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SOME INDICATIONS OF THE INCOMPLETENESS OF REGISTRATION OF
INFANT BIRTHS AND DEATHS IN THE REPUBLIC OF ARGENTINA

Presented by

the National Development Council of the
Republic of Argentina

1. INTRODUCTION

The records of births and deaths, as with the majority of statistical data for under-developed countries, contain errors in more than one sense: in completeness on the one hand and in accuracy on the other. The social-economic planning organizations are not the most suitable bodies for evaluating the quality of the vital records (in the first place this should be done by the producers of statistics like the national statistics bureaux) but when such an evaluation is not made then it must be undertaken as a necessity. In fact, the social-economic planners use the population as one of their most important sources of reference, since any calculations of the growth of the production of goods and services - one of the basic indicators of social-economic development - just like other measures, only acquire real significance when related to the number of inhabitants, in the past and present in order to study trends and make analyses and in the future in order to present plans. Thus not only are these planners interested in the size of the population at any given moment as a static measure, but also they are interested in past and probable future trends. In this way, one of the basic sources of information is provided by the registration of births and deaths. Therefore, an evaluation of its completeness and accuracy becomes an urgent necessity for the social-economic planning organizations provided they regard a true statistical base as desirable for their projects.

The aim of this report is the evaluation of the completeness of the registration of infant births and deaths in the Republic of Argentina, by provinces. Since the completeness of registration is in direct relation to the level of social-economic development, varying degrees of completeness may be expected to be found in the different parts of the country which are unequally underdeveloped. Therefore, as vital statistics are presented and published by provinces it is not possible in this study to take into consideration social-economic areas (which do not co-incide with the jurisdictional boundaries) but merely the larger political divisions - provinces - as mere approximations. Exceptions to this rule are made in the following cases: data of the Federal Capital and of the province of Buenos Aires has been collected to form a single total because of the transference of records from one jurisdiction to another within the City of Buenos Aires 1/ and the

1/ The City of Buenos Aires is formed by the Federal Capital and Greater Buenos Aires. The latter pertains to the province of Buenos Aires. In this report the term Buenos Aires refers to the two jurisdictions considered together.

/statistics of

statistics of Chabut, Santa Cruz and Comodoro Rivadavia have very often been considered together because this last jurisdiction, which geographically speaking is included in the first two, existed only temporarily and it was thought that here also there might have existed the problem of transference from one jurisdiction to another. It should be noted, therefore, that numerically speaking the importance of each province is very unequal. The extreme cases are those of Buenos Aires and Tierra del Fuego, with populations of 7,255 thousand and 5 thousand inhabitants, respectively, in 1947 and 10,045 thousand and 8 thousand in 1960.

In this field, that of the evaluation of the completeness of the vital statistics, an already established method is practically non-existent for applying to a country like Argentina, where if under-registration does exist it is not so evident as to be revealed by broad comparison and where information from other sources is not sufficiently reliable. This has been one of the main difficulties in the undertaking of this project which has brought about an additional objective: an attempt to indicate a possible method of analysis to detect incompleteness (and to measure it if possible) in the registration of vital events. But this has not proved an easy task and it has only been possible to suggest a way that ought to be followed with exploration at every turn. Nevertheless, it is believed that this evaluation should be made in the field, through special surveys, when the limits of time and cost permit. But as both ways do not exclude each other there is nothing to prevent their continuing together thus providing a trial of the two independent methods.

The figures of births and deaths for the period 1942-1960 were examined to allow a comparison with the censuses of 1947 and 1960. These figures appeared in the official publications, except for some which were supplied directly by the National Statistics and Census Bureau. As far as the two censuses are concerned, even if the figures of 1947 seem to be of sufficiently acceptable quality, 1960, apart from the fact that there is very little data available at the moment, has a percentage of incompleteness that, even if in itself is not very considerable (3,6%) ^{2/} means it must be rejected as a reliable base for the detection of incompleteness in the other sources.

^{2/} CONADE, Annual figures of the population of Argentina, 1947-1970, Buenos Aires, 1964.

2. INDICATIONS OF THE INCOMPLETENESS OF THE REGISTRATION OF BIRTHS

a) By means of the male birth rate

As is known, the relation between male births and female births is approximately 105 (or 105 males born to every 100 females). "For biological reasons the male birth rate can only vary in very well defined proportions".^{3/} Thus male birth rates that diverge very much from this figure reflect some kind of error as the births taken are those "registered" which may be different in number from those "occurred".

The male birth rates by provinces were calculated for the years 1942 to 1960. The only case of absolute regularity was observed in Buenos Aires where the rates oscillated around 105, never being less than 104 or more than 106 except in the year 1958. The rates of Santa Fe and Salta could be taken to be fairly regular and acceptable and in later years those of Mendoza also. The remaining provinces have very abrupt oscillations all through the years or rates which cannot be accepted as real which can be attributed to errors in the statistics or more precisely to an incomplete sex differential. Over these years the national rates remain fairly constant, all falling within the acceptable limits. This probably was so due to the figures of one province compensating those of another. Examples of this can be seen in table 1 and graph 1.

Setting aside the hypothesis that declarations by sex are inaccurate and accepting the principle that the birth ratio between the sexes cannot vary outside certain limits, the fact that the male birth rate is too high or too low would seem to indicate that one sex is more incomplete than the other. From this assumption the birth rates were corrected as follows:

- 1) It was established that a correct male birth rate should lie somewhere between 104 and 106.
- 2) If it is less than 104 it must be that the registration of female births is more complete and so to obtain the corrected male birth rate the female births are multiplied by 105. If, on the other hand, the rate is over 106 then it is the declaration of male births that is more complete and therefore, to obtain the corrected female birth rate male births are divided by 105.

^{3/} UNITED NATIONS, Manual II, Methods to measure the quality of the basic data for population calculations, ST/SOA/Series A/23 (page 23).

/3) Thus,

- 3) Thus, a new series of total birth rate figures were obtained by provinces for the years 1942-1961. It is believed that this is the minimum adjustment that can be made to the series since although corrected they continue in many provinces to show inexplicable irregularities such as large variations in total from one year to another. Besides, it must not be forgotten that regularity in the rates is no indication that they are correct but omissions could be hidden in both sexes, in such a way that the rates appear correct. This minimum adjustment is 6.8% for Tierra del Fuego and 3.4% for La Rioja and means an adjustment of 0.9% for the whole country. This is to say that the minimum error detected by this rough method is of the order of 1% of omission in the estimated births. See table 2.
- b) By means of the censused populations of 1947 and 1960

The population of 0-4 years at any given moment is a result of the births of the previous five years that is if migratory movements are taken to be negligible and for this age group this assumption can be made without errors of any significance. Thus, by dividing the population of 0-4 years censused in 1947 by the quinquennial rates of survival based on the mortality rate of the country ^{4/} an estimate was obtained by provinces of the births occurring between 1942 and 1947. Then the number of births obtained in this way was compared with the registered number for the same period. By this method, as can be seen in table 2, omissions of births are discovered in approximately half of the provinces and over-registration of births, or which is more probable censal omission, in the other half. The results obtained also may be due to the fact that the rates of survival applied (corresponding to a mortality rate) are not really accurate. But, trying different mortality rates and using the population of 5-9 years which ought to have less censal errors than the group 0-4, similar results are obtained for births during 1937-1942 and therefore it can be concluded that the census of 1947 has errors of much greater significance in some provinces than in others. In support of this hypothesis is the fact that the provinces of Tucuman, Santiago del Estero, Chabut and Santa Cruz, which in this analysis appear with over-registration, show high rates of omission in the registration of births in the analysis made by means of the male birth rate. On the other hand, the provinces of Corrientes, Chaco, La Rioja, Formosa, San Luis, Catamarca, Tierra del Fuego and Misiones show signs of incompleteness in both analyses, although of different size.

^{4/} The rates of survival used were calculated according to CAMISA, Zulma C.'s Abbreviated table of mortality for the pampas region of the Republic of Argentina, 1946-1948, (Santiago CELADE, 1964). This was used for the provinces of Buenos Aires, Córdoba, Entre Ríos, Santa Fe and La Pampa. For the rest of the country the same author's work Abbreviated table of mortality - the Republic of Argentina, 1946-1948 (Santiago, CELADE, 1964) was used.

/A similar

A similar attempt was made based on the census of 1960 (using tabulations by age at the provincial level) but the results, as only can be expected, show in the age groups 0-4 and 5-9 years consistent with that found for the whole country a high rate of censal omission - larger than the under-registration of births. 5/

It can be concluded from these analyses that through the male birth rates there can only be detected a minimum omission and the existing errors may still be completely hidden, and that to attempt a study using the population census it must be certain that the censal count of the 0-4 and 5-9 groups is complete or that its incompleteness has been measured by means not dependent on the vital records.

3. INDICATIONS OF THE INCOMPLETENESS OF REGISTRATION OF INFANT DEATHS.

a) Analysis of the separation factors, by provinces, 1944-1961.

A proportion of the children who die before attaining one year of age, in any given year, were born in the preceding year. The separation factor provides this proportion. As is a known fact the rate of infant mortality - from the first year of life - is highest during the first weeks and then diminishes with age and this is directly related to the causes of death: mainly endogenous causes (prematurity, congenital malformations etc., in the first month and exogenous causes (infectious, parasitical illnesses, etc.) later. Mortality due to exogenous causes is easier to control than that caused by endogenous causes. Therefore, when the rate of infant mortality diminishes, it is due mainly to a decrease in the rate of post-natal mortality (from one to eleven months of age). Thus the separation factors also ought to diminish with the rate of infant mortality.

The decrease of the separation factors like variations in all the vital rates in general - should follow a regular trend - without abrupt changes, at least in the absence of fortuitous events like epidemics. The consideration of the separation factor in the analysis of the data on infant mortality has the advantage that its calculation is made from one source, as a result of which any distortions in its results are due, not to real causes, but to some type of error in the death records: error in the quality of the data for instance inaccurate declaration of age or error by lack of declaration that is to say by under-registration.

5/ CONADE, op. cit.

Now when the ages are taken in wide groups for a calculation of the separation factor 6/ it is very probable that the inaccuracies regarding the declaration of age compensate each other. In this way, the distortions observed in the separation factors for the argentinian provinces, calculated in wide age groups, are caused almost completely by omission.

Table 1 and Graph 2 present the annual series of separation factors 1944-1961, for selected provinces. By a mere examination of the graphs it can be seen that the quality of the information differs according to the province with which it deals, in some jurisdictions the variations are too extreme to be considered real (as in Tierra del Fuego, Catamarca and Santa Cruz). On the other hand, the factors in some provinces are suspiciously low, but this analysis will be gone into in more detail on examining the rates of infant mortality.

To summarize, this first analysis using the separation factors indicates that the data on infant mortality in Tierra del Fuego and Santa Cruz is absolutely unacceptable during the whole period under consideration. The figures on Rio Negro are very bad (especially up to 1955) also in Chabut, Santiago del Estero, Formosa, San Luis, Jujuy (from 1944 to 1953), Neuquen, Catamarca and Corrientes. Those of Buenos Aires and Tucuman are acceptable from 1949, San Juan from 1950 and La Rioja (except perhaps for 1958 and 1959).

b) Analysis of the rates of infant mortality 1945-1961

Observation of the trends of the rates of infant mortality also reveals indications of errors in the basic data since when there are very extreme oscillations from one year to another they cannot be taken to be reflecting real variations in mortality.

Such is the case in the provinces of Santa Cruz, San Luis, Rio Negro, Chaco, Santiago del Estero, San Juan, Jujuy, Neuquen and Tierra del Fuego in which are observed the most outstanding irregularities. See some examples in table 1 and graph 3.

6/ The following groups were used: under 1 month, 1-5 months, 6-11 months. The separation factor is calculated using the following equation:

$$f^z = \frac{D_z^z}{D_0^z}, \text{ where } f^z \text{ is the separation factor for}$$

the year z , D_z^z are infant deaths registered in the year z which can be attributed to births occurring in the year $z-1$ and D_0^z the total of infant deaths registered in the year z .

/Once again

Once again the conclusion is reached that through the mere study of the trends of the rates or indexes it is only possible to reveal indications of the existence of errors in the basic data, but nevertheless there is no doubt but that this analysis is useful when such a simple method can detect those cases of greatest error which merit for instance field investigation.

c) Relation between infant mortality and other factors of the social-economic development

It is a proposed and accepted belief that the rate of infant mortality is a true indicator of the standard of living 7/ and therefore that it is correlated to other indicators of the social-economic development, such as national income per head, standard of urbanization etc. There is a study by the United Nations in which measures of these correlations at the world-wide level are shown to be as follows: 8/

Correlation coefficient between infant mortality and:

Consumption of energy per head	- 0.69
National income per head	- 0.84
Urbanization	- 0.69
Scholastic matriculation	- 0.67
Calory consumption	- 0.81
Male labour force employed in agriculture	- 0.89

Therefore, if correlations can be found at the level of countries, they should also be ascertained for regions within the same country. Based on this fundamental idea, the hypothesis was adopted as follows: taking the Argentinian provinces as units of analysis correlations should be found between infant mortality and the other indicators. Those cases diverging considerably from the calculated correlations would therefore be showing deficiencies in their basic data. In this case, in which it is desired to prove the existence of incompleteness in the registration of infant deaths in some provinces, it was suggested as a check that the other indicators of the degree of development (except the rate of infant mortality) should be correlated among themselves. This is to say, that if for example, the correlation coefficient between the consumption of energy per year and the scholastic matriculation is, according to this report 0.76, a similar measure should be found for Argentina so that when each of these indicators is correlated with infant mortality it can be certain

7/ UNITED NATIONS, Report on the definition and international measure of the standard of living (E/CN. 3/L 79).

8/ UNITED NATIONS, Report on the social situation in the world, 1961 E/CN: 5/346/Rev.1, ST/SOA/42).

that data which deviates from the expected trend does so because of defects in the data used to calculate the rate of mortality and not in the other data. If the rate ^{9/} results inexplicably low it will be attributed to incompleteness in the registration of deaths and if it results strangely high it will be due to the fact that the births were omitted in a greater proportion. As can be seen, the use of the rate of mortality to evaluate the quality of the records has the disadvantage that it is possible that the errors of the numerator and of the denominator may compensate each other and the results may conceal incorrect facts or indicate errors of a size and/or sense different from the truth.

In order to avoid the influence of the incompleteness of births (since it is desired to concentrate on the incompleteness of deaths) the rates of infant mortality were calculated with the births corrected as in point 2a).

The figures for the years 1947 and 1960 were collected together using the data of the two censuses, except for the rates of infant mortality where averages of the years 1946, 1947 and 1948 and 1959, 1960 and 1961 were used in order to avoid the abrupt variations which occur in any year due to fortuitous circumstances.

It is to be noted that there were many difficulties in compiling the basic data. Thus for 1947 only the following were obtained: consumption of energy per head, illiteracy, urbanization and the male labour force occupied in agriculture. For 1960, were obtained consumption of energy per head, illiteracy, scholastic matriculation and the male labour force occupied in agriculture.

In the graphs corresponding to 1947 can be seen how the provinces of Chaco, Formosa and Misiones deviate very noticeably from all the trends which is to say that they have improbable levels of infant mortality which reflect considerable under-registration of infant births. Other examples which can be added to these are those of Tierra del Fuego, Santiago del Estero and La Pampa. See graph 4.

Unfortunately, the graphs for 1960 show greater dispersion but there is no doubt that it can be said that the infant mortality figures of Chaco, Corrientes, Misiones, Santiago del Estero and Formosa contain signs of incompleteness. See graph 5.

^{9/} The rate of infant mortality is calculated, generally speaking, as the quotient between the deaths of under one year of age and the births registered in a given year. In this report in order to make a finer calculation the separation factors were applied.

/Contrary to

Contrary to what was expected, the correlations for all the other factors among themselves are very low, as a result of which it has not been possible to obtain more objective measures to point out the cases in which omission is apparent. This may be due to at least three causes:

1. The other figures apart from those of infant mortality are of very bad quality as can be seen from scholastic matriculation.
2. The figures are good supposedly for urbanization but the definition adopted is not.^{10/}
3. The indicators which may very well be most reliable at the national level are not necessarily so at the level of the jurisdictions within a single country. An excellent example is provided by the case of Tierra del Fuego which has the highest consumption of energy per head for the country, due, not to the fact that it is a highly industrialized zone but to its particular geographical position (in the extreme south) which determines certain conditions of life for the small population.

These problems should be fully investigated. In this study there has been no opportunity to do so or to obtain thereby more reliable rates to indicate omissions, but it is believed that once these problems are solved the method is valid and merits consideration.

4. CONCLUSIONS

From the methods used the conclusions are as follows:

- a) By means of the male birth rates abnormalities can be detected that would indicate under-registration of births, but in a much lesser degree than expected.
- b) The comparison of the vital records with the census of population would only be a sure indication of incompleteness if there existed an independent proof of the completeness of the censal figures.
- c) The analysis of the trends of the separation factors and the rates of infant mortality provide rather imprecise indications of the incompleteness of registration.
- d) The method of analysis of the correlations between infant mortality and the other factors of the social-economic development is an effort which, if

^{10/} The censal definition was adopted which considers as urban every nucleus of 2 000 or more inhabitants when in reality it may be that a population of 2 000 or even larger has rural characteristics. To avoid irregularities of this kind it is usual to consider those of 20 000 or more inhabitants.

it seems adequate as a measure of under-registration, needs to be more fully investigated.

From the above can be seen:

- 1) There are obvious signs of omission, as much in births as in infant deaths, varying in size according to area. If this is so, it can be supposed that the problem no doubt exists for deaths generally.
- 2) The methods developed up to the present give only an imperfect view of the subject and therefore, there remains much research to be undertaken in this direction. An investigation should be made into those methods which would result not only in the detection of omissions but also in their effective measurement. Perhaps the best solution would be to attempt, other than methods based on the internal consistency of the figures and on the comparison between different sources, to conduct field investigations in areas where the existence of error has already been discovered by other methods. An efficient method to measure incompleteness would be necessary, besides, to evaluate the efforts that are made to improve the vital statistics.

/STATISTICAL APPENDIX

STATISTICAL APPENDIX

Table 1

MALE BIRTH RATES, SEPARATION FACTORS, AND RATES OF INFANT MORTALITY
FOR SELECTED PROVINCES, 1945-1960

Years	Male birth rates <u>a/</u>			Separation factors <u>b/</u>			Rates of infant mortality (per thousand) <u>b/</u>		
	Buenos Aires	Formosa	Tucumán	Buenos Aires	Santa Cruz	Corrientes	Buenos Aires	Chaco	Jujuy
1945	104.9	106.9	98.9	0.2874	0.3056	0.3614	54.37	98.29	180.67
1946	104.4	114.4	96.4	0.2704	0.2250	0.3317	47.21	80.48	194.65
1947	105.1	108.3	99.9	0.2761	0.2128	0.3279	53.57	78.39	172.64
1948	105.4	106.8	104.9	0.2550	0.2131	0.3382	44.39	72.57	176.72
1949	105.8	106.7	103.2	0.2713	0.2319	0.3569	46.58	74.89	157.11
1950	105.7	105.2	102.0	0.2765	0.2787	0.3529	48.15	70.32	155.62
1951	104.9	112.6	102.9	0.2634	0.3014	0.3484	43.96	67.12	184.23
1952	105.4	104.6	101.6	0.2611	0.3448	0.3504	44.63	67.31	166.04
1953	104.8	106.6	104.9	0.2543	0.3385	0.3340	42.87	68.33	151.09
1954	104.7	107.5	101.1	0.2635	0.2969	0.3301	42.27	62.96	149.08
1955	104.1	106.3	102.1	0.2664	0.3830	0.3065	43.90	75.28	136.07
1956	105.2	105.6	101.0	0.2578	0.3200	0.3222	41.90	60.21	140.69
1957	104.3	109.1	100.9	0.2828	0.3881	0.3697	50.41	86.92	164.10
1958	102.8	102.9	101.4	0.2574	0.2742	0.3498	43.65	72.22	131.67
1959	103.9	105.4	101.9	0.2423	0.2805	0.3242	44.29	70.83	133.82
1960	105.4	100.4	100.2	0.2526	0.2473	0.3391	48.72	80.24	124.35

a/ Up to 1957: Calculations based on figures of the Statistical Annual, 1957.
From 1958 onwards: Monthly Statistical Bulletin, April-June 1963.

b/ Data 1945-1951, National Statistics and Census Bureau, Demographic Bulletin of the Republic of Argentina, 1944/54.
Data 1952 to 1957, National Statistics and Census Bureau, Statistical Annual of the Republic of Argentina, 1957.
Data of births 1958 to 1961, National Statistics and Census Bureau, Statistical Bulletin, July 1963.
Other figures are presented directly by the National Statistics and Census Bureau.

/Table 2

Table 2

THE REPUBLIC OF ARGENTINA - CALCULATIONS OF THE ERRORS IN THE REGISTRATION
OF BIRTHS BY MEANS OF THE MALE BIRTH RATES (1942-1960) AND
THE CENSUSED POPULATION OF 0 - 4 YEARS IN 1947 (1942-1947)

Province	Differences between registered and estimated births (expressed as a percentage of the latter) by means of:	
	Male birth rates	Population of 0-4 years in 1947
Buenos Aires	1.1	0.1
Catamarca	2.7	1.0
Cordoba	1.5	1.4
Corrientes	14.0	2.1
Chaco	15.3	1.4
Entre Rios	0.8	1.0
Jujuy	-16.8	1.4
La Pampa	-1.8	1.1
La Rioja	19.2	3.5
Mendoza	-0.6	1.1
Salta	-11.7	0.7
San Juan	-2.2	1.5
San Luis	5.0	1.9
Santa Fe	8.4	0.4
Santiago del Estero	-4.8	1.8
Tucumán	-15.9	1.8
Formosa	9.8	1.3
Misiones	3.4	1.4
Neuquen	-12.7	1.1
Rio Negro	-6.7	1.2
Tierra del Fuego	9.1	6.8
Chubut-Santa Cruz-Comodoro Rivadavia	-8.2	1.9
<u>Total by country</u>	<u>1.3</u>	<u>0.9</u>

SUMMARY

An attempt has been made to measure the degree of incompleteness in the registration of birth by means of the irregularities and standards presented by the index of male births. From this analysis it can be concluded that this method only detects omission to a very small degree. On the other hand, the study based on the censused population of under 5 or 10 years of age is only reliable when the completeness of the census has been evaluated independently from the vital records.

The trends of the separation factors and the infant mortality rates were analyzed and by this simple method the existence of errors in a large number of jurisdictions was discovered. Also an attempt was made to discover some indications of incompleteness in the registration of infant deaths by means of the correlations between infant mortality and other indicators of the social-economic development. It was found that the provinces of Formosa, Chaco, Misiones, Tierra del Fuego and Santiago del Estero in 1947 and Chaco, Corrientes, Misiones, Santiago del Estero and Formosa in 1960, showed evident signs of omission. But this method just as in general all the methods designed for the evaluation of the completeness of the vital records, for an effective measurement of this completeness must be more fully investigated.

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/FIGURE I

Gráfico I

INDICES DE MASCULINIDAD DE LOS NACIMIENTOS, 1944 - 1960
PROVINCIAS SELECCIONADAS

Escala natural

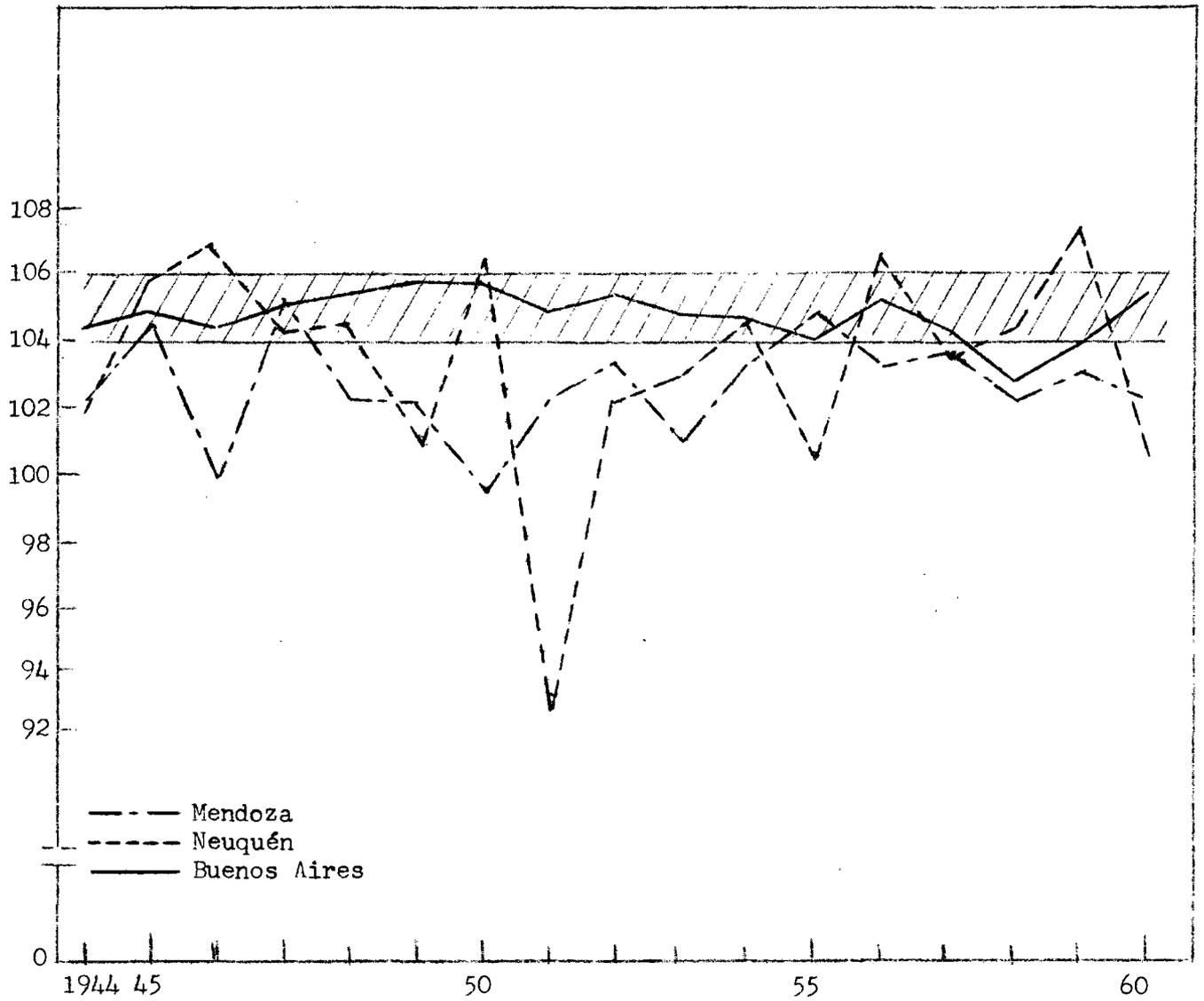


Gráfico II

FACTORES DE SEPARACION, 1944 - 1960
PROVINCIAS SELECCIONADAS

Escala natural

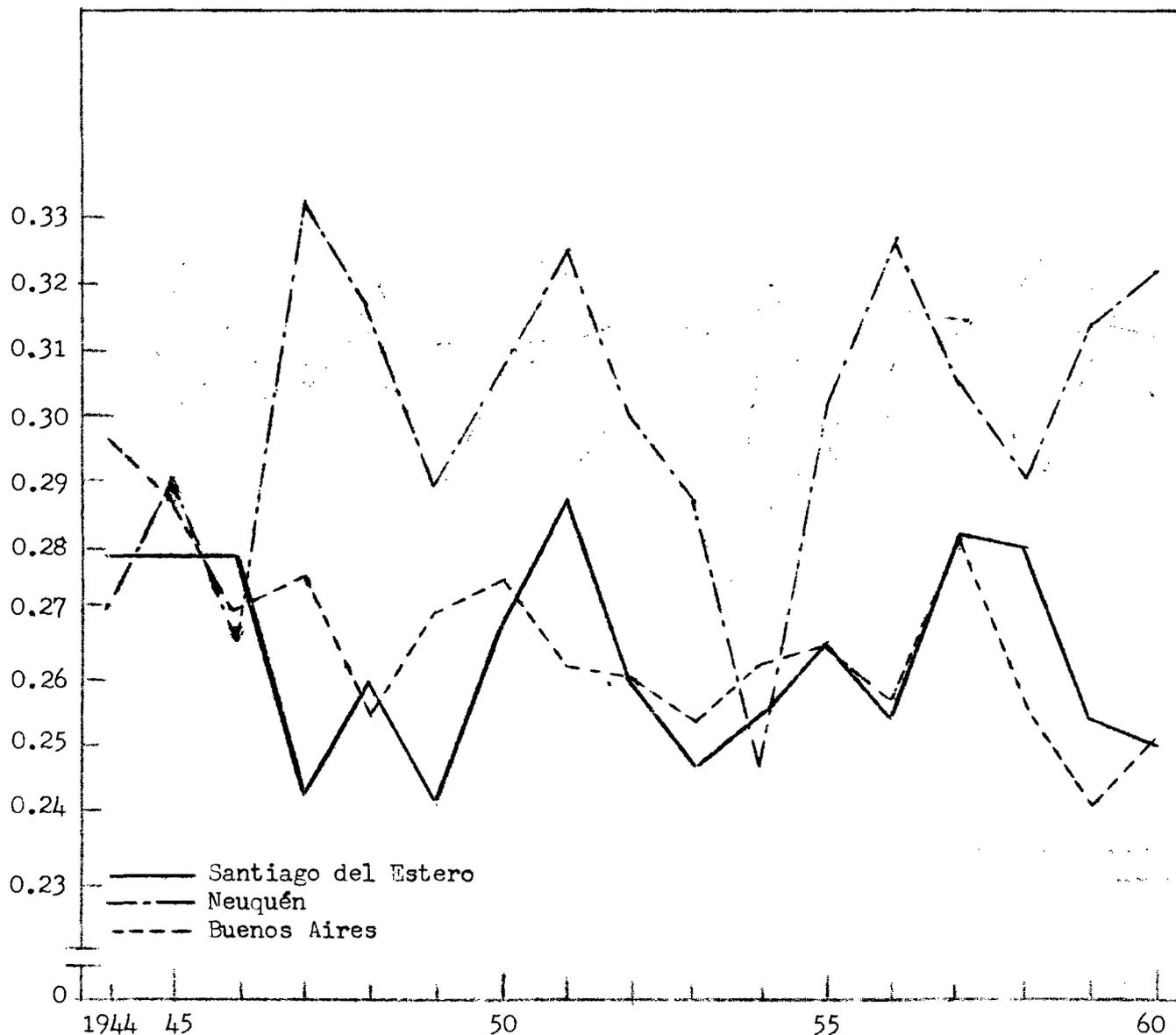


Gráfico III

TASAS DE MORTALIDAD INFANTIL, 1945 - 1960
PROVINCIAS SELECCIONADAS

Escala natural

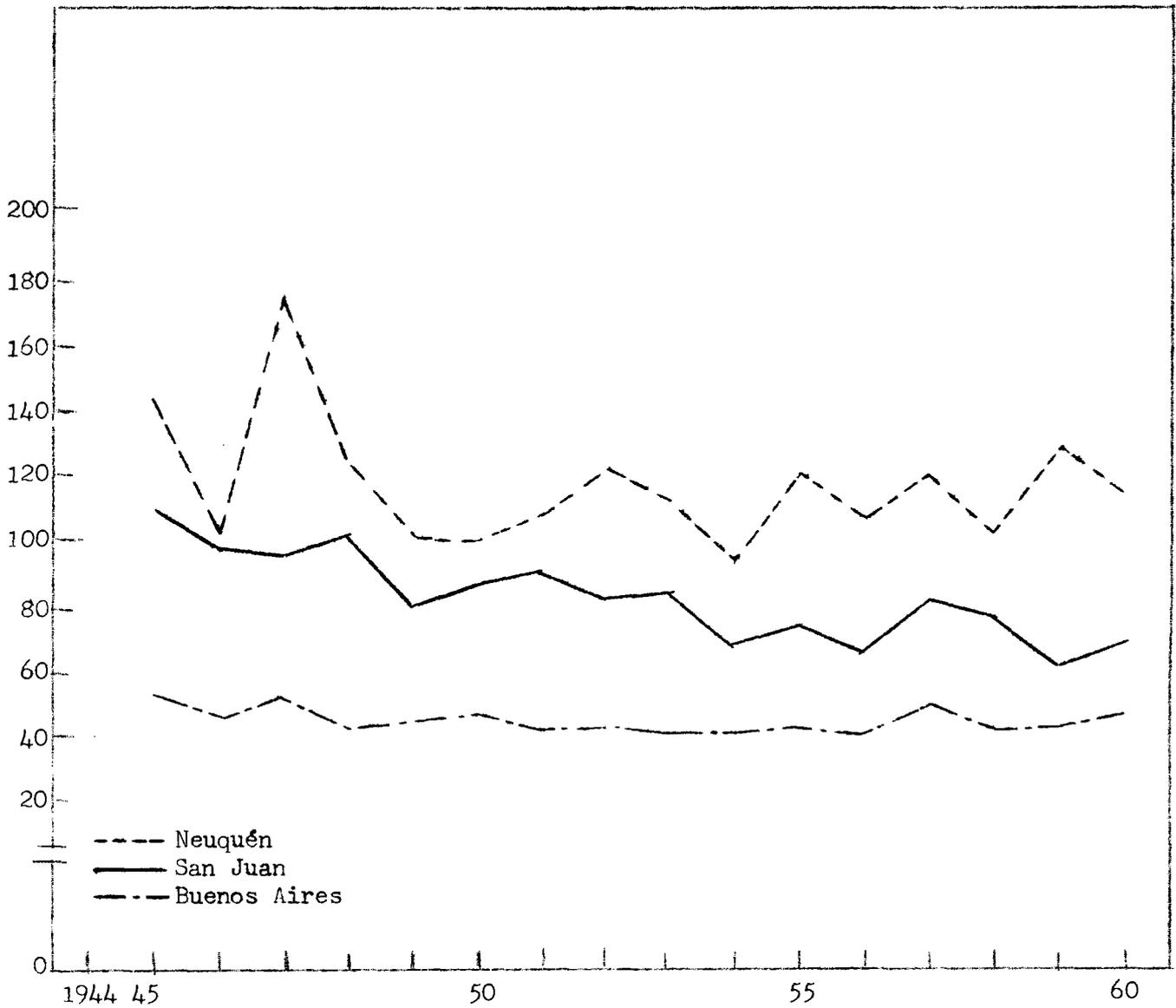


Gráfico IV

RELACION ENTRE EL NIVEL DE ORGANIZACION
Y LA MORTALIDAD INFANTIL - 1947,

Escala natural

Tasas de Mortalidad infantil en miles

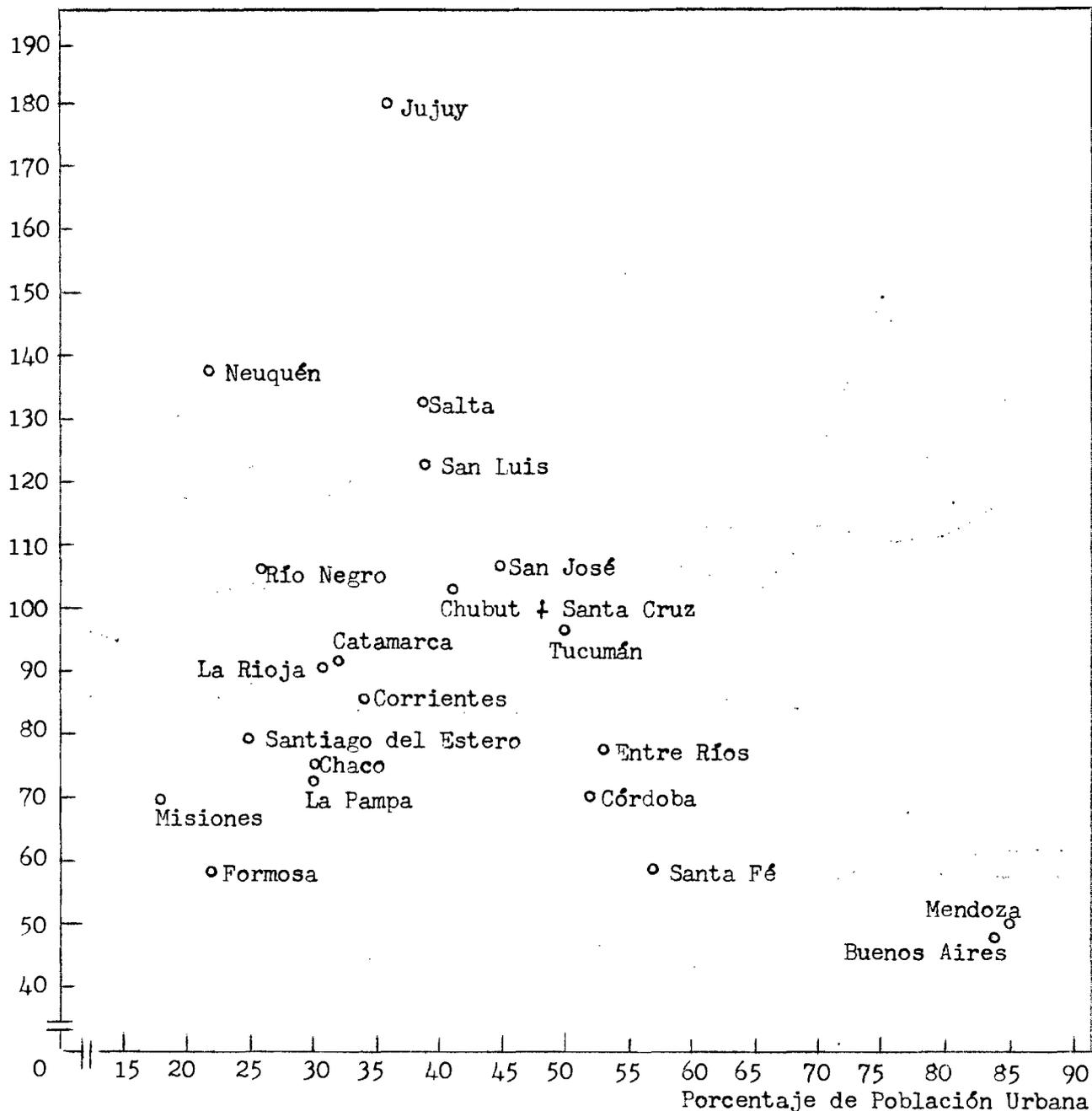


Gráfico V

RELACION ENTRE EL CONSUMO DE ENERGIA PER CAPITA Y LA MORTALIDAD INFANTIL - 1960

Escala natural

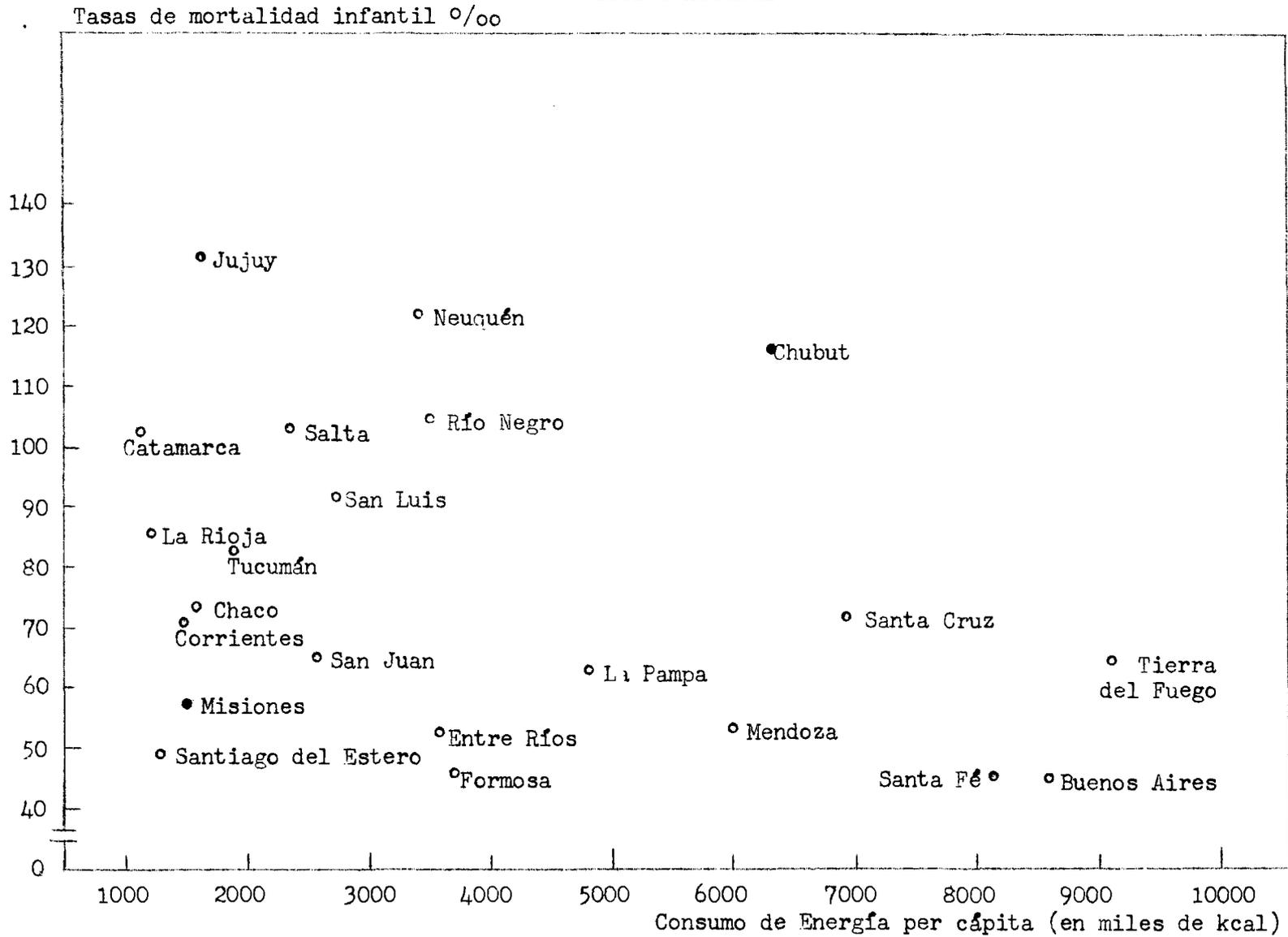


Gráfico VI

RELACION ENTRE EL CONSUMO DE ENRGIA PER CAPITA Y LA MORTALIDAD INFANTIL - 1947

Escala natural

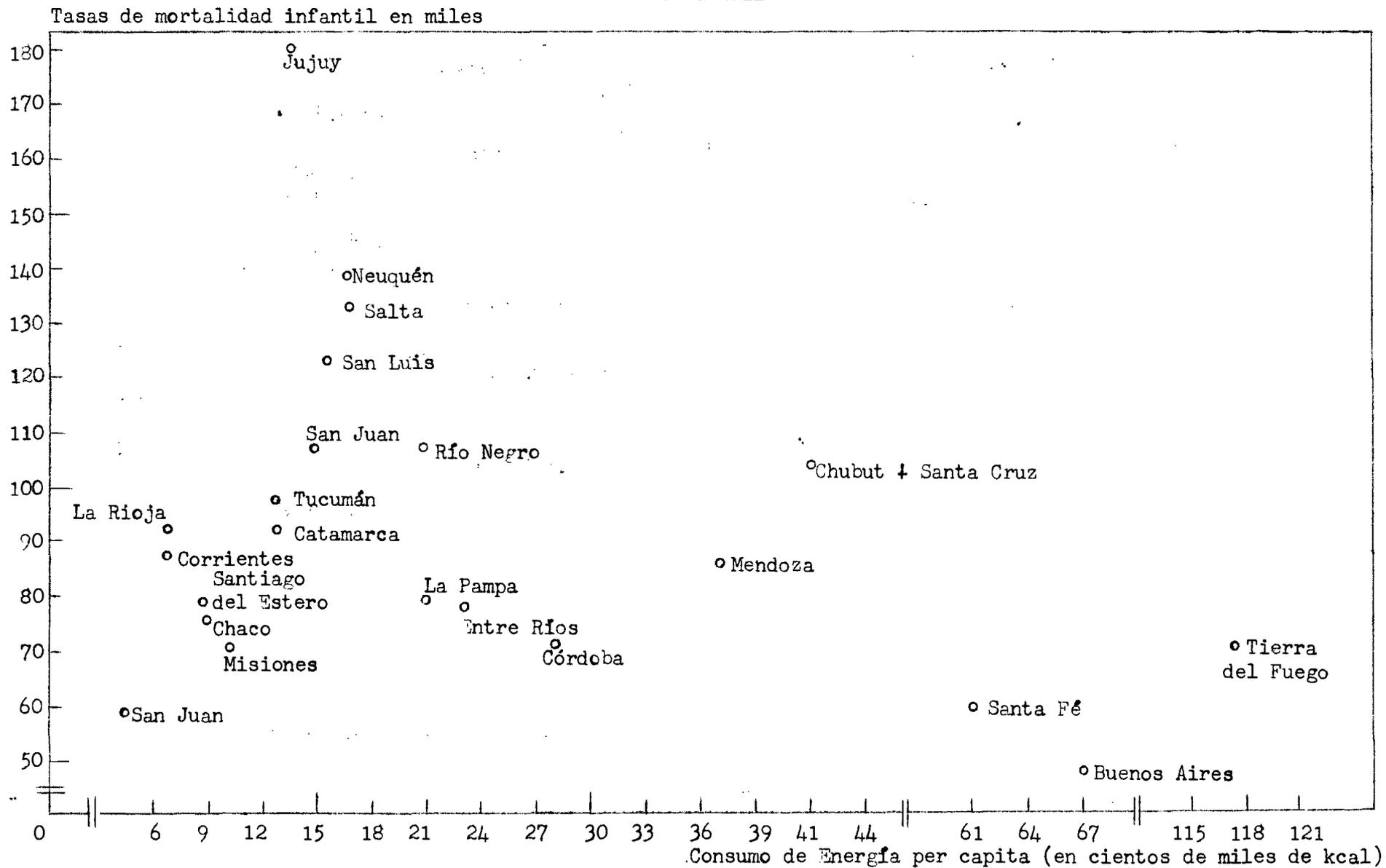


Gráfico VIII

RELACION ENTRE EL PORCENTAJE DE ANALFABETOS Y LA MORTALIDAD INFANTIL - 1960

Escala natural

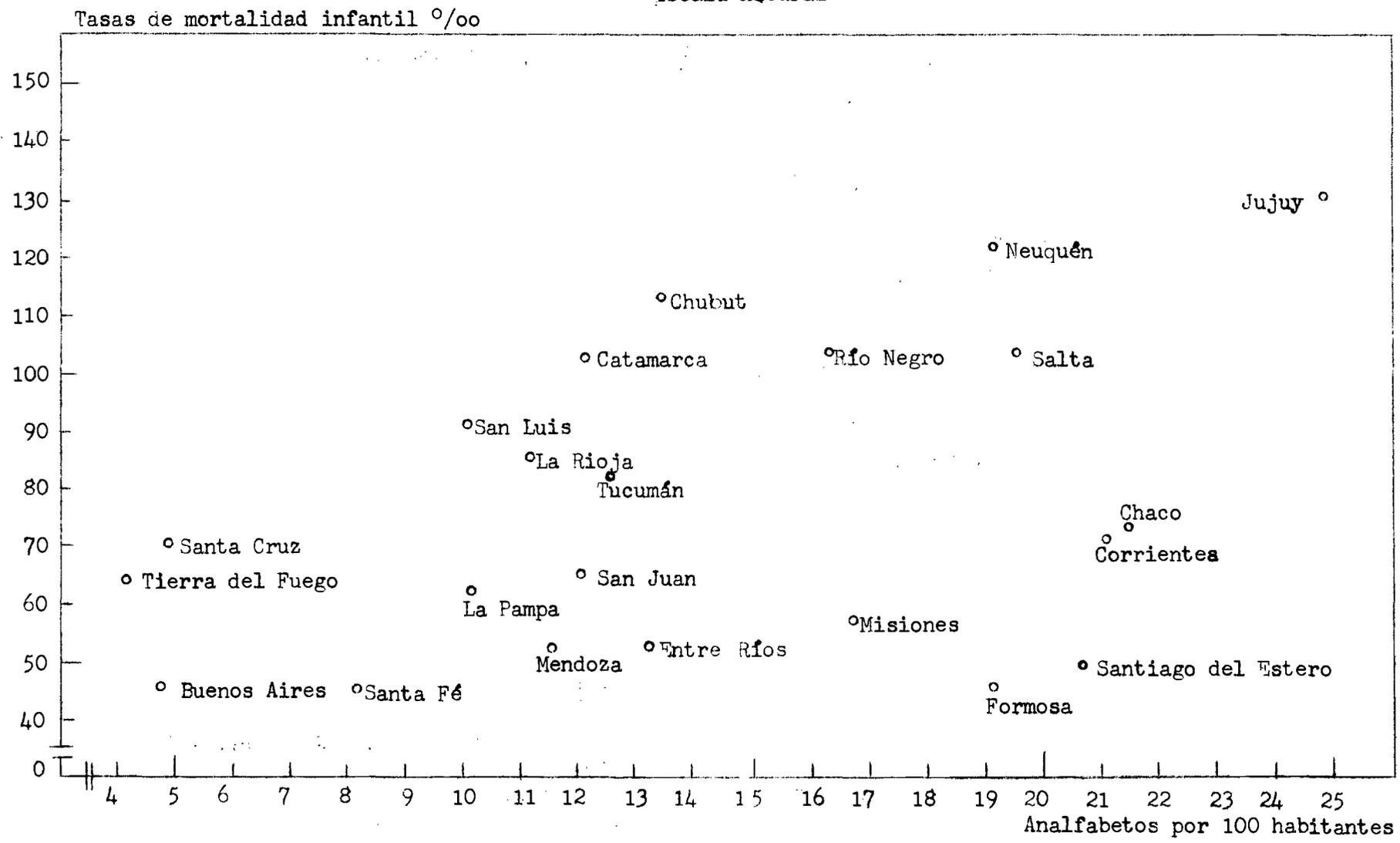


Gráfico VI.I

RELACION ENTRE LA FUERZA DE TRABAJO MASCULINA OCUPADA EN LA AGRICULTURA
Y LA MORTALIDAD INFANTIL - 1947

Escala natural

