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Prereproductive Mortality in Babia (León, Spain)

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Resumo. São analisadas 1650 famílias que viveram no distrito de Babia (Leon, NW Espanha) entre 1850 e 1979. Das 5906 crianças provenientes destas famílias, aproximadamente 8% morreram com menos de 1 ano, enquanto que pouco mais de 14% não atingiram os 15 anos, idade considerada aqui como o início do período reprodutivo. Em cerca de 50% das famílias ocorreu uma morte antes da idade reprodutiva o que constitui uma taxa consideravelmente baixa relativamente ao bom padrão da região.

No presente artigo analisam-se essas mortes relativamente à ordem dos nascimentos e das mortes, sex-ratio e idade à morte, sendo este último factor utilizado para diferenciar mortalidade neo-natal, pos-natal, pós-infantil e juvenil.

Os resultados mostram uma maior mortalidade masculina independentemente da ordem do nascimento, morte ou ainda grupo etário.

Palavras-chave: Mortalidade; sex-ratio.

Abstract. One thousand six hundred and fifty families studied, who lived in the district of Babia (León, NW Spain) between 1850 and 1979 had 5906 children, nearly 8% of whom died in their first year, while a little over 14% died before their fifteenth birthday, taken as the beginning of the reproductive period. In approximately 50% of the families a death occurred before reproductive age, a considerably low rate due to the relatively good standard of the region.

The present paper analyses these deaths with regard to variables such as the order of births and deaths, sex ratio and age at death, this last factor being used to differentiate between neonatal, postnatal, post-infantile and juvenile mortality.

The results show a greater mortality among males than in females regardless of the order of birth or death, or age group.

Key-words: Mortality; sex-ratio.

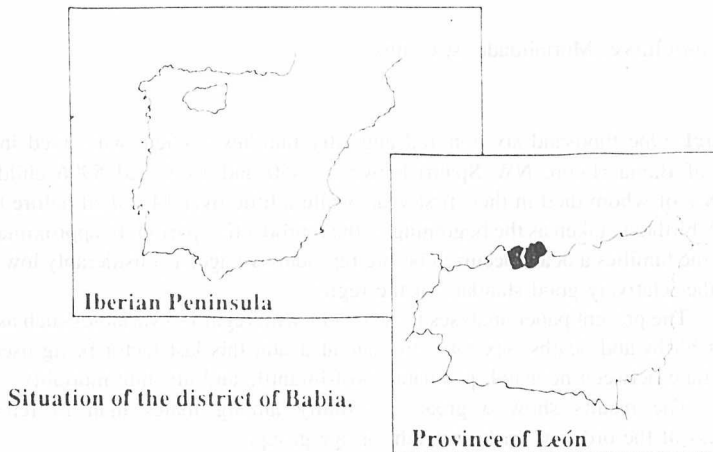
Introduction

The estimation of the prereproductive mortality of a population is one of the most obvious parameters of its reproductive structure, as it gives an indirect indication of the number of its individuals theoretically capable of contributing to the success of the following generation, and therefore, of transmitting its genetic heritage. The selective value of the population is thus defined, as is its degree of adaptation to its surroundings, that is, its biological efficiency. The factors reflected in the conduct of the members of a population, and which can lead to fatality in general and prereproductive ones in particular, shaping the population's family structure, are social and educational (Singh, 1974; Himsworth, 1989) and ecological, geographical and climatic (Mazess, 1965; Frisancho and Crossman, 1970; Lin and Crawford, 1983). Other studies have stressed the close relationship mortality has with the place in the order of births (Salzano, 1980; Brennan, 1983) and, to a lesser extent, with such other biodemographic variables as the age of the mother (Sorg and Craig, 1983) and family size (Gene Trapp *et al.*, 1983).

Previous studies have analysed the population of Babia with regard to survival of descendants to reproductive age as a marker of its biological efficiency (Sanchez Compadre, 1987), the district being noted for the high viability of its descendance, not only during the key stage of early childhood, but into reproductive age.

Multiple regression analysis enabled us to establish that the variable with greatest influence on survival is indeed family fertility, accounting for 85% of its variability. Other variables include the mother's age at the birth of her first child and the average of maternity, this last factor, together with infant mortality giving negative coefficients of regression with regard to survival (Sanchez Compadre, 1989).

Prereproductive mortality has been divided into four age-groupings (neonatal, postnatal, postinfantile) in order to establish the sexual distribution and the influence on it of the order of births and deaths.



Situation of the district of Babia.

Babia is situated between latitudes 42° 57' and 42° 58' north, and longitudes 2° 28' and 2° 19' west in the northern part of the province of León, Spain, where the rivers Sil and Luna rise. Its situation on the southern slopes of the Cantabrian Mountains is clearly limited by the presence of peaks of over two thousand metres. There are 28 population centres, situated between altitudes of 1100 and 1500 metres. Since the middle of last century, the local population has been between 3500 and 4000, although the 1981 census revealed the lowest figure in recent history — 2718.

Material and Methods

The analysis of parochial archives and civil registries for the period 1850-1979 revealed population changes including 12,209 births, 8,440 deaths and 3,118 marriages, enabling us to reconstruct the fecund life of each family. Records were thus made of 1,650 reconstructed married couples, about 53% of the total. Only complete families are taken into account, that is those that lived the whole of their reproductive period in the district and in which the woman reached her 49th birthday.

Data processing was carried out on an IBM 3178 computer using the 1983 version of the BMDP program package.

The end of the prereproductive period has been taken as 15 years (Fleury and Henry, 1976; Brennan, 1983), as children under that age are more likely to be dependant on their parents. Other authors do, however, set different limits (Schull *et al.*, 1970) according to the social and/or economic conditions of a community.

Results and Discussion

During the period 1850-1979, 5,906 children were born to the 1,650 families we reconstructed, giving an average fertility rate of about 3.5 children per family (Sanchez Compadre, 1987), a low rate in comparison with those of other districts in Spain with similar characteristics (Fuster, 1982; Luna, 1982) (Table 1). Of those born, 833 (approximately 14%) died before reaching reproductive age, most of whom nearly 10% of those born — died in the first year of life, while neonatal mortality accounted for little over 4%.

These three types of mortality reached their peak in the closing years of the Nineteenth Century, when they all doubled, as a slight increase in family fertility occurred, exceeding four children per family. A sharp reduction in mortality then took place, the lowest values being for the latest period studied, when family fertility was also at its lowest ever level — 2.15 children per family.

An analysis of the number of deaths in each family according to the order of births reveals the existence of a differential mortality rate, as may be seen in Table 2, where the first two columns, corresponding to places in the order of births, show a higher mortality rate among babies aged 1-12 months than for those younger than one month. This higher frequency of deaths from outside causes is unlike that found

in other communities (Sorg and Craig, 1983), where the first two babies born are more likely to die from internal causes.

Table 1. Changes in the fertility, infant mortality and prereproductive mortality rates over the whole period studied.

Periods	No Families	Child Mortalities							
		Children		< 1 month		< 1 year		< 15 years	
		No	X	No	X	No	X	No	X
1850/74	390	1491	3,82	46	0,11	85	0,21	197	0,51
1875/99	406	1649	4,06	102	0,24	172	0,42	310	0,77
1900/24	391	1381	3,53	58	0,15	110	0,28	200	0,51
1925/49	319	1075	3,36	30	0,09	84	0,26	112	0,35
1950/79	144	310	2,15	4	0,02	12	0,08	14	0,10
1850/1979	1650	5906	3,57	240	0,14	463	0,28	833	0,50

Table 2. Deaths before reproductive age according to the place in the order of births, age at death and sex.

Age	Place in order of Births									Total
	1	2	3	4	5	6	7	8	9	
<1 month	54	30	31	41	30	20	17	7	10	240
1-12 months	65	40	30	30	25	10	12	7	4	223
1-5 years	39	35	40	25	19	13	13	8	6	198
5-15 years	37	34	38	26	12	11	6	5	3	172
Total	195	139	139	122	86	54	48	27	23	833
Males	109	87	80	58	51	31	28	13	11	468
Females	86	52	59	64	35	23	20	14	12	365
Total	195	139	139	122	86	54	48	27	23	833

The third place in the order of births gives an equal rate for both types of mortality, but thereafter a reverse tendency is observed, with a greater number of deaths in the first month. Although statistical tests show no significance ($\chi^2 = 30.01$; $p=0.18$), which would indicate no dependence of mortality on the order of births, there

is a tendency for endogenous causes of infant mortality to be greater in the order of births, while outside factors decrease.

Both postinfantile (1-5 years) and juvenile (5-15 years) mortality rates are remarkably uniform and independent of place in the birth order, while also being mutually similar. These results differ from those obtained by Brennan (1983), who ascertains that in the population of Sanday (Orkney, Scotland, U.K.), the likelihood of death in the four years of life increases with the place in the birth order and family size, decreasing with the interval between deaths.

Prereproductive mortality regarding place in the birth order is manifestly greater among males and, although it is not statistically significant ($x^2=8.08$; $p=0.42$), we do not take the greater number of males born (Table 3) to be an adequate explanation, while we do consider that other factors of a probably genetic nature could have altered the proportion (Adinolfi *et al.*, 1985; Marcuzzi and Martinelli, 1987).

Table 3. Sex ratio for births and deaths before the age of 15 according to place in the order of births.

Place in the order of Births	Sex-Ratio	
	Births	Deaths before 15 years
1 ^o	105,32	125,58
2 ^o	110,97	167,30
3 ^o	113,65	135,59
4 ^o	93,03	90,62
5 ^o	110,89	148,57
6 ^o	108,72	134,78
7 ^o	141,23	140,00
8 ^o	117,46	92,85
9 ^o	122,85	91,66

The order of deaths within a family is another factor which may throw light on the development of the reproductive life of a community, for the data given for Babia in Table 4 would appear to indicate that it has an influence, though not a statistically significant one ($x^2=12.01$; $p=0.44$) on age at death.

Regarding the first death in each family, the proportions in the various age groupings are not very different, although the highest frequencies are for the other places in the order of deaths.

It should be pointed out that neonatal mortality increases with the place in the order of deaths, possibly attributable both to the mother's age and to hereditary causes affecting certain families. Postneonatal mortality shows uniform rates, which would point to its independence of the order of deaths. For the other age groups, a reduction in mortality occurs as the number of deaths per family increases. No statistical

significance, however, has been found to explain the differences observed ($\chi^2=8.30$; $p=0.08$).

Table 4. Deaths according to age and sex ratio related to the place in the order of deaths

	Place in the order of deaths					Total
	1	2	3	4	5	
<1 month	152	59	23	6	0	240
1-12 months	153	53	15	1	1	223
1-5 years	140	42	11	4	1	198
5-15 years	124	36	7	4	1	172
<i>Total</i>	569	190	56	15	3	833
<i>Males</i>	330	98	34	6	0	468
<i>Females</i>	239	92	22	9	3	365
<i>Total</i>	569	190	56	15	3	833

As for sexual differences, and despite the greater number of male fatalities for relationship ($\chi^2=0.71$; $p=0.86$).

Finally, the sex ratio among the deaths for each age group has been determined in order to establish the relationship between these two variables, it being shown that for the total of ages, mortality is higher among males than females (Table 5), with an average percentage of 56,2% overall. It should be stressed that this frequency is practically constant over the various age groups, which would indicate that the sex ratio is independent of age.

Table 5. Prereproductive mortality according to age and sex.

	Age at Death				Total
	< 1 month	1-12 months	1-5 years	5-15 years	
<i>Males</i>	136	122	116	94	468
<i>Females</i>	104	101	82	78	365
<i>Total</i>	240	223	198	172	833

Similar values have been found for other rural and pretransitional communities over similar periods of time, sex being found to be the factor determining mortality

risk for the 0-4-year-old group (Brennan, 1983), providing nutritional and medical conditions have been good, as is the case in Babia.

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