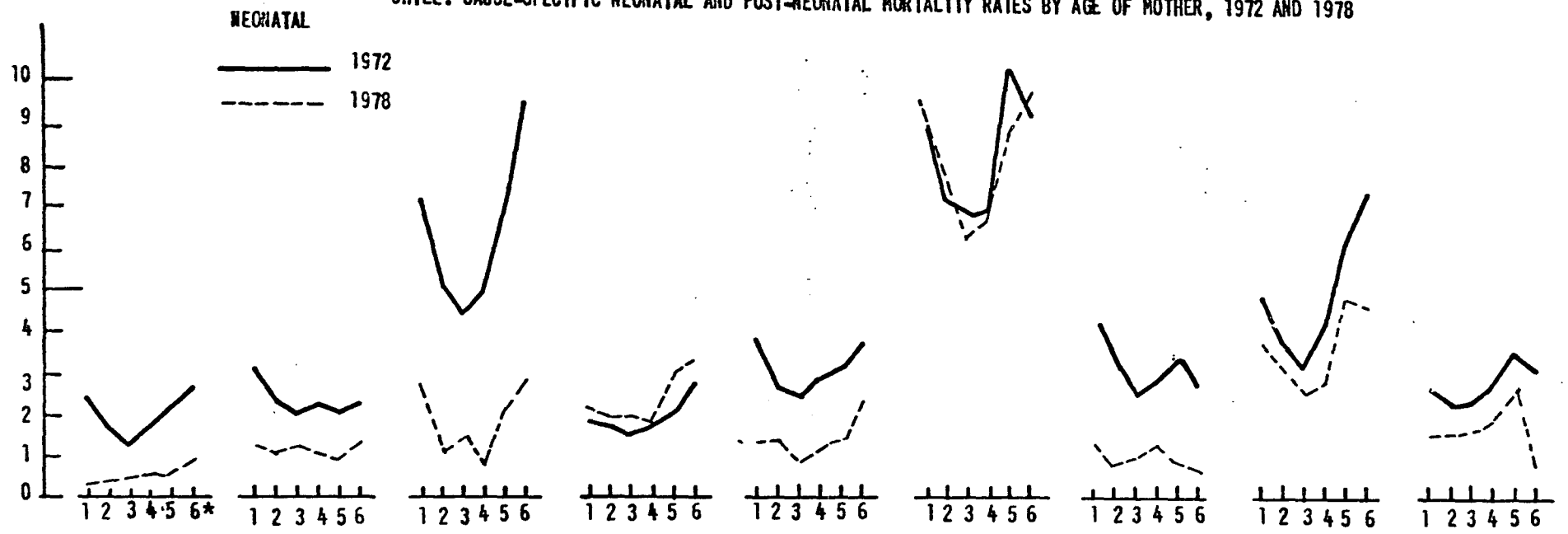


Figure 15

CHILE: CAUSE-SPECIFIC NEONATAL AND POST-NEONATAL MORTALITY RATES BY AGE OF MOTHER, 1972 AND 1978



* 1 = /20, 2 = 20-24, 3 = 25-29, 4 = 30-34, 5 = 35-39, 6 = 40 and over (age).

3.3.5 Conclusions

In brief, neither the variations in mortality by birth order nor those which occur in relation with age of the mother may be attributed to the behaviour of mortality from any particular cause. Mortality in each group of causes follows behaviour patterns that are very similar to those of total mortality; this in turn means that the composition by cause of the groups classified according to birth order or age of the mother is similar. It would thus appear that rather than there being an excess of deaths from endogenous causes in the groups having higher mortality, what happens is that vulnerability to death from any cause increases with birth order and when the mother belongs to an age group at either extreme.

3.4 Relationship between mortality differentials in respect of birth order, age of the mother and length of birth interval, and socioeconomic factors

The theory postulated in hypothesis 2, that the differentials in respect of birth order, age of the mother and birth interval are biological in nature is the opposite of another possible explanation, according to which the differences in mortality observed in the different categories of those variables are due to a concentration of births under substandard socioeconomic conditions among the high mortality groups.

The first way to find out which of the above assumptions is more credible is to control the socioeconomic levels and analyse what happens with those differentials in groups that are homogeneous in this respect. Another approach is to analyse the composition by socioeconomic level of births in the different categories of presumably biological variables and to study whether the differentials may be attributed to differences in that structure.

3.4.1 Mortality differentials of presumably biological nature within socioeconomic categories

If the differentials in respect of birth order, age of the mother and birth interval are mainly of biological origin, it is to be expected that they will remain constant when the socioeconomic variable is controlled. On the other hand, if they are determined mainly by differences in the socioeconomic structure, it is to be expected that within each social group, there will be no differentials for those variables, but that there will be substantial differences in the mortality levels of different social groups so that if, for example, most children

/in the

in the higher birth orders were born under substandard conditions, that would explain the higher mortality among them.

The indicator of socioeconomic level used here is the educational level of the mother.

Figures 16 to 18, which are based on tables A 4 to A 6, in the Annex show that the mortality differentials with respect to birth order, age of the mother and birth interval are maintained within the groups classified according to the educational level of the mother. This finding supports the hypothesis that those differentials are biological in nature. The data on Chile presented in figure 19 lead to the same conclusion.

Obviously, educational level of the mother is only an indicator of socioeconomic level and its use in establishing categories does not necessarily mean that all the external factors that might influence the magnitude of the differentials are being controlled. Nevertheless, educational level of the mother has been shown to be so closely associated with infant mortality levels, as well as with fertility levels and behavioural variables that the findings for its subdivisions are important.

3.4.2 Influence of the socioeconomic structure of births on mortality differentials presumably of biological nature

One of the arguments used in questioning the hypothesis of the biological origin of infant mortality differentials in respect of birth order, age of the mother and length of birth interval is that births in high-mortality groups, i.e., those having high birth orders, very young or older mothers, and short birth intervals, are more frequent when fertility is high, which in turn occurs at the lower socioeconomic levels. This would lead to the assumption that in the aforementioned categories, most of the births would take place among the socially disadvantaged groups rather than among those having lower mortality rates. This difference in the structure of births would in the final analysis explain the mortality differentials.

To investigate this assumption the percentage of births of mothers having a low level of education was calculated in each category of birth order, age of the mother and birth interval. In Costa Rica, Mexico, Paraguay and Peru, a low educational level was defined as referring to 0 to 3 years of schooling;

/Figure 16

Figure 16

INFANT MORTALITY BY BIRTH ORDER WITHIN CATEGORIES OF EDUCATIONAL LEVEL OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU

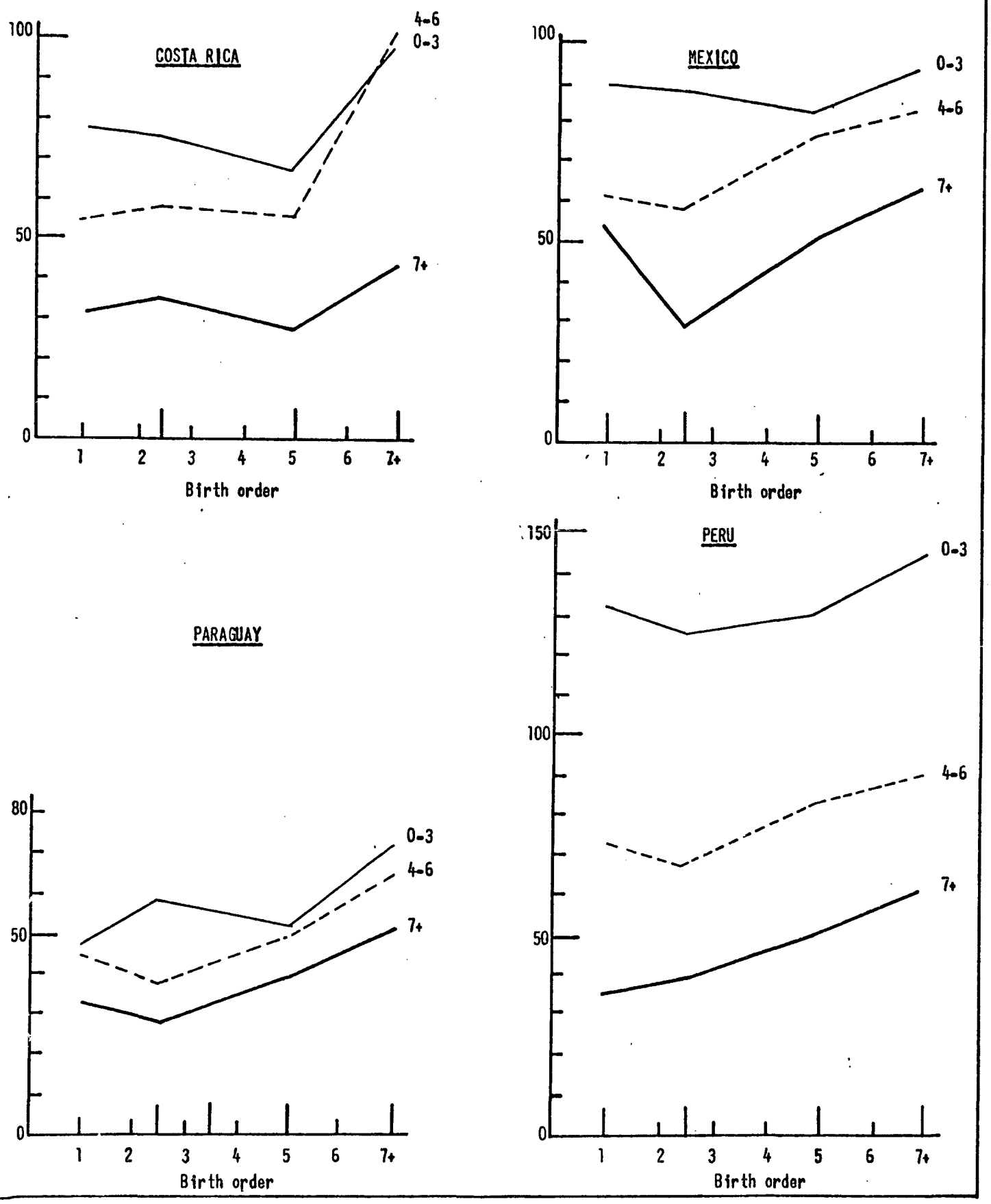


Figure 17

INFANT MORTALITY RATES BY AGE OF MOTHER WITHIN CATEGORIES OF EDUCATIONAL LEVEL OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU

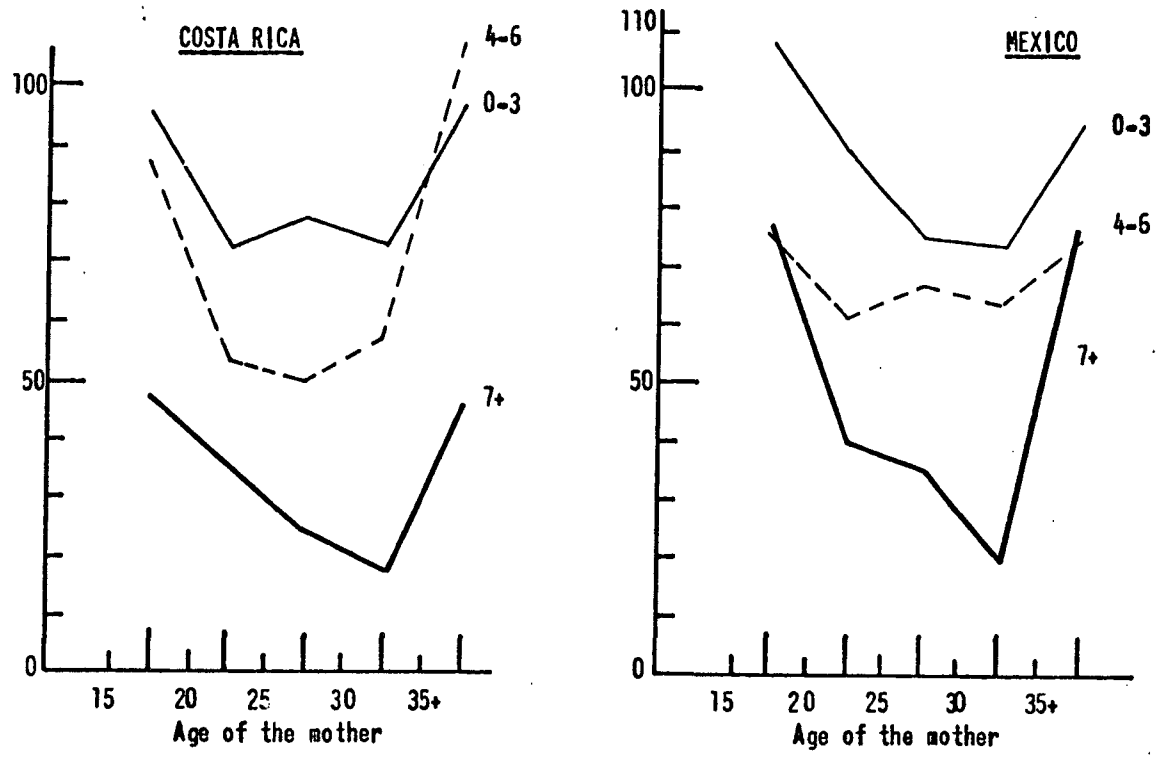


Figure 18

INFANT MORTALITY RATES BY LENGTH OF BIRTH INTERVAL WITHIN CATEGORIES OF EDUCATIONAL LEVEL OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU

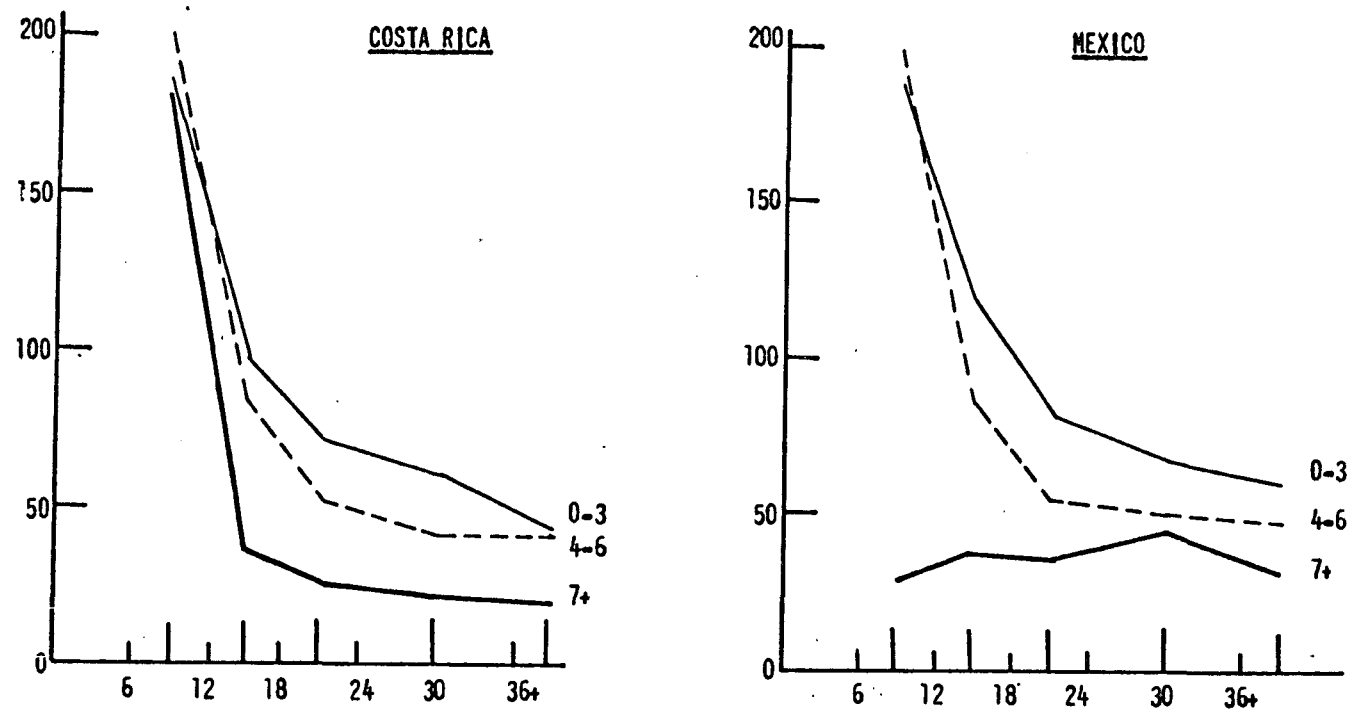
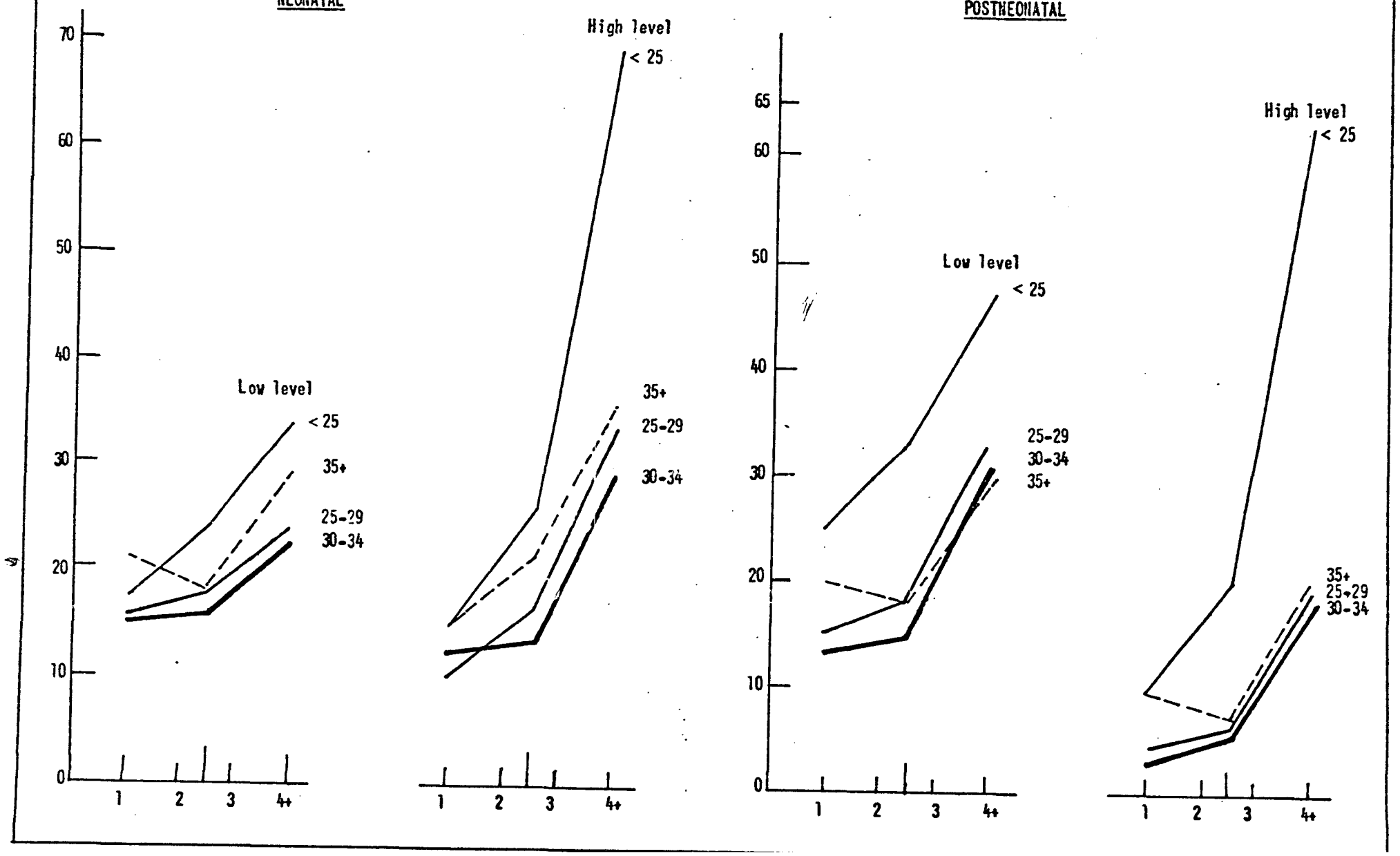


Figure 19

NEONATAL AND POSTNEONATAL MORTALITY RATES BY BIRTH ORDER, AGE OF THE MOTHER AND EDUCATIONAL LEVEL OF THE MOTHER IN CHILE, 1978



in Chile, on the other hand, it refers to mothers having no schooling or having a primary education, because of the different scale on which the data from each source are obtained. The relevant information is shown in table A 24 in the Annex and in figure 20.

It will be noted that the percentage of mothers with a low level of education rises with birth order and that, except in the case of Paraguay, follows a U-curve with respect to age of the mother, duplicating the relationship between infant mortality and the categories of these variables noted in figures 1 and 2. Birth interval, on the other hand, is not associated with educational level of the mother.

When birth order and maternal age specifie rates for each country are standardized using the composition of its total births by educational level of the mother, as standard population, it can be seen that the differentials remain very similar when the influence of composition by educational level of the mother is eliminated, this is illustrated in tables A 25 and A 26 in the Annex and in figure 21. Only in Peru is there a leveling off of the relationship between infant mortality and birth order and a decline in the higher maternal age rates. The birth specifie rates were not standardized because the differences in composition of births by educational level of the mother between categories of birth interval were negligible.

Similar results are obtained when neonatal, post-neonatal and infant mortality rates by birth order and age of the mother are standardized according to composition of births by educational level of the mother in Chile in 1972 and 1978. The relevant findings are shown in tables A 27 and A 28 in the Annex.

3.4.3 Conclusions

Both in the countries where the fertility survey data were analysed and in Chile in the two years, despite the intense relationship that exists between percentage of births having mothers with a low educational level and birth order and age of the mother, standardization for that composition does not fundamentally alter the characteristics of the differentials; this is consistent with the persistence of mortality differentials by birth order and age of the mother within groups of educational level of the mother, noted above. Therefore, neither finding contradicts the assumption that the differentials are biological in nature.

/3.5 Mortality

3.5 Mortality differentials in large and small completed families

A further argument against the biological cause of child mortality differences with regard to birth order and age of the mother is that births in the higher mortality categories correspond only, or mostly, to families that will have had a high number of children by the time the woman has reached the end of her reproductive period. It may at the same time be assumed that mothers of large families have characteristics that result in a greater risk of death for their children than those of mothers of small families. This would thus explain the differences under consideration.

The accuracy of this hypothesis cannot be verified on the basis of vital statistics data. On the contrary, it is possible to select births to mothers of completed fertility from the pregnancy histories in the surveys and to examine mortality differentials in the lower birth orders and by age of the mother in large and small families. An analysis will also be made of the composition of births according to family size in each category of variables. Finally, the characteristics of women with large and small families will be studied.

The criteria for establishing that a woman is of completed fertility were: that she should not be currently pregnant and not have had children over the past five years having been married or living in a union for at least five years, or that she should have been sterilized or be currently using efficient contraceptive methods and state that she does not wish to have more children. Among these women, who were selected from among all those interviewed, births that had occurred over a period of twenty years, starting one year before the survey, were considered. A small family was defined as a family with less than five live births and a large family was defined as one with five or more live births, regardless of whether the children in question had survived or not.

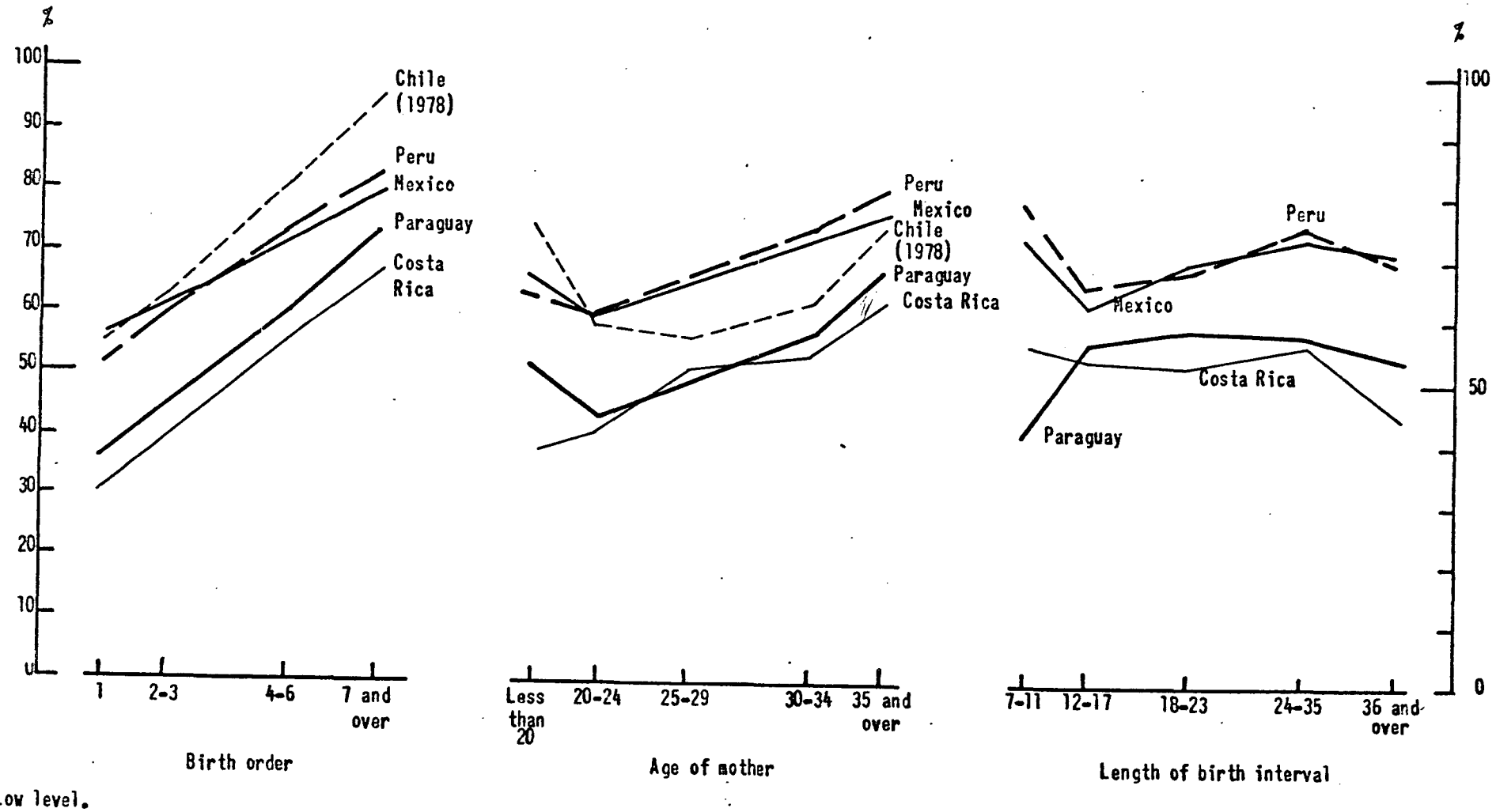
3.5.1 Child mortality rates by birth order and age of the mother in large and small completed families

On the basis of the hypothesis that differences are of a biological nature it was anticipated that in both small and large families mortality would increase from the first to the fourth order and that births to women between the ages of 25 and 29 years would reflect lower mortality than births in the extreme groups.

/Figure 20

Figure 20

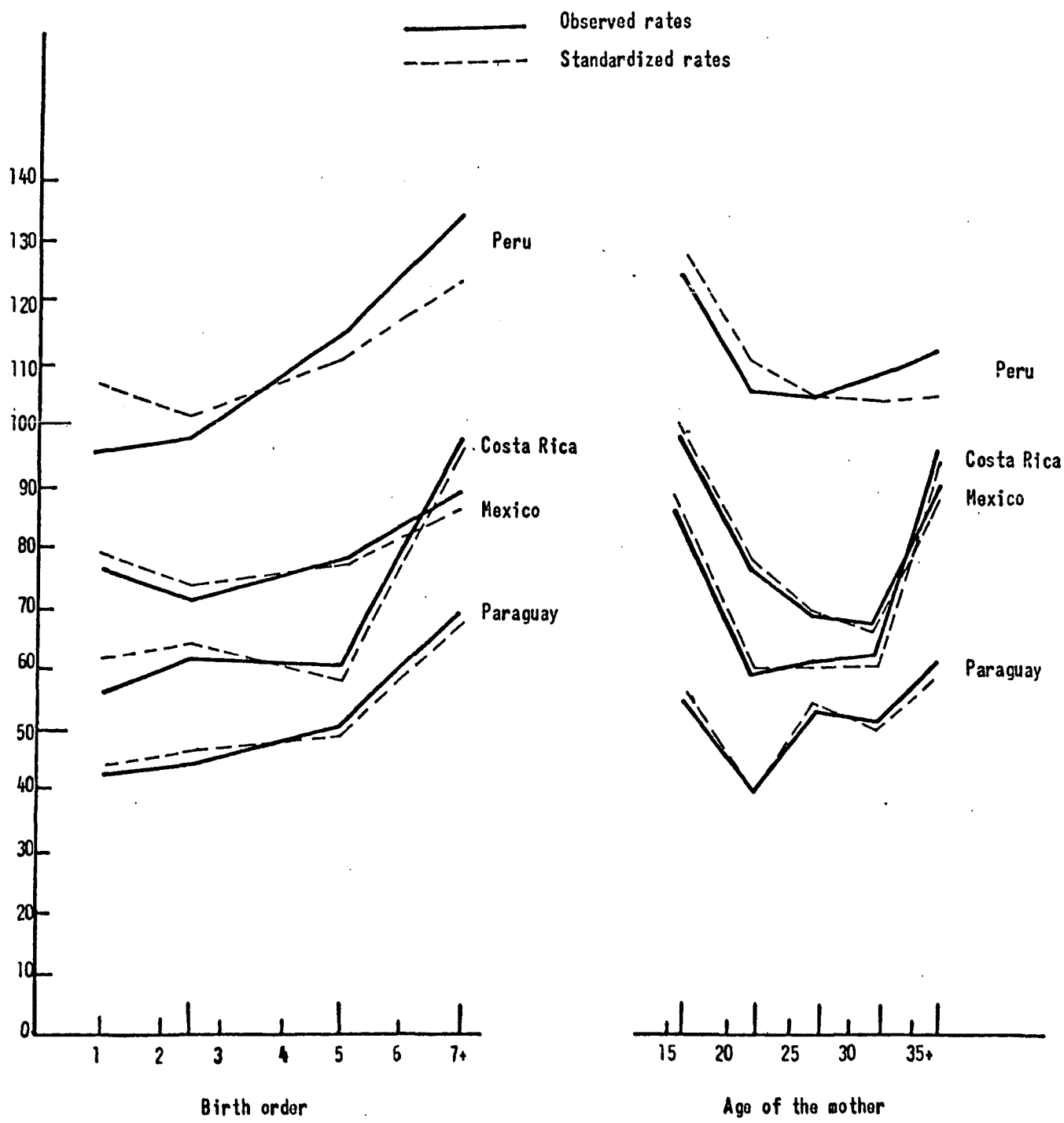
PERCENTAGE OF BIRTHS WITH MOTHERS OF LOW LEVEL OF EDUCATION BY BIRTH ORDER, AGE OF MOTHER AND LENGTH OF BIRTH INTERVAL BY COUNTRIES a/



a/ Low level.
Chile : none or primary school
All others: 0-3 years of schooling

Figure 21

INFANT MORTALITY BY BIRTH ORDER AND BY AGE OF THE MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU. OBSERVED RATES AND RATES STANDARDIZED BY EDUCATIONAL LEVEL OF MOTHER



The results, which may be seen in table A 29 and A 30 in the Annex and in figures 22 and 23, are not in keeping with these expectations, and the behaviour of the rates appears entirely random with regard to birth order and age of the mother. The only thing that is clear is that mortality is far greater in large families than in small families.

When differences with regard to birth order are analysed from the point of view of the mother's education level, on the basis of the data in table A 29, it may be seen that the behaviour of child mortality is different in the four countries concerned. The only constant factor is that the lowest rates are found in children of mothers with a high level of education and small families. With a number of exceptions, the highest rates are seen in children of mothers with low levels of education and large families. The position with regard to the two remaining groups varies from country to country. There is no direct relationship between the mortality level and birth order in any of the subgroups.

It is possible that one of the reasons for the higher mortality in large families is the fact that their socioeconomic characteristics are more unfavourable than those of small families. A further possible reason could be that, in view of the fact that family-size was defined on the basis of the number of live births, a higher mortality rate in the lower birth orders would result in a greater number of live births in order to attain the desired family-size, which would mean that the higher mortality rate is the cause rather than the consequence of larger family-size, defined in terms of the number of live births.

A further disruptive factor is the varying composition by maternal age of births of different orders in large and small families. In large families third or fourth order births frequently fall within the youngest maternal age group, whereas in small families this is extremely rare and, on the other hand, low birth orders frequently occur at higher maternal ages, which is virtually never the case in large families. However, there is no justification for adjusting rates by maternal age because the behaviour of mortality by age of the mother within the categories by birth order is also irregular owing to the low number of vital events available upon making subclassifications in so many categories. An attempt made in that connexion confirms the futility of such standardization of rates.

/A further

A further possible reason for the great disparity in the mortality of large and small families was that it would appear possible, upon analysing births that occurred over a period of 20 years prior to the survey, that births in large completed families occurred in earlier years in relation to the survey than those in small families, and that in the case of the births in large families there was a higher overall infant mortality rate. With a view to assessing the effect of this, Peruvian rates specified by birth order, age of the mother and family-size were standardized on the basis of the period in which the births occurred. The method of indirect standardization with a set of model rates was used, since the rates considered in the subgroups were based on a small number of vital events. It was in fact noted that the rates of large families tended to drop and those of small families to rise with standardization, but in general there was no change as a result of the standardization in the relationship between birth order and age of the mother and the relative levels of the various rates.

3.5.2 Composition by family size of births in successive birth orders

With a view to testing the hypothesis that the increase in mortality in successive birth orders is due to a progressive increase in the proportion of births belonging to potentially large families, which in turn are subject to higher mortality risks, the composition by family size of births by birth order was analysed.

Naturally, the study could only be based on births to mothers regarded as being of completed fertility, the size of whose families is thus known. This results in a minor proportion of births suitable for analysis, ranging from 19% in Peru to 38% in Costa Rica (see table 8).

The percentages of births falling in small and large families in the successive birth orders are shown in table A 31 in the Annex. It may be noted that, as anticipated, the proportion of births falling in large families increases from values of 20% to 40% in the first birth order to figures ranging from 40% to 55% in the fourth order, following which, all births fall into the category of large families, by definition. Despite this increasingly unfavourable composition, the rates did not display a regular increase according to birth order as was seen in point 3.5.1. This may be due to the random variations in rates based on such small numbers of vital events.

/Figure 22

Figure 22

INFANT MORTALITY RATES BY BIRTH ORDERS 1 TO 4 IN LARGE AND SMALL COMPLETES FAMILIES IN COSTA RICA, MEXICO, PARAGUAY AND PERU

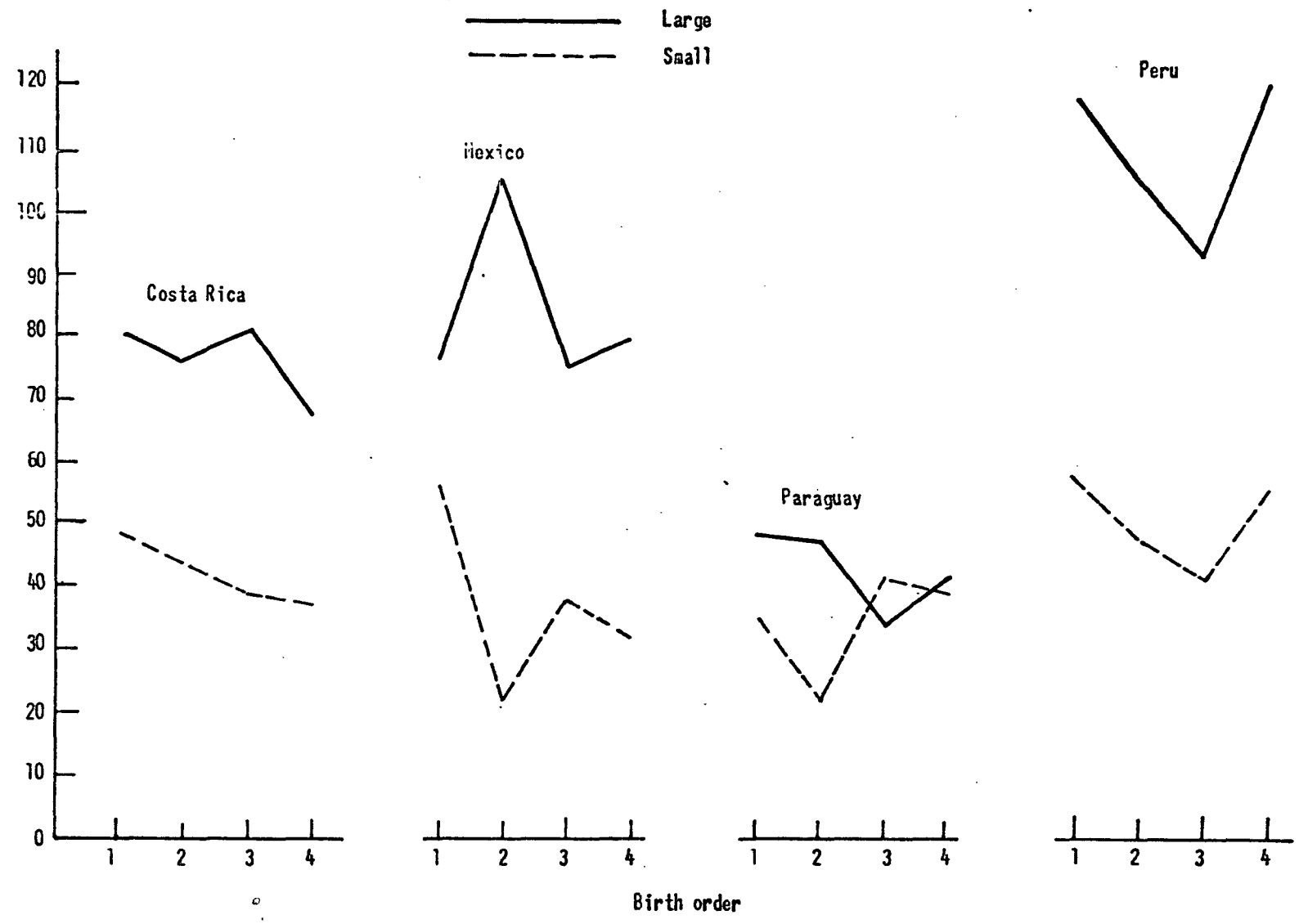


Figure 23

INFANT MORTALITY RATES BY AGE OF THE MOTHER IN LARGE AND SMALL COMPLETED FAMILIES, IN COSTA RICA, MEXICO, PARAGUAY AND PERU

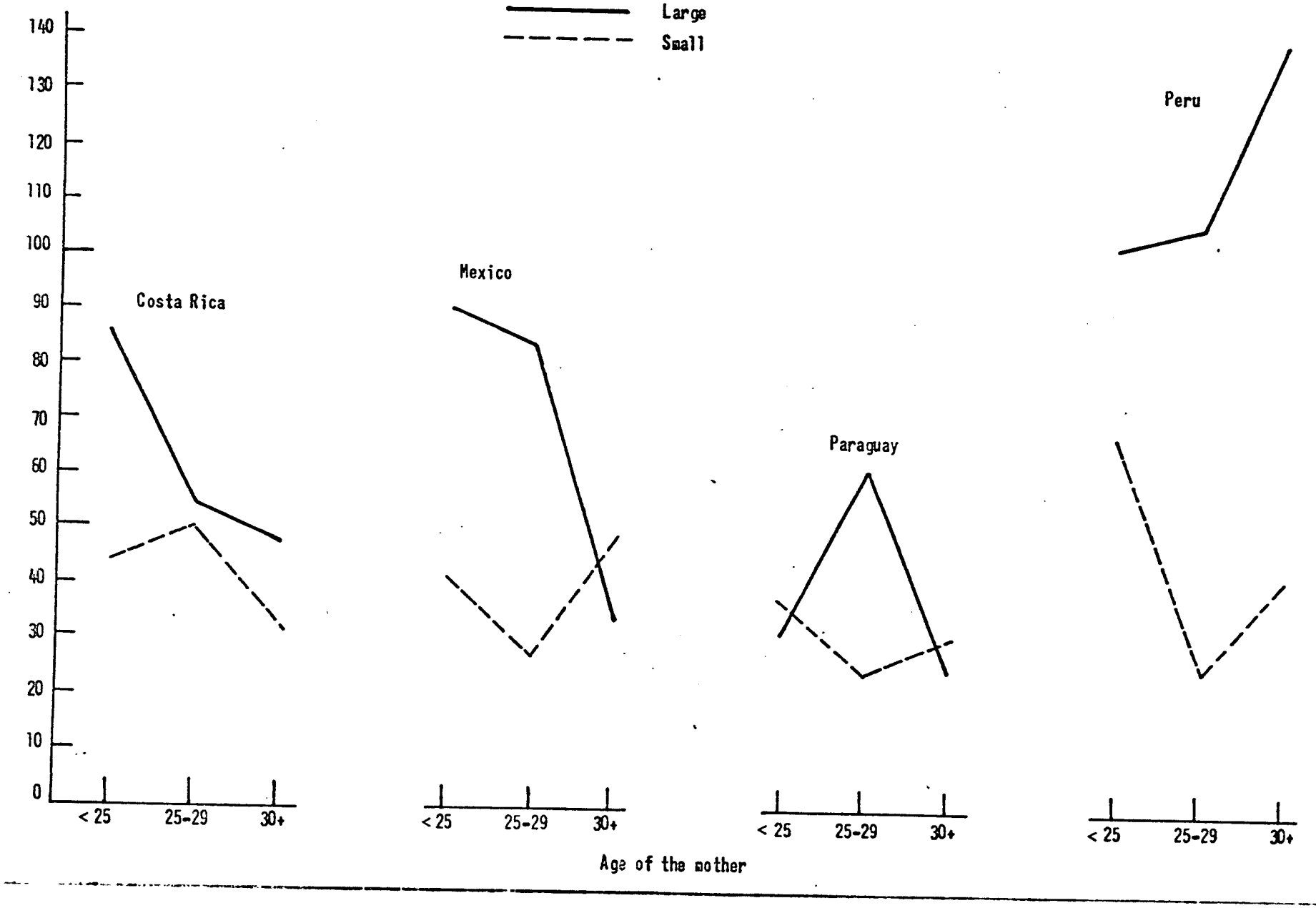


Table 8

TOTAL BIRTHS AND BIRTHS FALLING IN THE CATEGORY OF COMPLETED FAMILIES IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Country	Total births	Births falling in the category of completed families	
		Number	Percentage
Costa Rica	11 093	4 199	37.9
Mexico	22 720	4 941	21.7
Paraguay	9 319	2 113	22.7
Peru	20 706	3 911	18.9

3.5.3 Characteristics of women of completed fertility with large and small families

The great disparity between mortality levels in births in large and small completed families suggested that women with either the one or the other family-size would have different characteristics. The data considered were as follows: age of the mother at the time of the interview, her age upon marriage, duration of lactation in the last completed interval, use of efficient contraceptives, place of residence at the time of the interview, the women's level of education and her spouse's occupation. The corresponding data is set forth in table A 32 of the Annex.

On average, the women of completed fertility with small families are five years younger at the time of the interview than women of completed fertility with large families, and they married two years later. Thus, on average the time of exposure to marriage, disregarding dissolved marriages, is 7 to 8 years lower in the case of women with small families.

It was anticipated that the average length of lactation would be shorter in women with large families. It was found, on the contrary, that in such families the percentage of women with over six months of lactation was much higher than in the case of women with small families. However, in the case

/of small

of small families there was a high proportion of non-response to that particular question, which somewhat invalidates the conclusion that this factor could reflect traditional cultural behaviour in women with large families.

With regard to use of contraceptives, since women of completed fertility were being considered, it would appear logical to anticipate that those with small families would have used contraceptives more frequently than those with large families. This is only the case in Peru, where the proportion of women who are even users of efficient contraceptives is 25% in the case of women with small families, and 21% in the case of women with large families. In the remaining countries the percentage of women who have ever used efficient contraceptives is consistently lower in the case of women with small families, contrary to what was expected.

With regard to socioeconomic indicators, the data available confirm the knowledge there is of their relationship with fertility levels: a greater proportion of women with large families live in rural areas, they are less educated and their spouses' occupations are at a lower social level than women with small families.

3.5.4 Conclusions

The scarcity of vital statistics that resulted from selection of births to women with completed families made it impossible to carry out the analyses planned or adequately to assess the results obtained. Obviously, child mortality in children born to mothers with large families was far higher than that of children born to mothers with small families. An unknown factor in that connexion is whether this is owing to the fact that replacement of deceased children leads to large families, defined in terms of the number of live births, as was so in this case. This question should be considered in future studies.

When they are considered from a socioeconomic point of view, the most unfavourable characteristics of women with large families may indicate that differences with regard to birth order are influenced by the increase in the proportion of births in large families. However, in the analysis, made under point 3.4 it was also noted that the variations in the proportion of mothers with a low level of education were similar to those in mortality rates by age of the

/mother and

mother and by birth order, but standardization of births by composition according to the mother's level of education did not result in major changes in mortality differentials with respect to the variables in question. This was so because differentials by mother's age and birth order were maintained within the individual groups of levels of education. It is possible that these differences also persist within the framework of family-size. In that particular case there was not sufficient data to justify investigation. In future analyses it may be possible to classify births in families of incomplete fertility into potential final large or small family-sizes, on the basis of a discriminant analysis of maternal characteristics. A greater number of cases would thus be available, permitting work with more stable rates.

4. Multivariate statistical analysis of the factors of infant mortality related to fertility level

To complement the previous analyses we now present the results of a multivariate statistical analysis. This was an attempt to specify the influence of birth order, mother's age, length of birth interval and mother's level of education on the infant mortality level, by investigating the statistical significance of the main effects and of the interactions of these variables.

4.1 Background

The importance of the main effects of the four variables whose relationship with infant mortality was studied was already seen by comparing figures 1 to 4. The effect of the length of the birth interval clearly appears as the most important, followed by the effect of the mother's level of education. Birth order and mother's age show almost the same strength of association with infant mortality, but in different shapes.

The interactions between the effects of the variables investigated were seen in figures 6 to 10 and 16 to 19. The interaction between birth order and mother's age is the only one that appears clear, especially in Chile where the large number of cases available makes this relationship appear more regularly (figure 7), and it can be seen more clearly that the relationship of infant mortality with birth order varies according to the maternal age group in which it is studied. The remaining interactions are difficult to categorize from the figures. It may only be said that in general the so-called biological

/determinants of

determinants of differentials do not show an interaction with the mother's level of education, since these relationships behave very similarly within the different categories of that level.

By comparing the size of the differentials by means of the coefficients of variation presented in table 9, it may be seen that the greater importance of the length of birth interval in determining infant mortality differentials is corroborated, followed by the mother's level of education. It also appears that this latter is more important in post-neonatal mortality than in neonatal mortality in both years studied in Chile, as expected, taking into account that post-neonatal mortality is more influenced by external, socioeconomic factors. There appears to be no constant ordering of the size of the coefficients of variations by birth order and mother's age, among countries, nor in Chile between the two components of infant mortality, or between years.

One attempt to quantify the interaction of the different variables consisted of standardizing the rates. The results referring to Chile are present in tables A 27 and A 28 of the Annex, and in figure 24. When the birth order rates are standardized according to the composition of births by age and educational level of the mother, it is seen that the greatest modifications correspond to the standardization by age. Although not conclusive, this is an indication of its interaction with birth order. The same conclusion may be reached by analysing the standardization of the rates for mother's age in table A 28 and in figure 24.

/Figure 24

Figure 24

NEONATAL, POSTNEONATAL AND INFANT MORTALITY RATES BY BIRTH ORDER, OBSERVED AND STANDARDIZED BY EDUCATIONAL LEVEL OF MOTHER AND AGE OF THE MOTHER AND RATES BY AGE OF THE MOTHER OBSERVED AND STANDARDIZED BY EDUCATIONAL LEVEL OF MOTHER AND BIRTH ORDER. CHILE 1972-78

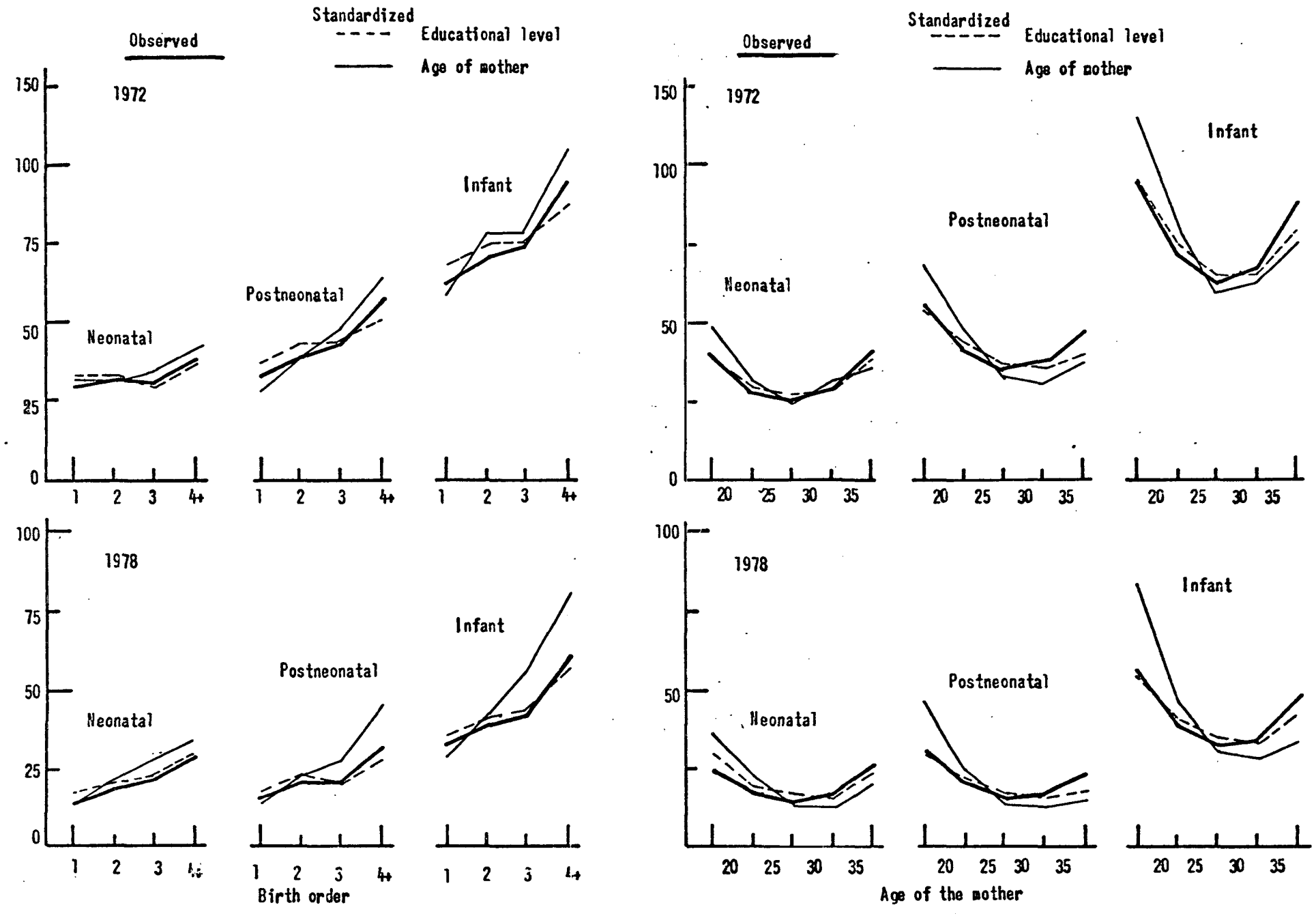


Table 9

COEFFICIENTS OF VARIATION OF SPECIFIC RATES ACCORDING TO BIRTH ORDER MOTHER'S AGE, LENGTH OF BIRTH INTERVAL AND MOTHER'S EDUCATIONAL LEVEL IN COSTA RICA, MEXICO, PARAGUAY AND PERU AND IN CHILE IN 1972 AND 1978 FOR SPECIFIC MORTALITY RATES UNDER 1 MONTHS, FROM 1 TO 11 MONTHS AND UNDER ONE YEAR

Country	Variables of specific rates				
	Birth order	Age of mother	Birth interval	Educational level mother	Occupation spouse
Costa Rica	0.2766	0.2295	0.7275	0.4123	0.2742
Mexico	0.0915	0.1637	0.5406	0.3274	0.1806
Paraguay	0.2275	0.1416	0.6052	0.2818	0.1629
Peru	0.1620	0.0774	0.5241	0.5524	0.3382
Chile 1972					
Under 1 month	0.1288	0.1977	-	0.4434	-
1-11 months	0.2130	0.1833	-	0.7304	-
under 1 year	0.1768	0.1813	-	0.6109	-
Chile 1978					
under 1 month	0.2325	0.1840	-	0.4783	-
1-11 months	0.3259	0.2377	-	0.7783	-
under 1 year	0.2778	0.2242	-	0.6388	-

4.2 Multivariate

4.2 Multivariate statistical analysis

After analysing the available programmes in different computer packages, it was decided to use the P3F of the BMDP of the University of California at Los Angeles (UCLA), which appeared to be the most suitable for the needs of the analysis.

The programme adjusts a log-linear model to the frequencies of the cells of a multiple entry table. The model is hierarchical, so that the inclusion of an interaction of a higher order implies that the main effects and interactions of a lower order, whose factors are subsets of the effect of the higher order, are automatically included in the model. Infant mortality was converted to a 0.1 variable for survival to age 1 for survey data. Similarly, neonatal mortality was measured as survival to age 1 month, and post-neonatal as survival to 1 year of those who survived the first month, for vital statistics data.

The statistical significance of the main effects and of the interactions of the factors in the four countries whose fertility survey data was analysed is presented in table A 33 of the Annex. The results were obtained for the difference between the chi squares of the adjustment of models which did or did not include the effect in question, being similar in all the remaining factors.

It appears that the interval between births and the mother's level of education are the two factors which show the greatest and most constant statistical significance in all countries. Birth order is significant but to a lesser extent, in all the countries, whereas the mother's age is only statistically significant as a determining factor in Mexico. The interactions have variable significance in the different countries. Those of higher orders were excluded from the table because they were insignificant.

In Chile the significance of the effects on neonatal and post-neonatal mortality in 1972 and 1978 were studied. The results are presented in Table A 34 of the Annex and refer to the tests of partial and marginal association which are obtained for each effect in the saturated model. The effect of birth order, mother's age and mother's level of education were significant in all the groups except the partial association of level of education with neonatal mortality in 1978. The interaction of birth order with level of education is significant in all groups, and that of birth order and mother's age in all except neonatal

/mortality in

mortality in 1978. The same occurs with the interaction of mother's age and her level of education, which in neonatal mortality is insignificant in 1978, and is slightly significant in 1972. The interaction of the three factors is insignificant.

4.3 Conclusions

The multivariate analysis confirmed the importance of the main effects and of the interactions which have been detected in the figures, variation coefficients and standardization, providing information on their statistical significance.

The log-linear model predicts the frequency of cases in different cells of the multiple entry table. Here the search for an adequate model was not insisted on because it was not a point of first priority. It is probable that with other programmes and by seeking other adjustments one might arrive at a model with practical application. This would be a future task which could be based on the findings of the present research.

IV. SUMMARY AND CONCLUSIONS

The study of the effect of the decline in fertility on the infant mortality level was based on two hypotheses: (1) that changes in the structure of births with respect to birth order, mother's age and length of time between births due to the decline in fertility contribute to the reduction in infant mortality, and (2) that the infant mortality differentials with respect to these same variables are primarily biological in nature.

To investigate the truth of these hypotheses data were analysed from five Latin American countries: Chile, Costa Rica, Mexico, Paraguay and Peru. In the first, information from vital statistics was used and, in the remaining information from national fertility surveys carried out under the World Fertility Survey.

The results of the analysis show that the infant mortality differentials with respect to birth order, mother's age, length of birth interval and mother's level of education in the different countries are similar in both relative strength and in shape.

/It was

It was also found that the influence of the differences in structure of births related to fertility, on the infant mortality level, are better shown between two points in time in the same country than between countries.

The persistence and accentuation of the strength of the differentials with respect to birth order, mother's age and length of interval between births under conditions of low mortality, and their maintenance within different groups of mother's level of education, support the biological nature of their origin, but this is not true of the fact that the differential were stronger in post-neonatal mortality than in neonatal mortality. It was also unexpected that mortality with respect to birth order and mother's age would behave consistently in different groups of causes of deaths and that there would not be definite differentials with respect to birth order and mother's age in births from large and small completed families. However, there are explanations for these results which do not make it necessary to reject the initial hypothesis.

The conclusions which may be derived from the research findings are then, that the changes in structure of births caused by the decline in fertility favour a lower infant mortality level and that the differentials in terms of birth order, mother's age and interval between births may be considered primarily biological in nature.

The first lends validity to the objective of decreasing infant mortality which is proposed in many family planning programmes. The second indicates that contraception should be accessible to all women, no matter what their socioeconomic condition, so that their children may be born a sufficient distance apart, so that they may avoid having children at the extreme of reproductive ages or when they have already had many children. The large differences in mortality observed between children of mothers with different levels of education, on the other hand, indicate the need to correct the adverse socioeconomic conditions which lead to the high mortality rate in lower level groups and, as long as this occurs, to supply them with services such as supplementary food programmes, environmental health and reinforcement of medical care.

ANNEX

Table A1

INFANT MORTALITY RATES BY BIRTH ORDER AND AGE OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Birth order	Age of mother					
	Total	Less than 20	20-24	25-29	30-34	35 and over
			Costa Rica			
Total	67.7	85.6	59.3	61.5	62.0	95.8
1	56.6	69.4	44.5	50.2	(71.4)	-
2 - 3	62.0	103.2	55.6	58.4	32.0	-
4 - 6	60.6	(162.8)	75.1	49.0	47.3	98.4
7 and over	97.8	-	(163.9)	103.5	79.7	107.4
			Mexico			
Total	78.4	98.5	76.7	69.9	68.0	90.1
1	76.1	86.2	65.7	57.8	(43.0)	(166.7)
2 - 3	72.7	108.7	68.5	56.4	48.7	(30.9)
4 - 6	78.5	177.0	95.8	74.1	58.3	77.9
7 and over	89.5	-	(215.4)	83.4	81.2	95.2
			Paraguay			
Total	50.9	55.4	40.8	54.1	52.4	61.2
1	43.7	51.0	40.4	34.7	(27.4)	-
2 - 3	45.1	66.0	36.8	52.3	36.0	(48.8)
4 - 6	51.4	38.5	53.8	54.0	45.3	50.8
7 and over	69.6	-	-	85.2	68.9	66.6
			Peru			
Total	109.4	125.6	105.7	104.1	108.7	112.5
1	95.4	119.9	79.5	(50.3)	(61.9)	(153.9)
2 - 3	98.5	131.9	101.3	84.1	(76.3)	(54.3)
4 - 6	115.0	(180.6)	132.9	118.4	97.0	(100.2)
7 and over	134.5	-	(359.4)	(138.2)	137.2	121.2

Note: ( ) based on less than 100 births.
- not calculated. Less than 30 births or no deaths.

Source: WFS standard recode tapes.

Table A2

INFANT MORTALITY RATES BY BIRTH ORDER AND LENGTH OF PREVIOUS BIRTH INTERVAL IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Birth order	Previous birth interval (in months)					
	Total	7-11	12-17	18-23	24-35	36 and over
			Costa Rica			
Total	70.7	194.0	86.4	60.0	50.3	40.1
2 - 3	62.0	169.5	71.2	63.4	41.7	32.4
4 - 6	60.6	171.0	86.4	38.4	43.7	38.3
7 and over	97.8	254.4	112.2	84.0	70.4	59.9
			Mexico			
Total	78.8	181.2	103.5	71.8	63.3	55.8
2 - 3	72.8	175.1	82.5	62.9	65.8	53.2
4 - 6	78.2	153.4	125.3	74.9	59.1	50.7
7 and over	89.1	227.4	112.3	82.3	66.3	68.4
			Paraguay			
Total	52.9	130.4	93.5	41.9	37.4	40.4
2 - 3	45.1	107.1	66.7	47.2	27.1	39.8
4 - 6	51.4	121.7	105.1	34.2	38.6	38.9
7 and over	69.6	(168.4)	127.0	44.9	51.3	45.3
			Peru			
Total	112.5	244.3	148.6	122.8	96.7	57.5
2 - 3	98.3	210.5	120.2	116.1	91.3	46.0
4 - 6	115.0	239.4	155.5	128.9	94.4	65.8
7 and over	134.1	289.8	192.5	125.9	109.8	64.8

Note: ( ) based on less than 100 births.

Source: WFS standard recode tapes.

Table A3

INFANT MORTALITY RATES BY AGE OF MOTHER AND LENGTH OF PREVIOUS BIRTH INTERVAL IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Age of mother	Previous birth interval (in months)					
	Total	7-11	12-17	18-24	25-35	36 and over
			Costa Rica			
Total	70.7	194.0	86.4	60.0	50.3	40.1
< 20	109.6	(258.8)	94.4	95.8	74.8	(33.3)
20-24	64.7	184.0	76.0	46.5	38.0	31.3
25-29	62.7	141.2	83.7	55.3	41.7	42.9
30-34	61.6	(202.5)	103.9	56.8	28.8	38.4
35 and over	97.4	(311.1)	100.6	98.3	118.9	46.4
			Mexico			
Total	78.8	181.2	103.5	71.8	63.3	55.8
< 20	115.7	275.0	119.5	105.3	81.3	(21.5)
20-24	80.0	163.7	100.5	55.4	71.0	70.6
25-29	70.4	150.9	101.1	73.0	52.5	45.3
30-34	68.1	179.2	95.7	60.1	57.4	50.4
35 and over	88.8	(180.6)	115.2	114.3	74.5	69.6
			Paraguay			
Total	52.9	130.4	93.5	41.9	37.4	40.4
< 20	64.4	(52.6)	68.2	98.4	31.8	(62.5)
20-24	40.9	(126.4)	68.0	30.3	27.4	29.0
25-29	56.6	(125.0)	106.4	46.2	38.4	45.1
30-34	53.5	(178.1)	111.6	36.7	39.1	32.7
35 and over	62.1	(142.9)	127.8	35.3	53.7	52.2
			Peru			
Total	112.6	244.6	148.2	123.4	96.9	57.5
< 20	134.1	223.1	154.6	146.8	94.0	(25.6)
20-24	114.1	253.1	130.7	116.6	100.5	50.9
25-29	108.9	190.6	145.1	126.7	101.2	50.6
30-34	109.6	314.8	169.8	104.1	87.8	61.0
35 and over	112.1	(275.5)	171.2	157.9	96.5	70.8

Note: ( ) based on less than 100 births.

Source: WFS standard recode tapes.

Table A4

INFANT MORTALITY RATES BY BIRTH ORDER AND EDUCATIONAL LEVEL OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Birth order	Educational level of mother (in years of schooling)			
	Total	0 - 3	4 - 6	7 and over
		Costa Rica		
Total	67.7	80.9	64.1	32.8
1	56.7	79.2	55.0	32.4
2 - 3	62.1	77.9	59.7	33.7
4 - 6	60.6	68.0	56.5	28.1
7 and over	97.8	98.9	101.1	(42.9)
		Mexico		
Total	78.5	87.4	67.3	44.1
1	76.2	90.1	62.5	55.4
2 - 3	72.8	88.1	58.2	29.5
4 - 6	78.5	82.1	75.1	50.0
7 and over	89.5	92.3	81.0	62.5
		Paraguay		
Total	50.9	57.9	46.5	32.3
1	43.7	47.8	45.3	33.1
2 - 3	45.1	57.2	38.2	28.4
4 - 6	51.4	52.9	50.6	39.5
7 and over	69.6	71.4	65.4	(50.0)
		Peru		
Total	109.5	132.1	76.1	41.1
1	95.6	132.1	73.3	35.0
2 - 3	98.4	125.6	67.8	39.2
4 - 6	115.4	129.9	83.8	51.4
7 and over	134.3	144.0	89.6	60.4

Note: ( ) based on less than 100 births.

Source: WFS standard recode tapes.

Table A5

INFANT MORTALITY RATES BY AGE OF MOTHER AND EDUCATIONAL LEVEL OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Age of mother	Educational level of mother (in years of schooling)			
	Total	0 - 3	4 - 6	7 and over
		Costa Rica		
Total	67.7	80.9	64.1	32.8
< 20	85.6	95.4	87.2	48.3
20-24	59.3	74.5	53.2	36.7
25-29	61.6	78.9	51.6	24.8
30-34	62.1	73.7	58.9	18.1
35 and over	95.9	97.0	107.7	(46.5)
		Mexico		
Total	78.5	87.4	67.3	44.1
< 20	98.5	108.8	77.0	82.1
20-24	76.8	90.8	61.1	39.7
25-29	69.9	76.3	67.6	35.7
30-34	68.0	74.1	65.4	19.9
35 and over	90.2	94.3	75.4	76.3
		Paraguay		
Total	50.9	57.9	46.5	32.3
< 20	55.4	65.5	40.4	62.5
20-24	40.8	40.1	43.2	35.4
25-29	54.1	62.2	53.9	22.2
30-34	52.4	64.0	40.2	22.9
35 and over	61.2	64.3	60.8	29.4
		Peru		
Total	109.5	132.1	75.9	41.1
< 20	125.6	151.0	100.0	37.5
20-24	105.9	135.6	71.8	38.7
25-29	104.1	128.5	67.1	40.0
30-34	108.4	124.3	71.0	49.5
35 and over	112.6	124.5	72.9	48.0

Note: ( ) based on less than 100 births.

Source: WFS standard recode tapes.

Table A6

INFANT MORTALITY RATES BY EDUCATIONAL LEVEL OF MOTHER AND LENGTH OF PREVIOUS BIRTH INTERVAL IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Educational level of mother	Previous birth interval (in months)					
	Total	7-11	12-17	18-24	25-35	36 and over
			Costa Rica			
Total	70.7	194.0	86.4	60.0	50.3	40.2
0 - 3	81.2	189.8	98.0	72.6	60.9	45.3
4 - 6	67.1	202.7	82.4	51.3	40.9	43.1
7 and over	33.0	(181.8)	35.1	25.8	23.0	20.8
			Mexico			
Total	78.8	181.2	103.5	71.9	63.3	55.8
0 - 3	86.7	189.1	121.3	81.0	68.3	60.9
4 - 6	68.7	200.0	87.0	55.5	50.9	48.3
7 and over	38.8	30.3	39.1	38.6	45.2	33.1
			Paraguay			
Total	52.9	130.4	93.5	41.9	37.4	40.4
0 - 3	45.1	107.1	66.7	47.2	27.1	39.8
4 - 6	51.4	121.7	105.1	34.2	38.6	38.9
7 and over	69.6	(168.4)	127.0	44.9	51.3	45.3
			Peru			
Total	112.5	243.4	148.2	123.4	96.7	57.8
0 - 3	131.9	271.3	189.6	146.4	107.4	66.5
4 - 6	76.6	171.1	74.5	84.7	81.2	44.8
7 and over	44.2	100.0	61.9	48.7	32.9	23.1

Note: ( ) based on less than 100 births.

Source: WFS standard recode tapes.

Table A7

INFANT MORTALITY RATES BY EDUCATIONAL LEVEL OF MOTHER AND OCCUPATION OF HUSBAND IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Educational level of mother (years of schooling)	Occupation of husband			
	Total	White collar and transitional	Mixed	Traditional
		Costa Rica		
Total	67.2	45.6	66.4	80.6
0 - 3	79.5	81.5	70.2	83.3
4 - 6	65.0	42.2	66.2	79.4
7 and over	30.9	21.4	54.8	25.9
		Mexico		
Total	78.4	62.3	77.3	89.9
0 - 3	87.1	76.0	84.7	92.0
4 - 6	67.4	56.9	71.4	78.7
7 and over	44.6	45.0	37.1	63.0
		Paraguay		
Total	50.9	39.4	51.7	54.1
0 - 3	57.9	59.8	58.8	57.4
4 - 6	46.9	39.5	53.4	45.4
7 and over	31.7	27.6	27.0	75.3
		Peru		
Total	109.5	66.7	104.0	135.7
0 - 3	132.3	109.2	126.6	139.4
4 - 6	75.6	61.5	73.2	104.8
7 and over	40.7	29.2	60.3	102.9

Source: WFS standard recode tapes.

Table A8

BIRTHS AND INFANT MORTALITY RATES BY LENGTH OF PREVIOUS BIRTH INTERVAL, BIRTH ORDER AND AGE OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Previous birth interval and birth order	Age of mother							
	Total		Less than 25		25 - 29		30 and over	
	Births	Rate	Births	Rate	Births	Rate	Births	Rate
				Costa Rica				
Less than 18 months	3 098	107.2	1 504	105.1	906	94.9	688	127.9
2 - 3	1 304	89.0	1 018	92.3	227	83.7	59	50.9
4 - 6	992	102.8	442	122.2	407	81.1	143	104.9
7 and over	802	142.1	44	(227.3)	272	125.0	486	144.0
18 months and over	5 663	50.7	1 769	47.5	1 822	46.7	2 072	57.0
2 - 3	2 165	45.7	1 284	49.8	612	49.0	269	18.6
4 - 6	2 060	40.3	466	38.6	941	35.1	653	49.0
7 and over	1 438	73.0	(19)	105.3	269	81.8	1 150	70.4
				Mexico				
Less than 18 months	4 820	120.1	2 337	125.8	1 363	111.5	1 120	118.8
2 - 3	2 049	99.6	1 612	107.3	348	80.5	89	33.7
4 - 6	1 639	131.8	684	153.5	677	127.0	278	89.9
7 and over	1 132	140.5	(41)	390.2	338	112.4	753	139.4
18 months and over	13 581	64.1	4.646	69.3	4.222	57.1	4.713	65.4
2 - 3	4 930	61.7	3 327	67.9	1 186	48.9	417	48.0
4 - 6	5 318	61.7	1 289	72.9	2 457	58.6	1 572	57.3
7 and over	3 333	71.7	(30)	66.7	579	67.4	2 724	72.7
				Paraguay				
Less than 18 months	1 574	101.0	654	74.9	453	110.4	467	128.5
2 - 3	667	73.5	474	67.5	143	97.9	50	60.0
4 - 6	505	108.9	177	96.1	225	111.1	103	126.2
7 and over	402	136.8	3	-	85	129.4	314	140.1
18 months and over	5 685	39.6	1 776	34,4	1 738	42.6	2 171	41.5
2 - 3	2 350	37.0	1 418	35.3	622	41.8	310	35.5
4 - 6	2 085	37.4	351	31.3	978	40.9	756	35.7
7 and over	1 250	48.0	7	-	138	58.0	1 105	47.1

(concl. in next page)

Concl. Table A8

Previous birth interval and birth order	Age of mother							
	Total		Less than 25		25 - 29		30 and over	
	Births	Rate	Births	Rate	Births	Rate	Births	Rate
				Peru				
Less than 18 months	4 338	172.7	1 831	162.8	1 307	156.9	1 200	205.0
2 - 3	1 750	138.9	1 279	146.2	366	109.3	105	152.4
4 - 6	1 558	178.4	511	182.0	690	171.0	357	187.7
7 and over	1 030	221.4	(41)	(439.0)	251	187.3	738	220.9
18 months and over	12 465	91.7	3 886	97.0	3 847	92.5	4 732	86.6
2 - 3	4 998	84.2	2 979	93.0	1 419	76.8	600	58.3
4 - 6	4 797	94.6	884	108.6	2 072	100.9	1 841	80.9
7 and over	2 670	100.4	23	173.9	356	106.7	229	98.7

Note: ( ) based on less than 100 births.
- not calculated. Less than 30 births or no deaths.

Source: WFS standard recode tapes.

Table A9

BIRTHS AND INFANT MORTALITY RATES BY EDUCATIONAL LEVEL OF MOTHER, BIRTH ORDER AND AGE OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Educational level of mother and birth order	Age of mother							
	Total		Less than 25		25 - 29		30 and over	
	Births	Rate	Births	Rate	Births	Rate	Births	Rate
Costa Rica								
0 - 3 years	5 303	80.9	2 127	80.9	1 533	78.9	1 643	82.8
1	707	79.2	600	73.3	79	113.9	28	107.1
2 - 3	1 373	77.9	978	80.8	303	89.1	92	10.9
4 and over	3 223	82.5	549	89.3	1 151	73.9	1 523	86.7
4 years and over	5 784	55.7	3 098	58.8	1 471	43.5	1 215	62.6
1	1 623	46.8	1 352	50.3	198	25.3	73	41.1
2 - 3	2 092	51.6	1 324	59.7	535	41.1	233	30.0
4 and over	2 069	66.7	422	82.9	738	50.1	909	72.6
Mexico								
0 - 3 years	15 145	87.4	6 783	97.6	3 931	76.3	4 431	81.7
1	2 286	90.1	2 062	89.7	167	83.8	57	122.8
2 - 3	4 292	88.1	3 171	94.3	844	74.6	277	57.8
4 and over	8 567	86.4	1 550	114.8	2 920	76.4	4 097	82.7
4 years and over	7 570	60.5	3 948	62.3	2 079	57.7	1 543	59.6
1	1 955	59.9	1 660	63.9	230	39.1	65	30.8
2 - 3	2 718	48.6	1 787	56.5	700	34.3	231	30.3
4 and over	2 897	72.1	501	77.8	1 149	75.7	1 247	66.6
Paraguay								
0 - 3 years	4 869	57.9	1 916	49.6	1 254	62.2	1 699	64.2
1	753	47.8	664	48.2	74	40.5	15	66.7
2 - 3	1 328	57.2	909	50.6	305	78.7	114	52.6
4 and over	2 788	61.0	343	49.6	875	58.3	1 570	65.0
4 years and over	4 450	43.2	2 197	42.3	1 225	45.7	1 028	41.8
1	1 307	41.3	1 019	45.1	214	32.7	74	13.5
2 - 3	1 689	35.5	983	36.6	460	34.8	246	32.5
4 and over	1 454	53.7	195	56.4	551	59.9	708	48.0

(concl. in next page)

Concl. Table A9

Educational level of mother and birth order	Age of mother							
	Total		Less than 25		25 - 29		30 and over	
	Births	Rate	Births	Rate	Births	Rate	Births	Rate
				Peru				
0 - 3 years	13 985	132.1	5 617	140.8	3 737	128.5	4 631	124.6
1	2 059	132.6	1 819	139.1	190	68.4	50	140.0
2 - 3	4 117	125.6	2 713	133.4	1 027	114.9	377	98.1
4 and over	7 809	135.5	1 085	162.2	2 520	138.5	4 204	126.8
4 years and over	6 716	62.4	3 420	65.8	1 871	55.6	1 425	63.2
1	1 840	54.4	1 500	58.0	267	37.5	73	41.1
2 - 3	2 630	56.3	1 545	66.0	757	42.3	328	42.7
4 and over	2 246	76.1	375	96.0	847	73.2	1 024	71.3

Source: WFS standard recode tapes.

Table A10-a

CHILE: NEONATAL MORTALITY RATES BY BIRTH ORDER, AGE AND EDUCATIONAL LEVEL OF MOTHER 1972

Age and educational level of mother	Birth order							
	Total	1	2	3	4	5	6	7 and over
Total	31.70	28.88	30.43	30.07	33.32	35.51	38.31	40.20
< 20	38.62	33.76	48.50	48.74	69.14	61.13	64.13	-
20-24	29.70	26.02	29.87	31.08	37.10	36.43	49.70	65.17
25-29	26.49	22.91	22.21	25.98	27.49	34.41	36.13	41.13
30-34	29.62	29.98	27.67	25.62	28.21	31.39	33.29	32.88
35-39	40.04	38.65	28.90	37.00	41.83	46.75	40.56	42.25
40 and over	43.18	57.31	28.39	36.15	50.89	28.54	47.58	44.40
None	56.53	73.99	67.01	56.52	51.77	48.51	48.93	48.53
< 20	72.64	70.67	67.59	94.55	82.28	45.43	218.04	-
20-24	62.27	75.10	78.15	42.05	51.43	54.51	68.56	35.45
25-29	50.37	66.70	65.67	49.90	44.27	31.09	49.44	50.99
30-34	51.50	109.94	60.77	71.44	44.93	51.65	31.92	43.66
35-39	59.44	63.59	8.72	76.51	89.78	92.06	52.54	54.74
40 and over	47.54	62.65	68.14	27.95	39.89	22.48	68.14	46.82
Primary	31.94	30.79	31.82	29.73	30.82	33.70	35.92	36.57
< 20	38.32	34.36	46.17	43.12	61.03	69.88	-	-
20-24	30.00	27.47	29.70	29.82	34.61	31.30	47.52	69.13
25-29	27.90	26.68	23.62	26.68	26.20	34.11	33.77	37.29
30-34	28.38	29.05	31.31	24.52	24.48	29.59	32.24	28.64
35-39	37.27	40.78	32.61	36.31	34.52	43.20	38.53	36.83
40 and over	43.42	58.03	27.68	42.80	57.06	31.43	40.30	43.86
High school and over	24.62	21.36	23.20	25.41	35.24	34.61	42.13	61.04
< 20	31.79	25.51	54.14	58.14	161.51	-	-	-
20-24	24.18	20.88	24.42	33.10	43.54	62.13	22.71	172.13
25-29	19.50	16.21	17.50	21.16	26.02	40.30	36.69	72.20
30-34	24.50	22.60	18.89	20.60	33.35	26.50	44.20	54.67
35-39	36.34	30.90	25.25	29.54	46.04	30.57	39.14	72.28
40 and over	35.62	53.54	12.38	24.55	38.74	21.80	61.71	40.08

Source: Instituto Nacional de Estadísticas. Tapes of births and deaths.

Table A10-b

CHILE: POSTNEONATAL MORTALITY RATES BY BIRTH ORDER
AGE AND EDUCATIONAL LEVEL OF MOTHER
1972

Age and educational level of mother	Birth order							
	Total	1	2	3	4	5	6	7 and over
Total	42.82	33.19	39.99	43.44	49.79	52.60	54.76	64.15
< 20	55.95	49.01	68.78	79.12	86.61	41.39	130.26	246.04
20-24	42.61	27.20	44.33	56.89	66.93	68.06	85.26	110.32
25-29	35.56	21.13	26.25	33.30	48.00	51.14	57.45	78.60
30-34	38.17	22.74	22.38	27.39	36.14	47.10	50.03	63.82
35-39	43.57	29.95	24.46	31.48	38.49	46.91	44.94	56.66
40 and over	53.70	46.30	44.69	40.96	36.73	53.84	45.56	61.22
None	96.35	107.15	113.19	100.68	116.09	99.13	78.97	93.96
< 20	125.82	133.02	128.44	79.09	167.12	46.14	-	-
20-24	109.97	99.15	110.59	98.07	146.24	83.04	97.49	180.03
25-29	91.20	53.72	117.84	101.37	82.43	94.74	72.81	107.14
30-34	83.51	102.35	65.35	88.32	82.13	88.36	84.79	81.87
35-39	89.53	46.14	53.15	103.60	149.79	103.34	75.59	88.02
40 and over	86.35	63.63	138.40	99.36	94.52	148.39	25.95	84.80
Primary	46.99	42.51	49.32	50.52	51.06	51.67	56.33	60.03
< 20	58.43	52.38	67.93	79.17	78.89	42.58	201.31	138.40
20-24	47.94	33.65	49.58	58.65	59.76	66.22	82.33	91.82
25-29	42.24	31.58	35.62	37.90	47.48	47.47	56.45	72.18
30-34	40.53	26.03	28.85	32.31	38.27	43.33	46.19	58.73
35-39	41.93	39.69	27.60	32.96	38.10	43.88	43.29	48.17
40 and over	50.64	54.73	41.09	41.18	37.25	43.89	56.53	54.26
High school and over	18.48	14.92	18.70	21.27	29.52	36.22	31.26	60.94
< 20	30.69	24.07	52.69	78.73	41.01	-	-	-
20-24	20.75	13.62	24.33	36.97	54.43	63.10	92.26	58.27
25-29	12.87	8.23	8.58	14.43	36.25	30.70	37.26	80.66
30-34	14.81	9.18	8.57	10.70	17.37	37.69	29.93	65.33
35-39	16.08	10.46	13.57	12.85	7.44	20.69	17.03	48.94
40 and over	23.02	19.77	12.58	19.95	11.24	29.53	10.44	44.78

Source: Instituto Nacional de Estadísticas. Tapes of births and deaths.

Table A10-c

CHILE: INFANT MORTALITY RATES BY BIRTH ORDER, AGE AND EDUCATIONAL LEVEL OF MOTHER 1972

Age and educational level of mother	Birth order							
	Total	1	2	3	4	5	6	7 and over
Total	74.62	62.07	70.42	73.51	83.11	88.11	93.07	104.35
< 20	94.57	82.77	117.28	127.86	155.75	102.52	194.39	-
20-24	72.31	53.22	74.20	87.97	104.03	104.49	134.96	175.49
25-29	62.05	44.04	48.46	59.28	75.49	85.55	93.58	119.73
30-34	67.79	52.72	50.05	53.01	64.35	78.49	83.32	96.70
35-39	83.61	68.60	53.36	68.48	80.32	93.66	85.50	98.91
40 and over	96.88	103.61	73.08	77.11	87.62	82.38	93.14	105.62
None	152.88	181.14	180.20	157.20	167.86	147.64	127.90	142.49
< 20	198.46	203.69	196.03	173.64	249.40	91.57	-	-
20-24	172.24	174.25	188.74	140.12	197.67	137.55	166.05	215.48
25-29	141.57	120.42	183.51	151.27	126.70	125.83	122.25	158.13
30-34	135.01	212.29	126.12	159.76	127.06	140.01	116.71	125.53
35-39	148.97	109.73	61.87	180.11	239.57	195.40	128.13	142.76
40 and over	133.89	126.28	206.54	127.31	134.41	170.87	94.09	131.62
Primary	78.93	73.30	81.14	80.25	81.88	85.37	92.25	96.60
< 20	96.75	86.74	114.10	122.29	139.92	112.46	-	-
20-24	77.94	61.12	79.28	88.47	94.37	97.52	129.85	160.95
25-29	70.14	58.26	59.24	64.58	73.68	81.58	90.22	109.47
30-34	68.91	55.08	60.16	56.83	62.75	72.92	78.43	87.37
35-39	79.20	80.47	60.21	69.27	72.62	87.08	81.82	85.00
40 and over	94.06	112.76	68.77	83.98	94.31	75.32	96.83	98.12
High school and over	43.10	36.28	41.90	46.68	64.76	70.83	73.39	121.98
< 20	62.48	49.58	106.83	136.87	202.52	-	-	-
20-24	44.93	34.50	48.75	70.07	97.97	125.23	114.97	230.40
25-29	32.37	24.44	26.08	35.59	62.27	71.00	73.95	152.86
30-34	39.31	31.78	27.46	31.30	50.72	64.19	74.13	120.00
35-39	52.42	41.36	38.82	42.39	53.48	51.26	56.17	121.22
40 and over	58.64	73.31	24.96	44.50	49.98	51.33	72.15	84.86

Source: Instituto Nacional de Estadísticas. Tapes of births and deaths.

Table A11-a

CHILE: NEONATAL MORTALITY RATES BY BIRTH ORDER, AGE AND EDUCATIONAL LEVEL OF MOTHER
1978

Age and educational level of mother	Birth order							
	Total	1	2	3	4	5	6	7 and over
Total	19.92	15.92	19.38	21.85	25.34	27.93	29.98	31.25
< 20	23.94	19.96	33.42	58.79	67.99	38.79	-	-
20-24	18.74	14.12	19.64	26.05	31.14	40.82	79.07	32.61
25-29	17.64	12.78	16.41	18.29	23.49	24.19	30.27	34.43
30-34	17.87	13.52	12.95	16.41	20.61	24.35	23.70	28.81
35-39	25.07	20.57	17.20	22.30	28.89	27.46	28.30	31.00
40 and over	26.49	12.04	18.81	16.45	20.97	40.17	25.42	32.90
None	40.44	42.95	35.00	33.33	50.59	44.12	32.25	42.66
< 20	48.47	39.90	59.83	73.05	140.61	-	-	-
20-24	36.75	45.38	20.66	32.14	58.90	37.92	56.25	51.13
25-29	41.35	39.82	36.95	22.72	50.92	50.92	48.30	48.38
30-34	37.21	44.64	36.29	33.92	41.86	31.42	18.34	43.77
35-39	41.43	36.89	41.28	38.79	60.12	8.03	32.85	46.81
40 and over	39.68	102.27	-	27.44	-	152.53	16.79	34.32
Primary	19.77	16.67	20.02	20.20	20.93	27.20	26.76	25.16
< 20	23.00	19.67	29.64	48.45	59.20	56.25	-	-
20-24	18.80	14.17	19.20	23.29	24.15	39.27	66.17	31.25
25-29	18.02	14.65	18.57	15.88	19.71	22.75	20.99	28.64
30-34	17.48	13.49	13.13	16.78	16.70	22.82	26.90	20.51
35-39	22.62	21.40	14.26	17.94	22.53	34.87	25.34	24.17
40 and over	24.05	9.87	25.50	12.72	23.80	23.50	20.14	30.13
High school and over	18.01	13.83	17.60	23.68	33.25	23.03	51.13	76.38
< 20	23.71	18.83	44.29	146.24	80.35	-	-	-
20-24	17.66	13.27	20.28	34.15	61.71	64.28	312.48	-
25-29	15.47	10.71	13.85	21.85	31.50	13.97	98.30	73.76
30-34	15.91	12.06	11.86	14.91	25.73	27.94	5.86	102.27
35-39	25.23	18.30	18.70	26.17	35.82	12.16	41.41	61.74
40 and over	25.19	-	10.18	22.39	20.70	38.13	61.63	71.59

Source: Instituto Nacional de Estadísticas. Tapes of births and deaths.

Table A11-b

CHILE: POSTNEONATAL MORTALITY RATES BY BIRTH ORDER
AGE AND EDUCATIONAL LEVEL OF MOTHER
1978

Age and educational level of mother	Birth order							
	Total	1	2	3	4	5	6	7 and over
Total	21.01	16.80	20.05	20.47	30.87	28.70	34.07	41.76
< 20	31.48	26.92	44.21	57.58	95.68	40.03	-	-
20-24	20.64	13.00	23.25	31.32	43.72	43.25	63.05	117.78
25-29	15.66	9.40	11.37	15.82	24.67	29.53	44.26	50.15
30-34	17.09	8.78	9.42	11.61	22.06	19.84	33.05	46.43
35-39	20.70	14.36	13.20	12.74	16.73	31.17	17.90	35.08
40 and over	29.24	14.49	22.94	15.28	25.58	31.10	32.80	37.63
None	58.41	64.03	55.90	48.38	61.82	56,91	50.90	62.09
< 20	78.15	72.86	102.92	45.23	72.56	-	-	-
20-24	61.81	69.02	42.64	63.03	91.17	52.17	-	211.08
25-29	50.50	41.10	46.61	35.18	62.11	57.33	56.98	62.41
30-34	53.17	36.86	22.46	40.84	48.60	58.37	44.16	74.53
35-39	40.34	38.07	31.95	50.04	26.59	33.17	42.37	43.63
40 and over	80.57	246.26	145.12	56.63	94.77	118.06	103.96	68.87
Primary	24.79	21.70	24.96	24.05	27.48	26.84	32.22	35.62
< 20	34.06	29.42	45.47	54.88	99.30	58.05	-	-
20-24	24.72	17.17	25.90	32.16	37.85	37.92	72.85	107.49
25-29	20.58	14.35	16.72	18.75	25.15	27.12	42.24	48.38
30-34	20.08	12.48	12.90	15.16	23.66	16.50	31.12	40.22
35-39	21.45	15.10	13.91	15.43	19.93	34.97	16.20	28.72
40 and over	22.87	10.18	17.54	18.39	12.28	27.28	20.78	29.19
High school and over	10.92	8.72	11.20	11.08	19.20	22.92	29.55	50.16
< 20	18.54	16.39	25.60	92.88	82.93	-	-	-
20-24	12.54	7.66	17.79	22.92	57.91	99.50	64.50	-
25-29	7.00	4.97	5.46	9.66	14.69	25.24	45.08	38.07
30-34	7.72	3.99	5.67	5.72	14.16	19.23	36.28	40.40
35-39	12.62	11.62	10.22	5.78	8.41	18.83	7.12	92.03
40 and over	11.91	6.25	10.51	-	35.61	-	31.81	10.55

Source: Instituto Nacional de Estadísticas. Tapes of births and deaths.

Table A11-c

CHILE: INFANT MORTALITY RATES BY BIRTH ORDER, AGE AND EDUCATIONAL LEVEL OF MOTHER 1978

Age and educational level of mother	Birth order							
	Total	1	2	3	4	5	6	7 and over
Total	40.93	32.72	39.43	42.30	56.21	56.63	64.05	75.01
< 20	55.42	46.88	77.63	116.37	163.67	78.82	-	-
20-24	39.38	27.12	42.89	57.37	74.86	84.07	142.12	150.39
25-29	33.30	22.18	27.78	34.11	48.16	53.72	74.53	84.57
30-34	34.96	22.30	22.37	28.02	42.67	44.19	56.75	75.24
35-39	45.77	34.93	30.40	35.04	45.62	58.63	46.20	66.08
40 and over	55.73	26.53	41.75	31.73	46.55	71.27	58.22	70.53
None	98.85	106.98	90.90	81.71	112.41	101.03	83.15	104.75
< 20	126.62	112.76	162.75	118.28	213.17	-	-	-
20-24	98.56	114.40	63.30	95.17	150.07	90.09	-	262.21
25-29	91.81	80.92	83.56	57.90	113.03	108.25	105.28	110.79
30-34	90.38	81.50	58.75	74.76	90.46	89.79	62.50	118.30
35-39	81.77	74.96	73.23	88.83	86.71	41.20	75.22	90.44
40 and over	120.25	348.53	-	84.07	-	270.59	120.75	103.19
Primary	44.56	38.37	44.98	44.25	48.41	54.04	58.98	60.78
< 20	57.06	49.09	75.11	103.33	158.50	114.30	-	-
20-24	43.52	31.34	45.10	55.45	62.00	77.19	139.02	138.74
25-29	38.60	29.00	35.29	34.63	44.86	49.87	63.23	77.02
30-34	37.56	25.97	26.03	31.94	40.36	39.32	58.02	60.73
35-39	44.07	36.50	28.17	33.37	42.46	69.84	41.54	52.89
40 and over	46.92	20.05	43.04	31.11	36.08	50.78	40.92	59.32
High school and over	28.93	22.55	28.80	34.76	52.45	45.95	80.68	126.54
< 20	42.25	35.22	69.89	239.12	163.28	-	-	-
20-24	30.20	20.93	38.07	57.07	119.62	163.78	376.98	-
25-29	22.47	15.68	19.31	31.51	46.19	39.21	143.38	111.83
30-34	23.63	16.05	17.53	20.63	39.89	47.17	42.14	142.87
35-39	37.85	29.92	28.92	31.95	44.23	30.99	48.53	153.77
40 and over	37.10	-	20.69	-	56.31	-	93.44	82.14

Source: Instituto Nacional de Estadísticas. Tapes of births and deaths.

Table A 12

BIRTH STRUCTURE BY BIRTH ORDER, AGE OF MOTHER, LENGHT OF BIRTH INTERVAL AND EDUCATIONAL LEVEL OF MOTHER AND PERCENTAGE OF "FAVORABLE" BIRTHS BY EDUCATIONAL LEVEL OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU a/

	Costa Rica	Mexico	Paraguay	Perú
Birth order				
1	21.0	18.7	22.1	18.8
2 - 3	31.3	30.9	32.4	32.6
4 - 6	27.5	30.7	27.8	30.7
7 and over	20.2	19.7	17.7	17.9
Total	100.0	100.0	100.0	100.0
Age of mother				
Under 20	15.2	17.1	14.9	14.5
20 - 24	31.9	30.2	29.2	29.2
25 - 29	27.1	26.4	26.6	27.1
30 - 34	16.6	16.8	18.1	18.3
35 and over	9.2	9.5	11.2	10.9
Total	100.0	100.0	100.0	100.0
Lenght of birth interval (months)				
7 - 11	6.8	5.6	4.4	6.5
12 - 17	28.5	20.6	17.2	19.3
18 - 23	22.3	23.8	21.7	20.5
24 - 35	23.6	31.1	32.8	30.1
36 and over	18.8	18.9	23.9	23.6
Total	100.0	100.0	100.0	100.0
Educational level of mother (years)				
0 - 3	47.8	66.7	52.3	67.5
4 - 6	38.1	23.5	36.4	19.9
7 and over	14.1	9.8	11.3	12.6
Total	100.0	100.0	100.0	100.0
Educational level of mother (years)	Percentage of "favorable" births			
0 - 3	37.0	41.2	40.1	41.1
4 and over	58.9	57.8	60.1	60.6
Total	48.4	46.8	50.0	47.4

a/ "Favorable birth": birth order under 4, age of mother under 30.

Table A 13

BIRTH STRUCTURE BY BIRTH ORDER, AGE OF MOTHER AND EDUCATIONAL LEVEL OF MOTHER AND PERCENTAGE OF "FAVORABLE" BIRTHS BY EDUCATIONAL LEVEL OF MOTHER IN CHILE, 1972 AND 1978 a/

	1972	1978
Birth order		
1	33.5	40.4
2	23.5	26.8
3	14.5	14.4
4	8.8	7.4
5	5.7	4.0
6	3.9	2.4
7 and over	10.1	4.6
Total	100.0	100.0
Age of mother		
Under 20	15.9	17.3
20 - 24	31.4	33.5
25 - 29	25.2	24.6
30 - 34	15.2	14.6
35 - 39	8,1	7.2
40 and over	4.2	2.8
Total	100.0	100.0
Educational level of mother		
None	6.9	3.8
Primary	66.4	59.7
High school and over	26.7	36.5
Total	100.0	100.0
Educational level of mother	Percentage of "favorable" births	
None + Primary	55.8	64.1
High school and over	73.3	75.4
Total	60.5	68.2

a/"Favorable" births: birth order under 4, age of mother under 30.

Table A 14

COEFFICIENTS OF VARIATION OF INFANT MORTALITY RATES SPECIFIC FOR BIRTH ORDER, AGE OF MOTHER AND LENGTH OF BIRTH INTERVAL WITHIN CATEGORIES OF EDUCATIONAL LEVEL OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU AND IN CHILE IN 1972 AND 1978

Educational level of mother a/	Costa Rica	Mexico	Paraguay	Peru	Chile	
					1972	1978
Birth Order						
Low	0.1597	0.1074	0.1769	0.0593	0.1262	0.1242
Medium	0.3247	0.1538	0.2312	0.1256	0.0929	0.1653
High	0.1817	0.2875	0.2476	0.2492	0.4453	0.6528
Age of mother						
Low	0.1361	0.1598	0.1816	0.0841	0.1644	0.1760
Medium	0.3448	0.0973	0.1932	0.1735	0.1453	0.1577
High	0.3797	0.5339	0.4802	0.1306	0.2395	0.2515
Birth Interval						
Low	0.6136	0.5083	0.5415	0.5049	-	-
Medium	0.8129	0.7282	0.6229	0.5186	-	-
High	0.2404	0.1553	0.6527	0.4113	-	-

a/ In Costa Rica, Mexico, Paraguay and Peru:

Low = less than 4 years of schooling
Medium = 4 to 6 years of schooling
High = 7 or more years of schooling

In Chile:
Low = none
Medium = primary school
High = high school or more

Table A 15

"FAVORABLE" AND "UNFAVORABLE" BIRTHS, DEATHS AND MORTALITY RATES, AND RATIOS BETWEEN "UNFAVORABLE" AND "FAVORABLE" RATES BY EDUCATIONAL LEVEL OF MOTHER, IN COSTA RICA, MEXICO, PARAGUAY AND PERU a/

Educational level (years) and countries	Total births	Favorable			Unfavorable			Ratio unf/fav
		Births	Deaths	Rates	Births	Deaths	Rates	
Total								
Costa Rica	11 087	5 369	333	62.0	2 432	198	81.4	1.31
Mexico	22 715	10 621	801	75.4	5 344	422	79.0	1.05
Paraguay	9 319	4 628	210	45.4	2 278	136	59.7	1.31
Peru	20 701	9 818	977	99.5	5 228	606	115.9	1.16
0-3								
Costa Rica	5 303	1 960	159	81.1	1 523	132	86.7	1.07
Mexico	15 145	6 244	561	89.9	4 097	339	82.7	0.92
Paraguay	4 869	1 952	105	53.8	1 570	102	65.0	1.21
Peru	13 985	5 749	746	129.8	4 204	533	126.8	0.98
4 and more								
Costa Rica	5 784	3 409	174	51.0	909	66	72.6	1.42
Mexico	7 570	4 377	240	54.8	1 247	83	66.6	1.22
Paraguay	4 450	2 676	105	39.2	708	34	48.0	1.22
Peru	6 716	4 069	231	56.8	1 024	73	71.3	1.26

a/ Favorable: birth order under 4 and age of mother under 30
Unfavorable: birth order 4 and over and age of mother 30 and over

Table A 16

"FAVORABLE" AND "UNFAVORABLE" NEONATAL, POSTNEONATAL AND INFANT MORTALITY RATES AND RATIOS BETWEEN UNFAVORABLE AND FAVORABLE RATES IN CHILE, 1972 AND 1978 a/

	1972			1978		
	Under 1 month	1-11 months	Under 1 year	Under 1 month	1-11 months	Under 1 year
Total	29.1	38.7	67.7	17.7	18.1	35.8
Favorable	27.0	35.6	62.6	16.5	17.2	33.6
Unfavorable	34.5	47.2	81.6	24.1	25.3	49.4
Others	30.6	40.6	71.2	18.3	17.3	35.6
None+Primary	31.4	46.7	78.1	18.7	23.1	41.8
Favorable	30.1	45.0	75.1	17.5	22.5	40.0
Unfavorable	34.2	50.0	84.2	23.1	26.9	50.0
Others	32.4	47.7	80.0	19.2	22.3	41.5
High and over	22.6	16.7	39.3	16.0	9.4	25.4
Favorable	20.7	15.9	36.5	15.0	9.4	24.3
Unfavorable	36.9	24.6	61.4	28.9	17.1	46.0
Others	24.6	17.0	41.6	16.5	8.1	24.6
	Ratios: Unfavorable/favorable					
Total	1.28	1.33	1.30	1.46	1.47	1.47
None+Primary	1.14	1.11	1.12	1.32	1.20	1.25
High and over	1.78	1.55	1.68	1.93	1.82	1.89

a/ Favorable: birth order under 4 and age of mother under 30
Unfavorable: birth order 4 and over and age of mother 30 and over

Table A 17

COEFFICIENTS OF LINEAR REGRESSION (b), RATIO BETWEEN b AND THE MEAN OF RATES ($b/\bar{y}$), CORRELATION COEFFICIENT (r) AND r^2 FOR THE RELATION OF INFANT MORTALITY RATES WITH BIRTH ORDER IN COSTA RICA, MEXICO, PARAGUAY, PERU AND CHILE, AND FOR THE RELATION OF NEONATAL AND POSTNEONATAL MORTALITY RATES WITH BIRTH ORDER IN CHILE WITHIN CATEGORIES OF EDUCATIONAL LEVEL OF MOTHER IN 1972 AND 1978

Rate, country, group	b	$b/\bar{y}$	r	r^2	Rate
Infant mortality					
Costa Rica	4.98	0.0719	0.9098	0.8277	67.70
Mexico	1.90	0.0240	0.9160	0.8391	78.43
Paraguay	3.33	0.0635	0.9755	0.9516	50.86
Peru	5.10	0.0460	0.9939	0.9878	109.44
Chile 1972	5.33	0.0649	0.9871	0.9744	74.62
Chile 1978	5.21	0.1001	0.9717	0.9442	40.93
Neonatal					
Chile 1972	1.56	0.0463	0.9657	0.9326	31.80
Chile 1978	2.00	0.0815	0.9427	0.8887	19.92
Postneonatal					
Chile 1972	3.76	0.0779	0.9838	0.9679	42.82
Chile 1978	3.21	0.1168	0.9682	0.9374	21.01
Neonatal, Chile, 1972					
No education	-3.14	-0.0556	-0.8291	0.6874	56.53
Primary	0.85	0.0261	0.8581	0.7363	31.94
High school and over	5.04	0.1452	0.9806	0.9616	24.52
Neonatal, Chile, 1978					
No education	-1.46	-0.0303	-0.3182	0.1013	40.44
Primary	1.18	0.0528	0.8000	0.6400	19.77
High school and over	7.80	0.2284	0.9391	0.8819	18.01
Postneonatal, Chile, 1972					
No education	-2.86	0.0282	-0.6111	0.3734	96.35
Primary	1.95	0.0377	0.9488	0.9002	46.99
High school and over	5.51	0.1812	0.9605	0.9226	18.48
Postneonatal, Chile, 1978					
No education	0.06	0.0010	0.0271	0.0007	58.41
Primary	1.73	0.0628	0.9623	0.9260	24.79
High school and over	5.28	0.2421	0.9770	0.9545	10.92

Table A 18

a) CHILE: CAUSE-SPECIFIC NEONATAL MORTALITY RATES BY BIRTH ORDER, 1972. (RATES PER 1000)

Causes	Order of birth			
	1	2-3	44 +	Total
Diarrheas (001-009)	1.75	1.84	2.13	1.90
Septicemia (038)	2.40	2.51	2.27	2.40
Respiratory diseases (460-519)	4.57	4.83	7.60	5.53
Congenital anomalies (740-759)	1.71	1.76	1.82	1.76
Birth injuries (772)	3.32	2.77	2.41	2.87
Anoxia and hypoxia (776)	7.06	7.70	8.31	7.65
Immaturity (777)	3.00	2.91	3.27	3.04
Ill-defined (778-796)	2.79	3.83	5.82	4.06
Others	2.30	2.19	3.12	2.49
Total	28.90	30.34	36.75	31.70

b) CHILE: CAUSE-SPECIFIC POSTNEONATAL MORTALITY RATES BY BIRTH ORDER, 1978. (RATES PER 1000)

Causes	Order of birth			
	1	2-3	44 +	Total
Diarrheas (001-009)	6.77	8.38	11.75	8.77
Septicemia (038)	1.05	1.06	1.76	1.26
Malnutrition (260-269)	1.41	1.89	3.32	2.15
Respiratory diseases (460-519)	13.73	16.13	22.70	17.23
Congenital anomalies (740-759)	1.03	1.48	1.67	1.38
Ill-defined (778-796)	4.23	6.07	8.50	6.17
Accidents (800-999)	1.09	1.53	0.88	1.17
Others	4.01	4.74	5.43	4.68
Total	33.32	41.28	56.01	42.81

Table A 19

a) CHILE: CAUSE-SPECIFIC NEONATAL MORTALITY RATES BY BIRTH ORDER, 1978. (RATES PER 1000)

Causes	Order of birth			
	1	2-3	44 +	Total
Diarrheas (001-009)	0.38	0.55	0.77	0.53
Septicemia (038)	1.07	1.06	1.73	1.19
Respiratory diseases (460-519)	1.25	1.45	2.78	1.62
Congenital anomalies (740-759)	1.70	2.29	2.30	2.06
Birth injuries (772)	1.00	1.24	1.69	1.21
Anoxia and hypoxia (776)	6.39	7.97	8.83	7.50
Immaturity (777)	0.87	0.96	1.36	0.98
Ill-defined (778-796)	2.05	3.08	5.89	3.19
Others	1.16	1.70	2.58	1.64
Total	15.87	20.30	27.93	19.92

b) CHILE: CAUSE-SPECIFIC POSTNEONATAL MORTALITY RATES BY BIRTH ORDER, 1978. (RATES PER 1000)

Causes	Order of birth			
	1	2-3	44 +	Total
Diarrheas (001-009)	2.39	3.06	4.80	3.09
Septicemia (038)	0.98	1.13	2.00	1.22
Malnutrition (260-269)	1.04	1.12	2.18	1.25
Respiratory diseases (460-519)	4.72	5.62	8.94	5.89
Congenital anomalies (740-759)	1.32	1.64	2.46	1.68
Ill- defined (778-796)	3.60	4.68	7.40	4.75
Accidents (800-999)	0.89	0.95	0.80	0.89
Others	1.85	2.05	3.52	2.25
Total	16.79	20.25	32.10	21.02

Table A 20

a) CHILE: CAUSE-SPECIFIC NEONATAL MORTALITY RATES BY BIRTH ORDER AND EDUCATIONAL LEVEL OF MOTHER, 1972. (RATES PER 1000)

Causes	Educational level and Birth order							
	None or Primary				Secondary or Higher			
	1	2-3	44 +	Total	1	2-3	44 +	Total
Diarrheas (001-009)	2.11	2.06	2.17	2.11	1.09	1.34	1.88	1.28
Septicemia (038)	2.71	2.86	2.32	2.63	1.85	1.70	1.88	1.79
Respiratory diseases (460-519)	5.89	5.70	7.92	6.52	2.24	2.81	4.97	2.81
Congenital anomalies (740-759)	1.71	1.63	1.79	1.71	1.71	2.04	2.15	1.91
Birth injuries (772)	3.56	2.80	2.29	2.85	2.91	2.66	3.49	2.88
Anoxia and hypoxia (776)	7.41	7.64	7.77	7.62	6.46	7.85	12.61	7.78
Immaturity (777)	3.42	3.15	3.14	3.22	2.24	2.37	4.29	2.54
Ill-defined (778-796)	3.75	4.93	6.06	4.97	1.09	1.29	3.89	1.51
Others	2.64	2.26	3.01	2.63	1.68	1.99	4.03	2.09
Total	33.20	33.03	36.47	34.26	21.27	24.05	39.19	24.59

b) CHILE: CAUSE-SPECIFIC POSTNEONATAL MORTALITY RATES BY BIRTH ORDER AND EDUCATIONAL LEVEL OF MOTHER, 1972. (RATES PER 1000)

Causes	Educational level and Birth order							
	None or Primary				Secondary or Higher			
	1	2-3	44 +	Total	1	2-3	44 +	Total
Diarrheas (001-009)	8.82	10.48	12.40	10.66	3.13	3.53	6.54	3.71
Septicemia (038)	1.26	1.25	1.79	1.44	0.68	0.63	1.50	0.76
Malnutrition (260-269)	1.88	2.39	3.46	2.60	0.57	0.76	2.18	0.84
Respiratory diseases (460-519)	18.87	20.32	24.14	21.22	4.63	6.42	11.03	6.16
Congenital anomalies (740-759)	1.06	1.51	1.55	1.40	0.96	1.39	2.59	1.34
Ill defined (778-796)	5.76	7.93	9.13	7.71	1.53	1.76	3.40	1.85
Accidents (800-999)	1.44	1.64	0.84	1.30	0.46	1.28	1.09	0.89
Others	4.91	5.56	5.38	5.31	2.39	2.81	5.72	2.97
Total	44.00	51.08	58.69	51.64	14.35	18.58	34.05	18.52

Table A 21

a) CHILE: CAUSE-SPECIFIC NEONATAL MORTALITY RATES BY BIRTH ORDER AND EDUCATIONAL LEVEL OF MOTHER, 1978. (RATES PER 1000)

Causes	Educational level and Birth order							
	None or Primary				Secondary or Higher			
	1	2-3	44 +	Total	1	2-3	44 +	Total
Diarrheas (001-009)	0.50	0.59	0.72	0.59	0.23	0.51	1.08	0.42
Septicemia (038)	1.11	1.04	1.77	1.24	1.04	1.08	1.45	1.10
Respiratory diseases (460-519)	1.54	1.73	2.89	1.94	0.90	1.00	2.18	1.04
Congenital anomalies (740-759)	1.56	1.95	1.84	1.78	1.89	2.82	4.90	2.54
Birth injuries (772)	1.06	1.06	1.54	1.18	0.92	1.51	2.55	1.31
Anoxia and hypoxia (776)	6.56	7.96	7.94	7.46	6.16	7.98	13.82	7.54
Immaturity (777)	0.87	0.96	1.12	0.97	0.86	0.96	2.72	1.05
Ill-defined (778-796)	2.85	3.78	6.29	4.06	1.04	1.96	3.63	1.64
Others	1.42	1.69	2.49	1.79	0.83	1.73	3.09	1.39
Total	17.47	20.76	26.60	21.01	13.87	19.55	35.42	18.03

b) CHILE: CAUSE SPECIFIC POSTNEONATAL MORTALITY RATES BY BIRTH ORDER AND EDUCATIONAL LEVEL OF MOTHER, 1978. (RATES PER 1000)

Causes	Educational level and Birth order							
	None or Primary				Secondary or Higher			
	1	2-3	44 +	Total	1	2-3	44 +	Total
Diarrheas (001-009)	3.62	4.23	5.06	3.95	0.83	1.22	3.36	1.20
Septicemia (038)	1.21	1.37	1.89	1.37	0.68	0.76	2.62	0.87
Malnutrition (260-269)	1.50	1.49	2.43	1.47	0.44	0.52	0.75	0.50
Respiratory diseases (460-519)	6.54	7.22	9.55	6.98	2.39	3.06	5.60	2.94
Congenital anomalies (740-759)	1.55	1.72	2.39	1.79	1.04	1.52	2.80	1.38
Ill-defined (778-796)	5.41	6.48	8.17	5.84	1.24	1.81	3.18	1.64
Accidents (800-999)	1.18	1.12	0.71	1.04	0.50	0.66	1.31	0.64
Others	1.97	2.38	3.44	2.32	1.69	1.52	3.93	1.79
Total	22.98	26.01	33.64	27.76	8.81	11.07	23.55	10.96

Table A 22

a) CHILE: CAUSE-SPECIFIC NEONATAL MORTALITY RATES BY AGE OF MOTHER, 1972. (RATES PER 1000)

Causes	Age of mother						
	< 20	20-24	25-29	30-34	35-39	40 +	Total
Diarrheas (001-009)	2.47	1.85	1.37	1.85	2.28	2.57	1.90
Septicemia (038)	3.10	2.43	2.16	2.22	2.12	2.27	2.40
Respiratory diseases (460-519)	7.12	4.93	4.38	4.93	7.30	9.69	5.53
Congenital anomalies (740-759)	1.89	1.70	1.58	1.60	2.12	2.68	1.76
Birth injuries (772)	3.64	2.66	2.50	2.78	3.17	3.50	2.87
Anoxia and hypoxia (776)	8.92	7.14	6.79	6.92	10.31	9.28	7.65
Immaturity (777)	4.12	3.21	2.37	2.67	3.28	2.78	3.04
Ill-defined (778-796)	4.83	3.58	3.05	4.02	6.03	7.22	4.06
Others	2.53	2.21	2.29	2.62	3.43	3.19	2.49
Total	38.62	29.71	26.49	29.61	40.04	43.18	31.70

b) CHILE: CAUSE-SPECIFIC POSTNEONATAL MORTALITY RATES BY AGE OF MOTHER, 1972. (RATES PER 1000)

Causes	Age of mother						
	< 20	20-24	25-29	30-34	35-39	40 +	Total
Diarrheas (001-009)	11.90	9.23	7.08	6.46	9.08	11.51	8.77
Septicemia (038)	1.73	1.00	0.96	1.40	1.56	2.20	1.26
Malnutrition (260-269)	2.88	1.97	1.76	2.03	2.09	3.55	2.15
Respiratory diseases (460-519)	23.15	16.98	14.35	15.11	17.78	20.52	17.23
Congenital anomalies (740-759)	1.21	1.44	1.15	1.28	1.72	2.61	1.38
Ill-defined (778-796)	7.77	5.90	5.54	5.62	6.44	7.22	6.17
Accidents (800-999)	1.73	1.21	0.95	1.40	0.49	0.84	1.17
Others	5.58	4.87	3.78	4.86	4.41	5.24	4.68
Total	55.95	42.60	35.57	38.16	43.57	53.69	42.81

Table A 23

a) CHILE: CAUSE-SPECIFIC NEONATAL MORTALITY RATES BY AGE OF MOTHER, 1978. (RATES PER 1000)

Causes	Age of mother						
	< 20	20-24	25-29	30-34	35-39	40 +	Total
Diarrheas (001-009)	0.45	0.48	0.55	0.61	0.64	0.92	0.53
Septicemia (038)	1.29	1.15	1.27	1.07	1.00	1.47	1.19
Respiratory diseases (460-519)	2.64	1.28	1.42	0.99	2.22	2.76	1.62
Congenital anomalies (740-759)	2.10	1.93	1.95	1.88	2.87	3.13	2.06
Birth injuries (772)	1.29	1.32	0.93	1.10	1.36	2.20	1.21
Anoxia and hypoxia (776)	9.45	7.21	6.48	6.57	8.74	9.57	7.50
Immaturity (777)	1.32	0.78	0.97	1.10	0.93	0.73	0.98
Ill-defined (778-796)	3.87	3.08	2.51	2.73	4.80	4.78	3.19
Others	1.53	1.53	1.59	1.81	2.51	0.92	1.64
Total	23.94	18.76	17.67	17.86	25.07	26.48	19.92

b) CHILE: CAUSE-SPECIFIC POSTNEONATAL MORTALITY RATES BY AGE OF MOHTER, 1978. (RATES PER 1000)

Causes	Age of mother						
	< 20	20-24	25-29	30-34	35-39	40 +	Total
Diarrheas (001-009)	4.56	3.08	2.46	2.21	2.81	4.75	3.09
Septicemia (038)	1.58	1.37	0.82	0.99	1.25	1.71	1.22
Malnutrition (260-269)	2.10	1.18	0.65	1.24	1.63	1.32	1.25
Respiratory diseases (460-519)	9.62	5.76	4.35	4.91	4.96	5.32	5.89
Congenital anomalies (740-759)	1.89	1.44	1.44	1.43	2.81	3.80	1.68
Ill-defined (778-796)	7.09	4.60	3.60	3.52	4.21	9.88	4.75
Accidents (800-999)	1.86	0.85	0.63	0.63	0.59	-	0.89
Others	2.75	2.36	1.69	2.16	2.44	2.47	2.25
Total	31.45	20.64	15.64	17.09	20.70	29.25	21.02

Table A 24

PERCENTAGE OF BIRTHS WITH MOTHERS OF LOW LEVEL OF EDUCATION BY BIRTH ORDER, AGE OF MOTHER AND LENGTH OF BIRTH INTERVAL, BY COUNTRIES 1/

	C.Rica	Mexico	Paraguay	Peru	Chile	
					1972	1978
Birth order						
1	30.3	53.9	36.6	52.8	64.0	56.1
2-3	39.6	61.2	44.0	61.0	69.8	61.5
4-6	55.9	71.7	60.6	74.0	85.3	81.2
7 and over	67.7	79.5	73.8	83.9	95.5	95.1
Total	47.8	66.7	52.3	67.6	73.3	63.6
Age of mother						
< 20	38.6	66.1	51.6	63.4	79.4	75.0
20-24	41.7	61.6	44.0	61.6	70.2	59.5
25-29	51.0	65.4	50.6	66.6	67.4	57.0
30-34	54.7	72.1	58.5	74.3	74.7	62.5
35 and over	62.5	77.9	68.4	80.1	83.8	74.9
Total	47.8	66.7	52.3	67.6	73.3	63.6
Birth interval (months)						
7-11	55.5	72.8	41.9	78.0	-	-
12-17	53.5	62.3	55.7	65.5	-	-
18-23	53.0	69.3	58.2	68.6	-	-
24-35	56.4	73.2	57.9	74.5	-	-
36 and over	44.3	71.4	53.4	71.0	-	-
Total	52.5	69.6	56.7	71.0	-	-

Table A 25

INFANT MORTALITY RATES BY BIRTH ORDER IN COSTA RICA, MEXICO, PARAGUAY AND PERU. OBSERVED RATES AND RATES STANDARDIZED BY EDUCATIONAL LEVEL OF MOTHER

Birth order	Costa Rica				Mexico			
	Rates observed by educational level			Standardized rates	Rates observed by educational level			Standardized rates
	0-3	4 +	Total		0-3	4 +	Total	
1	79.21	46.83	56.65	62.32	90.11	59.85	76.16	80.02
2-3	77.93	51.63	62.05	64.21	88.07	48.57	72.75	74.90
4-6	68.00	51.26	60.62	59.27	82.13	69.23	78.48	77.83
7 and over	98.88	95.44	97.77	97.09	92.34	78.43	89.49	87.70
% of births for standardization	47.83	52.17			66.67	33.33		

Birth order	Paraguay				Peru			
	Rates observed by educational level			Standardized rates	Rates observed by educational level			Standardized rates
	0-3	4 +	Total		0-3	4 +	Total	
1	47.81	41.32	43.69	44.71	132.10	54.86	95.64	107.04
2-3	57.23	35.52	45.08	46.86	125.55	55.89	98.40	102.95
4-6	52.90	48.97	51.35	51.02	129.92	73.90	115.36	111.74
7 and over	71.37	64.67	69.61	68.17	143.96	83.89	134.29	124.47
% of births for standardization	52.25	47.75			67.55	32.45		

Table A 26

INFANT MORTALITY RATES BY AGE OF MOTHER IN COSTA RICA, MEXICO, PARAGUAY AND PERU. OBSERVED RATES AND RATES STANDARDIZED BY EDUCATIONAL LEVEL OF MOTHER

Age of mother	Costa Rica				Mexico			
	Rates observed by educational level			Standardized rates	Rates observed by educational level			Standardized rates
	0-3	4 +	Total		0-3	4 +	Total	
Under 20	95.38	79.38	85.56	87.03	108.81	78.27	98.45	98.63
20-24	74.48	48.43	59.29	60.89	90.78	54.33	76.78	78.63
25-29	78.92	43.51	61.58	60.45	76.32	57.72	69.88	70.12
30-34	73.71	48.08	62.09	60.34	74.05	52.48	68.03	66.86
35 and over	97.03	94.00	95.89	95.45	94.27	75.63	90.15	88.06
% of births for standardization	47.83	52.17			66.67	33.33		

Age of mother	Paraguay				Peru			
	Rates observed by educational level			Standardized rates	Rates observed by educational level			Standardized rates
	0-3	4 +	Total		0-3	4 +	Total	
Under 20	65.46	44.58	55.36	55.49	150.97	81.82	125.63	128.53
20-24	40.07	41.34	40.78	40.68	135.63	58.19	105.87	110.50
25-29	62.20	45.71	54.05	54.33	128.45	55.53	104.10	104.79
30-34	64.02	35.87	52.35	50.58	124.25	62.50	108.39	104.21
35 and over	64.34	54.38	61.19	59.58	124.52	64.73	112.64	105.12
% of births for standardization	52.25	47.75			67.55	32.45		

Table A 27

CHILE: NEONATAL, POSTNEONATAL AND INFANT MORTALITY RATES BY BIRTH ORDER, OBSERVED AND STANDARDIZED BY EDUCATIONAL LEVEL OF MOTHER AND AGE OF MOTHER

Birth order	Under 1 month			1 to 11 months			Under 1 year		
	Observed rates	Rates standardized by Educational level	Rates standardized by Age of mother	Observed rates	Rates standardized by Educational level	Rates standardized by Age of mother	Observed rates level	Rates standardized by Educational	Rates standardized by Age of mother
				1972					
1	28.9	31.3	29.3	33.2	37.8	29.4	62.1	69.1	58.6
2	30.4	32.0	30.4	40.0	43.5	38.5	70.4	75.4	68.9
3	30.1	30.4	32.5	43.4	44.1	47.2	73.5	74.5	79.6
4 +	36.9	36.6	41.5	56.1	50.3	63.9	93.0	87.0	105.3
				1978					
1	15.9	16.6	15.2	16.8	18.6	14.1	32.7	35.2	29.2
2	19.4	19.7	20.0	20.1	21.1	21.1	39.4	40.8	41.2
3	21.8	22.0	27.9	20.5	20.3	27.4	42.3	42.2	55.3
4 +	28.0	29.2	35.6	32.2	28.8	45.0	60.1	58.0	80.6

Table A 28

CHILE: NEONATAL, POSTNEONATAL AND INFANT MORTALITY RATES BY AGE OF MOTHER, OBSERVED AND STANDARDIZED BY EDUCATIONAL LEVEL OF MOTHER AND BIRTH ORDER

	Under 1 month			1 to 11 months			Under 1 year		
		Rates standardized by			Rates standardized by			Rates standardized by	
	Observed rates	Educational level	Birth order	Observed rates	Educational level	Birth order	Observed rates	Educational level	Birth order
				1972					
Age of mother									
Under 20	38.6	39.0	48.8	56.0	55.7	67.5	94.6	94.7	116.2
20-24	29.7	30.7	31.6	42.6	45.0	48.1	72.3	75.7	79.7
25-29	26.5	27.2	26.1	35.6	37.8	34.0	62.1	65.0	60.1
30-34	29.6	28.9	32.4	38.2	36.7	31.5	67.8	65.6	63.9
35 +	41.1	39.6	39.1	47.0	40.7	38.5	88.1	80.3	77.6
				1978					
Age of mother									
Under 20	23.9	24.2	36.6	31.5	30.1	46.3	55.4	54.3	83.0
20-24	18.7	19.1	21.5	20.6	21.7	24.7	39.4	40.8	46.1
25-29	17.6	18.0	16.9	15.7	16.8	14.8	33.3	34.8	31.8
30-34	17.9	17.7	15.7	17.1	16.9	13.1	35.0	34.5	28.8
35 +	25.5	24.5	20.8	23.1	19.7	17.2	48.6	44.3	38.0

Table A 29

INFANT MORTALITY RATES BY BIRTH ORDERS 1 TO 4 AND BY EDUCATIONAL LEVEL OF MOTHER IN LARGE AND SMALL COMPLETED FAMILIES IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Birth order and educational level	Costa Rica		Mexico		Paraguay		Peru	
	S.F.a/	L.F.	S.F.b/	L.F.	S.F.	L.F.	S.F.	L.F.
Total	44.5	76.4	40.0	84.6	33.3	41.9	51.4	109.2
1	48.9	81.2	57.3	77.4	35.4	48.8	58.0	119.0
2	44.4	77.2	23.7	106.0	23.3	48.4	49.1	106.0
3	39.7	81.2	38.5	76.8	41.7	34.1	42.6	94.1
4	37.6	68.7	32.4	80.5	40.0	41.9	56.1	119.3
0-3 years								
Total	62.3	88.0	61.0	92.4	61.5	42.7	90.3	134.3
1	78.7	79.1	85.1	91.3	55.1	62.5	86.3	162.6
2	59.6	84.9	55.8	113.0	36.4	36.6	95.8	137.7
3	51.3	93.5	46.9	94.6	98.8	47.2	88.7	113.8
4	38.5	90.7	36.0	77.5	75.0	36.4	93.6	123.6
4 and over								
Total	38.6	63.3	27.2	74.1	21.8	41.2	37.7	59.6
1	39.8	83.3	41.9	62.2	28.3	40.0	45.6	71.3
2	39.7	68.8	4.7	97.0	18.1	57.7	29.9	62.1
3	35.4	66.7	33.2	51.5	16.4	21.9	23.6	29.1
4	37.3	42.5	29.4	85.0	16.7	48.3	22.3	75.4

a/ S.F.: Small families
b/ L.F.: Large families

Table A 30

INFANT MORTALITY RATES BY AGE OF MOTHER IN LARGE AND SMALL COMPLETED FAMILIES IN COSTA RICA, MEXICO, PARAGUAY AND PERU

Age of mother	Costa Rica		Mexico		Paraguay		Peru	
	S.F.[a]	L.F.	S.F.[b]	L.F.	S.F.	L.F.	S.F.	L.F.
Total	44.5	76.4	40.0	84.6	33.3	41.9	51.4	109.2
Under 25	44.4	85.7	42.6	90.4	38.1	32.4	68.7	103.4
25-29	50.9	54.9	28.0	84.5	25.4	62.3	27.9	107.3
30 +	34.4	48.0	49.9	34.5	32.0	26.1	43.6	140.0

a/ S.F.: Small families
b/ L.F.: Large families

Table A 31

PERCENTAGE OF BIRTHS BELONGING TO LARGE FAMILIES AMONG BIRTHS OF COMPLETED FAMILIES BY BIRTH ORDER

Birth order	Costa Rica			Mexico		
	Total births	Large families N°	%	Total births	Large families N°	%
1	1 175	419	35.7	1 289	504	39.1
2	1 149	518	45.1	1 287	613	47.6
3	1 019	591	58.0	1 248	755	60.5
4	856	670	78.3	1 117	870	77.9
Total	4 199	2 198	52.3	4 941	2 742	55.5

Birth order	Paraguay			Peru		
	Total births	Large families N°	%	Total births	Large families N°	%
1	603	123	20.4	965	293	30.4
2	572	186	32.5	1 045	434	41.5
3	528	264	50.0	1 010	564	55.8
4	410	310	75.6	891	696	78.1
Total	2 113	883	41.8	3 911	1 987	50.8

Table A 32

CHARACTERISTICS OF WOMEN WITH LARGE AND SMALL COMPLETED FAMILIES BY COUNTRIES

	Mean age at marriage		Mean age at interview	
	Large	Small	Large	Small
Costa Rica	19.4	21.3	40.2	35.3
Mexico	18.5	20.5	40.7	35.6
Paraguay	19.1	20.8	43.2	37.3
Peru	18.9	21.2	42.9	37.3

	Percentage among known, with 6 or more months of breastfeeding in last closed interval		Percentage of ever users of contraceptives	
	Large	Small	Large	Small
Costa Rica	57.4	41.1	55.9	42.6
Mexico	76.3	61.6	41.6	37.6
Paraguay	85.2	78.9	25.2	18.4
Peru	80.7	66.0	20.9	24.8

	Percentage with 4 or more years of schooling		Percentage living in urban areas	
	Large	Small	Large	Small
Costa Rica	45.7	75.7	40.0	67.2
Mexico	36.1	59.4	65.6	78.6
Paraguay	43.1	69.2	37.4	64.1
Peru	34.3	63.8	66.0	82.2

Table A 33

STATISTICAL SIGNIFICANCE OF MAIN EFFECTS AND INTERACTIONS OF BIRTH ORDER (O), AGE OF MOTHER (A), LENGTH OF BIRTH INTERVAL (I) AND EDUCATIONAL LEVEL OF MOTHER (E) ON SURVIVAL (S) IN COSTA RICA,MEXICO, PARAGUAY AND PERU (P3F programme of BMDP, UCLA, adjusting log-linear model)

Effects	Costa Rica	Mexico	Paraguay	Peru
SO	*	*	*	**
SA	N.S.	**	N.S.	N.S.
SI	**	**	**	**
SE	**	**	**	**
SOA	*	N.S.	N.S.	N.S.
SOI	N.S.	*	N.S.	*
SAI	N.S.	N.S.	N.S.	**
SOE	N.S.	**	N.S.	*
SAE	N.S.	**	N.S.	N.S.
SIE	N.S.	N.S.	N.S.	**

N.S.: $p > 0.05$

* : $0.01 < p < 0.05$

** : $p < 0.01$

Table A 34

STATISTICAL SIGNIFICANCE OF PARTIAL AND MARGINAL ASSOCIATIONS OF BIRTH ORDER (O), AGE OF MOTHER (A) AND EDUCATIONAL LEVEL OF MOTHER (E) WITH SURVIVAL (S) AT FIRST MONTH AND AT FIRST YEAR OF THOSE WHO SURVIVED THE FIRST MONTH IN CHILE, 1972 AND 1978
(P3F programme of MBDP, UCLA, adjusting log-linear model)

	1972				1978			
	First month		First year		First month		First year	
	Partial	Marginal	Partial	Marginal	Partial	Marginal	Partial	Marginal
SO	**	**	**	**	**	**	**	**
SA	**	**	**	**	**	**	**	**
SE	**	**	**	**	**	**	**	**
SOA	**	**	**	**	*	N.S.	**	**
SOE	**	**	**	**	**	**	**	**
SAE	*	*	**	**	N.S.	N.S.	**	**
SOAE	N.S.	-	*	-	N.S.	-	N.S.	-

N.S.: $p > 0.05$
* : $0.01 < p < 0.05$
** : $p < 0.01$