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THE NON-ADULTS OF THE NECROPOLIS OF THE OLD BISHOP'S PALACE OF POITIERS (4th CENTURY) AND SAINT-MARTIN-DE-COGNAC (7th–15th CENTURIES) IN FRANCE. PALAEODEMOGRAPHY AND FUNERARY PRACTICES

ABSTRACT: Palaeodemographic analyses of the two medieval necropolises from western France are presented with a view relevant to an archaeological perspective. The comparison between the age structure of the two non-adult populations with the data originated from historical demography, standard life-tables and mortuary practices tend to underline differences in burying modes according to the age of the deceased. Other hypotheses are proposed to explain the peculiar age repartition of these two populations.

KEY WORDS: Palaeodemography – Funerary practices – Middle Age – France

INTRODUCTION

In the last two decades controversial debates concerning palaeodemographic studies (Angel 1969, Acsadi, Nemeskeri 1970, Petersen 1975, Van Gerven, Armelagos 1983, Buikstra, Konigsberg 1985, Masset 1971, Bocquet-Appel, Masset 1982, 1985) have dealt with methodological problems specific to archaeological frame (Masset 1990, 1993, Sellier 1989, 1996, Konigsberg, Frankenberg 1992, 1994).

As a matter of fact, demography of archaeological populations aims to draw conclusions from the sex and age estimations of individuals. But pursuing such a study requires that this archaeological population corresponds either to the total of individuals living in a given socio-economical context during a given period of time, or to one of its representative parts (Masset 1987, Masset, Sellier 1990, Sellier 1996). Whereas dating a site rarely represents a constraint, the hypothesis according to which the archaeological sample is representative of the buried population and also represents the deceased population, is rarely observed. The often partial excavation of the funeral sites, the discrepancies in bone preservation and cultural behaviours facing death are the causes of biases which are difficult to assess, while they contribute to large uncertainties in attempts to define the demographic parameters of the buried population.

The distribution of the population into age groups represents an additional difficulty. Imprecision of the methods employed for skeletal age and sex estimations (Wood *et al.* 1992, Walker 1995) and occurrence of numerous systematic mistakes (Bocquet-Appel, Masset 1982) make any conclusion about the evolution of living conditions and death rate of these ancient populations questionable.

Studies conducted in palaeodemography concern more the sample number and population number obtained from

the study of the human remains within the cemeteries than a restricted definition of demographic parameters themselves. Our research on the demographic interpretation of the two medieval necropolises from western France has two main objectives: first to compare the age structure of the two buried populations with the data originated from historical demography, standard life-tables and mortuary practices, secondly to develop hypotheses and conclusions explaining the peculiar age repartition of these two populations.

ARCHAEOLOGICAL BACKGROUND OF THE TWO CEMETERIES

The Old Bishop's Palace of Poitiers

The Poitiers Bishop's Palace is located on the oriental side of the city within the lower Empire surrounding wall, in a district whose oldest remnants date back to the 2nd century A.D. (Le Masne 1987). The building and setting of houses bear witness of an intense artisan life at that time. As soon as the end of the 3rd century, deep social and economical changes can be observed: the houses of Roman tradition divided in several little rooms are being replaced by large-roomed buildings built on the ruins of the previous ones. Private space decreases to the benefit of working space compelling thus the inhabitants to live partially in the workshops. The existence of a little network of drains proves that a certain public life remains, but the district has lost its 2nd century diversity. After this period, the area was probably deserted as early as the middle of the 4th century.

This is the context in which the cemetery of this urban district was founded. It has been traced on a surface of 310 m^2. Its extension towards the north and to the east is determined without precision but we can observe that it disappears on the other side of the modern buildings of the Bishop's Palace. The absence of funeral material makes it difficult to date the site, but the surrounding archaeological context gives evidence of a chronological range in the second half of the 4th century. Its abandon is marked by a spreading of stones on its whole surface, as if it had been decided to close it down for good.

The necropolis includes forty tombs oriented east-west except for one of them. They are disposed in groups of different importance where adults and non-adults can be seen together, whereas there are numerous empty graves. All the corpses were buried directly into earth, with, for most of them, some stones or tiles around the head (70%). All deceased were laid on their backs with their legs stretched out, only three of them had their legs folded up. The position of their forearms varies but they are generally placed along the body, with hands on the level of the pubis.

The most frequent burying mode is the original individual tomb (26/34) but eight of them were multiple (Leclerc, Tarrête 1988, Duday *et al.* 1990): a quadruple, a triple and six double ones which contained individuals either superposed or put side by side. The study of the position and of the orientation of the bone remnants in the graves showed an identical burying mode: most fragile joints are still connected, giving way rapidly in the decay process, thus indicating the presence of original graves (Duday *et al.* 1990) where the bodies of adults and non-adults were buried at the same time. On the whole surface of the cemetery no second use could be observed.

The Saint-Martin-de-Cognac

Following a valorisation scheme in the oldest suburb of the town, the excavation of a sector next to Saint-Martin-de-Cognac, revealed a cemetery covering 800 m² partially excavated during a rescue operation which was carried out from 1986 to 1987 by a team of archaeologists (Boissavit-Camus 1989). The archaeological material found on the site allowed a chronological identification ranging from the seventh to the eighteenth centuries. Only the funeral structures from the medieval period have been studied (7th – 15th centuries). The stratigraphic study and the identification of the funeral objects and ornaments laying near the deceased, permit to establish six successive exploitation periods for this part of the cemetery.

One hundred and sixty four tombs were counted and divided into two different kinds: fifty nine were individual and one hundred and five contained between two to twenty bodies. No selection was observed with regard to age or sex.

During the various periods, individual graves appear to be as frequent as the multiple ones, except during the first period (phase I, 7th – 8th centuries) where space have been re-used. Until the end of the eighth century, the bodies were put into sarcophagi set out in rows inside and outside a building, probably a church. Beyond this area their orientation clearly bends towards the south-east. This is related to the building wall which seems to dictate the general spatial distribution, thus proving its ancient existence preceding the graves. The second period (phase II, 8th to the end of the 9th centuries) corresponds to the Carolingian use of the cemetery. Two burying manners have been observed: sarcophagi and graves dug in the rock. This period also corresponds to the secondary use of seventh and eighth centuries sarcophagi. However, the chronological order of the burials was not identified during the excavation. During phases I and II, the cemetery kept the same area surface and no disturbance affected the burials. Except for a few cases, the orientation of the graves is the same through the various time periods: the head westwards and the feet eastwards.

During phase III (10th century), a discontinuance with the previous use was noticed. The setting of the burials resulted in the prejudice of either older tombs or structures. From this period only coffins deposited in large graves and wedged-up by heaps of materials coming from the building can be numbered. This implies that the building has been destroyed and deserted, or destroyed and then partially used again.

The last phases of use (13th – 15th centuries) corresponded to a period of rotation of the churchyard towards the south-east without modification of the limits set at the previous period. The corpses were buried directly into the earth except for seven of them in sarcophagi.

From these archaeological data we can directly establish two facts:

- there is a chronological uncertainty concerning the numerous secondary uses of the sarcophagi in phases I and II (i.e. to identify which bodies come from the same tomb at either period is rather difficult);
- a difference in the number of tombs dug out through the different periods can be recognised.

Obviously the characteristics of the tombs do not accurately reflect the evolution of the cemetery through six chronological periods spread over nine centuries. Furthermore, some tombs do not automatically fit between two phases, neither chronologically nor typologically. In addition, the restricted number of individuals who were unearthed in phases III, IV and V, limits the analysis and comparison of biological data phase by phase.

Taking into account the archaeological and biological data, we have been able to identify three groups of individuals: the first one over a period ranging from the end of the seventh century to the end of the ninth century (N = 396); the second one, from the tenth century to the end of the twelfth century (N = 47); the third one, from the thirteenth century to the fifteenth century (N = 129).

The funeral practices put in evidence in the cemeteries of the Old Bishop's Palace of Poitiers and of Saint-Martin-de-Cognac appear to be different and show varied living conditions. The analysis of the non-adult population should attest of these funeral practices. It is not only a question of the behaviour of adults confronted to the death of the young, but also a question of showing different burying modes according to the age of the deceased.

AGE AT DEATH ESTIMATION OF THE NON-ADULT INDIVIDUALS

The Old Bishop's Palace of Poitiers cemetery comprises 52 individuals, 31 adults and 22 non-adults. The total number of individuals from the Saint-Martin-de-Cognac necropolis represents 562 people including 382 adults and 180 non-adults, coming from 165 graves excavated.

The age at death of the non-adults was evaluated in matching up the results obtained from different sources. However, the degree of dental calcification being considered as the criterium closest to the chronological age (Charlet 1984, Mappes *et al.* 1992, Saunders *et al.* 1993) was preferred to other criteria. As a matter of fact, dental calcification is less liable to individual variations and is also less submitted to periods of stress (Charlet 1984). The reference data used are those published by Moorrees, Fanning and Hunt (1963a,1963b) and by Ubelaker (1984). In the absence of dental remains bone measurements have been used to estimate the individual age (Fazekas, Kosa 1978, Palkama *et al.* 1962, Sempe 1987). For older individuals, additional information was provided by the closure of epiphyses (Birkner 1980).

Age distribution of the non-adults into groups was carried out taking into account the reliability range provided by the estimation method (Sellier 1996) and consequently some individuals may belong to two distinct age groups. As a matter of fact, this overlap is not due to the quality of the evaluation but to the age range brought by the method. However, we can reduce the interpretation errors due to the use of an average age and therefore be more in accordance with the standard life-tables of pre-industrial populations. If there are still discrepancies with natural mortality, we should interpret them in palaeoethnological terms (funeral modes, emergency burials, selection of the buried,...) apart from the data brought by the analysis itself.

Old Bishop's Palace of Poitiers: 22 (from 0 to 19 years) for a total of 53 individuals.

0	1–4	5–9	10–14	15–19 years
0	1	4	9	8

Saint-Martin-de-Cognac: 180 (from 0 to 19 years) for a total of 562 individuals.

0	1–4	5–9	10–14	15–19 years
36	56	49	24	15

DEMOGRAPHY AND THE ARCHAEOLOGICAL RECORD

The distribution of adults in decennial groups has been carried out on the basis of Masset's probability vectors (1982). The individuals whose skull was in a bad state of preservation were classified in proportion to the results obtained by the vectors, in order to include the total number of individuals proportions to adults/non-adults, which is our only purpose concerning our study of adults.

Methodological considerations

This survey is, indeed, limited by the partial excavation of the necropolises, but also by the poor state of preservation of the osteological material excavated. Nevertheless, the two sites revealed sufficiently enough graves (34 in Old Bishop's Palace of Poitiers, 165 in Saint-Martin-de-Cognac) to launch the survey of the buried population and the archaeological features of each cemetery allow us to expect interesting conclusions concerning funeral practices and the organisation of these two grave sites.

Demographic surveys usually aim to interpret the age and sex distribution of the deceased to evaluate life expectation and mortality within a population. The osteoarchaeological data collected, sometimes incomplete, represent in fact the only way how to study the original

living population (Masset 1980, Sellier 1989, Duday, Sellier 1990), although the data at our disposal, especially concerning the age of adults, the sex of adults through isolated long bones and finally the sex of non-adults (Masset 1971, 1982, 1990, Majo 1992) lack accuracy. By contrast the estimation of the age of non-adults is based upon methods far more reliable than those of adults and those of adults/non-adults.

In order to achieve the palaeodemographic reconstitution of the two non-adult populations, two preliminary hypotheses were retained:

1. The classifying of each sample into a stationary population with a zero increase rate (t = 0), that means a rate of births similar to that of deaths (t = n – m = 0) (Henry 1984, Sellier 1989, 1996). Even if this represents a restrictive clause to any palaeodemographic conclusion as it cannot be found in any population, it is justified by the goal we have set. Such an assumption is only satisfactory in the case of the Saint-Martin-de-Cognac necropolis that was used over a long period of time (eight centuries). In the Old Bishop's Palace of Poitiers (with a duration of 50 years), it is more appropriate to classify it as a constant population with a relatively high increase rate (t = +20‰) (Bocquet, Masset 1977).
2. The existence of an archaic pattern of mortality (Masset 1975). This pattern asserts the existence of plausible ranges of values for the different demographic parameters and state that, even for different populations, biological constraints always exist which do not allow any demographic structure (Sellier 1989). Natural mortality in every human population as well as in primates is clearly marked by strong analogies between some demographic parameters (Bocquet-Appel, Masset 1982), for instance between life expectancy at birth (e°0), death rates before 1, before 5 and before 15 years. Therefore, the graphs of deaths, survivors, mortality rate, life expectancy at birth at each age, have always got the same aspect. If we consider the graph of deaths, it will always be very high before five, will get to a minimum between 10 and 14, then will level off before reaching a peak from 60 onwards (Ledermann 1969, Henry 1984, Masset 1975, 1982).

For pre-industrial populations (that is before occurrence of preventive medicine dated to late 17th and 19th centuries) it could be observed that correlations between the various demographic parameters were linked to a low, sometimes very low[1)], life expectation at birth (Henry 1984, Cartier 1973, Perrenoud 1975, Masset 1975, 1976, Dupâquier 1979).

Within the two cemeteries examined in this report, apart from the chronological distribution, the living conditions of the populations are an element which also justifies the choice for an archaic mortality pattern. During the whole period of the Middle Ages, the areas concerned remain exclusively rural, even though economy starts improving beyond the 11th century (Debord 1984). Trade was profitable to those in power upper-class but did not seem to much improve the life of Saint-Martin-de-Cognac inhabitants located too far from main roads. From the archaeological context of the district of the Old Bishop's Palace of Poitiers, it is clear that the inhabitants in the second half of the 4th century had precarious life. We can therefore consider that populations buried in Poitiers and in Saint-Martin-de-Cognac subsisted mainly on agriculture and cattle-breeding and thus can be included in an archaic mortality pattern out of which the figures of the various demographic parameters will show an unnatural population (selected population, death peaks...) that shall have to be analysed. All the comparisons and corrections required to establish the demographic profile of these populations, are carried out both referring to the standard life-tables of Ledermann (1969), as well as to demographic estimators proposed by Bocquet and Masset (Bocquet, Masset 1977, Bocquet 1979).

Demography of the non-adult population of the Old Bishop's Palace of Poitiers

Sample number and population number

The classification of the whole population into age groups was made, attempting to come as close as possible to natural mortality, and the mortality chart calculated from raw data (for a So root of 1000, MF) gave the following results: a rather high life expectation at birth (e°0 = 36.17) which can be explained by a zero infant death rate (1q0) and by a very low proportion of individuals under 15 years (5q0 = 19.23 ‰ and 15q0 = 269.23‰). By contrast a high proportion of teen-agers was observed (*Table 1*). The graphs established from these results are very remoted from the reference standard life-tables e°0 = 25, e°0 = 30 or e°0 = 40 (Ledermann 1969, networks 100, MF) (*Figures 1, 2, 3*).

The 22 individuals numbered represented approximately 40% of the population studied (20q0 = 423.07‰). If on whole this figure conforms rather well to the data of historical demography, to some archaeological cemeteries[2)] and to reference standard life-tables, the examination of the various rates point out several aspects:

The proportion of deaths before 5 is extremely low; the rate 5q0 = 19.23‰ corresponds, according to Ledermann's

[1)] Life expectation at birth is around e°0 = 20–24 for lower classes and 36–39 for upper classes in Geneva in the 17th century (Perrenoud 1975).

[2)] Parish registers under Louis XIV show rates: 20q0 of 500 to 620‰ (Dupâquier 1979, Masset 1976), of around 400–500‰ for medieval series in the Neolithic site of Khirokitia and Greece (Acsadi, Nemeskéri 1970) and 580‰ for the cemetery of Lerne (Angel 1971). On the other hand, in the Westerhus population in the 12th and 13th centuries in Sweden, the rate reaches 618‰ (Gejwall 1960).

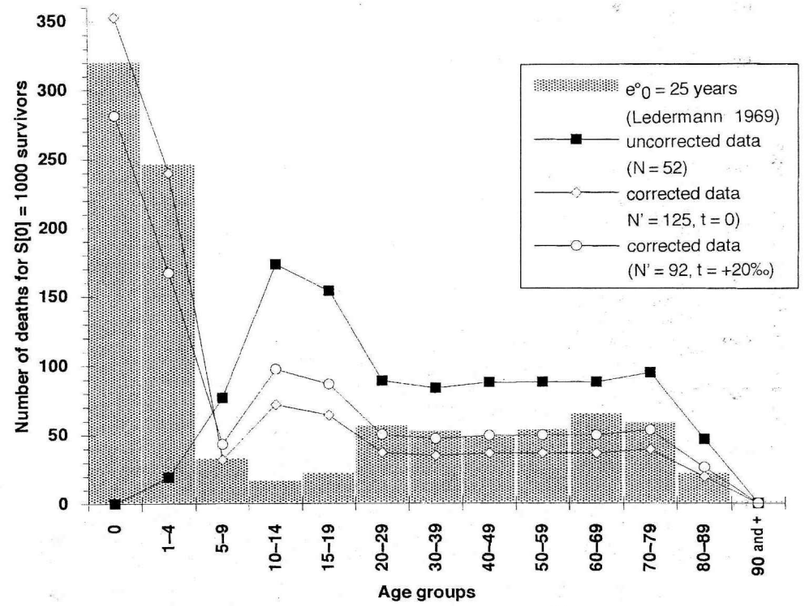

FIGURE 1. The Old Bishop's of Poitiers: death graph D(x, x+a) according to mortality tables calculated from raw data for a $S_{[0]}$ 1000 survivors (raw data, corrected data from stationary pattern: t = 0 and constant pattern: t = +20‰).

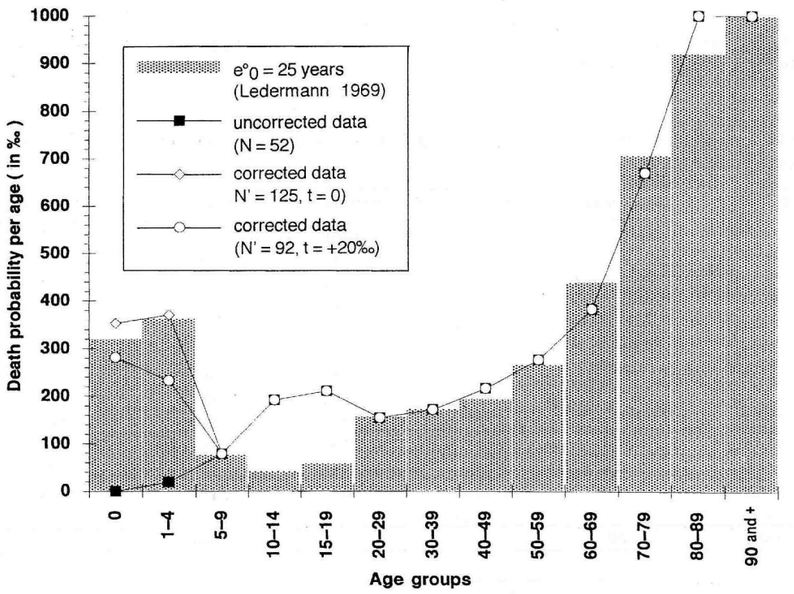

FIGURE 2. The Old Bishop's of Poitiers: mortality rates (a)q(x) per age (in ‰) calculated from raw data (uncorrected data, corrected data from stationary: t = 0, and constant pattern: t = +20‰).

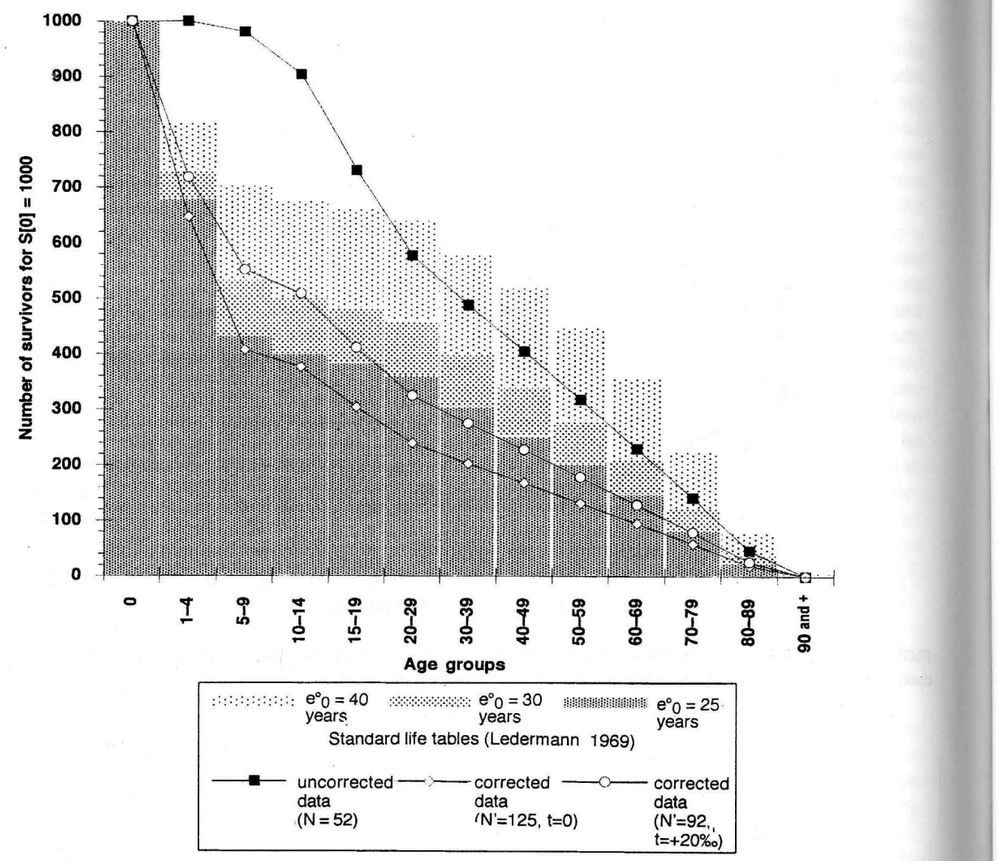

FIGURE 3. The Old Bishop's of Poitiers: the graph of the survivors S(x) according to mortality tables (uncorrected data, corrected data from stationary pattern: t = 0 and constant pattern: t = +20‰).

TABLE 1. The Old Bishop's of Poitiers: the mortality table calculated to the raw data for $S_{[0]}$ 1000 survivors. The adults are dispatched according to probability vectors (Masset 1982), N = 52.

Age groups	Raw deaths	Rates (a)q(x) in ‰	Survivors S(x)	Deaths D(x, x+a)	Life expectancy e°(x)
0	0	0.00	1000	0	36.17
1–4	1	19.23	1000	19	35.17
5–9	4	78.43	981	77	31.82
10–14	9	191.49	904	173	29.32
15–19	8	210.52	731	154	30.67
20–29	4.62	154.15	577	89	33.18
30–39	4.35	171.51	488	84	28.31
40–49	4.55	216.50	404	88	23.14
50–59	4.56	277.06	317	88	18.15
60–69	4.57	383.75	229	88	13.19
70–79	4.92	670.54	141	95	8.29
80–89	2.42	1000.00	46	46	5.00
90 and +	0	1000.00	0	0	5.00
Total	**52.00**			**1000**	

(5)q(0) calculated	1	19.23
(0–14) i.e. (15)q(0)	14	269.23
(0–19) i.e. (20)q(0)	22	423.07

TABLE 2. The Old Bishop's of Poitiers: the mortality table calculated to the corrected data by paleodemographic estimators (5)q(0) and (1)q(0) (Bocquet et Masset 1977) with t = +20‰, N = 92.

Age groups	Raw deaths	Rates (a)q(x) in ‰	Survivors S(x)	Deaths D(x, x+a)	Life expectancy e°(x)
0	26.01	281.36	1000	281	20.96
1–4	15.43	232.28	719	167	27.96
5–9	4.00	78.43	552	43	31.82
10–14	9.00	191.49	508	97	29.32
15–19	8.00	210.52	411	87	30.67
20–29	4.62	154.15	325	50	33.18
30–39	4.35	171.51	275	47	28.31
40–49	4.55	216.50	227	49	23.14
50–59	4.56	277.06	178	49	18.15
60–69	4.57	383.75	129	49	13.19
70–79	4.92	670.54	79	53	8.29
80–89	2.42	1000.00	26	26	5.00
90 and +	0	1000.00	0	0	5.00
Total	**92.44**			**1000**	

(5)q(0) calculated	41.44	448.29
(0–14) i.e. (15)q(0)	54.44	588.92
(0–19) i.e. (20)q(0)	62.44	675.46

standard life-tables, to a very high life expectancy at birth (around 80).

On the contrary, the proportion of deceased under 15 and 20, 15q0 = 269.23‰; 20q0 = 423.07‰, corresponds to a life expectancy at birth of about 40, which is still far too high for this type of population. For instance, life expectation at birth of the particularly protected upper class of Geneva in the 17th century is of e°0 = 35.9 years (Perrenoud 1975). The children of Ming Emperors (1368–1644) have a life expectancy of e°0 = 34.37 years (Cartier 1973, Sellier 1992).

These results illustrate first, the incompatibility which exists between the various mortality rates, and secondly the huge absence of non-adults compared to the number of adults. If the rates of mortality for each of the age-groups are studied separately, it will appear that the funeral site excavated is dedicated to receiving children over five: 1q0 = 0; 5q0 = 19.23‰; 15q0 = 269.23‰. A comparison with historical data and some archaeological sites where non-adults appear to be well represented enables us to understand this absence, as documented under the Old Regime in France (1q0 = from 200 to 300‰ and 4q1 = 250‰, Masset 1976) in Lerne (1q0 = 359‰, 4q1 = 200‰), in Taforalt (1q0 = 242‰ and 4q1 = 268‰) and in Columnata (1q0= 267‰).

The under-representation of children under five years is the main anomaly of the deceased population, but the relatively important number of late teen-agers raises an extra difficulty: the determination of the age of 3 individuals[3)] at their death who may have been classified along with adults. Their insertion among adults would imply a decrease of the rates of non-adults, which is acceptable (20q0 = 423‰), and would alter in no way the anomalies found in other age groups. Moreover, these three individuals would increase the 20–29 the population whose proportion is very close to the standard life-tables of the 25 age group. In order to avoid the addition of adding extra bias to the repartition of the buried, we have chosen to classify the three 18/19 individuals as teen-agers. Moreover, it would not change sufficiently the 10–14 and 18–19 age groups which are very important.

Infant and child mortality revisited: application of the estimator's method (Bocquet, Masset 1977)

As an indication, the demographic estimators proposed by Bocquet and Masset (1977), were used in order to evaluate the low quantity of individuals under 5. The population from the Old Bishop's Palace of Poitiers is low

[3)] No. 9 represented by upper-limbs, pelvis, lower limbs, posterior tarsus and some elements of the front tarsus. The age of the seaming of the diaphysis at the level of the epiphysis is between 16 (fibula) and 19 (femur bone) years.

No. 21: female individual figured by a fragment of left dental arcade, a fragment of left ilium, upper limbs and left clavicle. The 18 teeth are included with a non-calcified apex. The epiphysis of the forearm are barely seamed up, the upper end of the humerus is not seamed. This individual probably died between 17 and 19 years.

No. 22: male individual with the left arm, pelvis, lower limbs and feet. Epiphyses of radius and ulna seamed even though an edge remains on distal extremities. The hip-bones are not seamed and there is no ischium. The head of the thigh bone and the big trochanter are seamed in the middle. The epiphyses of the metacarpus (1-3-4-5) and of the metatarsus show an edge. This individual was probably *ca* 17–19 years old.

and so the estimators set in the case of a constant population with a relatively high increasing rate (t = + 20‰) were selected.

The results show a life expectancy of e°0 = 20.96, that means a quantity of infants 1q0 = 281.36 and of children under five 4q1 = 232.28 whose proportions this time are rather close to archaeological sites where young children are considered as well represented (cf. note 4; *Table 2*). The results obtained with this rate cannot be taken for granted, they have to be considered as a trend rather than the strict value of the rate. With a figure of the t = +20‰, we are doubtless far above reality (a rate of 30‰ reveals a rapid population growth), implying that the population double every 35 years, but we can consider it betrays either an increase of the population or an exceptional mortality peak. It appears clearly that we could keep this idea of an increase of the population only on the basis of such a calculation; but the individuals in multiple graves: Nos. 22–25, two women, one young adult and a late teen-ager have been buried at the same time. The same phenomenon can be observed concerning the individuals of grave 13: a woman, a young man and a late teen-ager. Similarly, the two individuals of graves 29–30: two non-adults between 12 and 14, and between 8 and 9, were buried together.

These observations make us think of sudden deaths, probably due to a disease. A very short mortality peak is now obvious, bearing in mind that the absence of a total knowledge of the cemetery makes it difficult to work on it at full length but it accounts partly for the enormous bias of the buried population, betraying thus an unnatural demography.

On the basis of a constant population, we can asses that, in regards with the number of adults deceased (N = 31), there is a lack of 40 dead children under five (98% of the 0–4 age group). The total amount of the deceased should therefore be of 93 individuals instead of the 52 buried in the excavated area. That is to say 44% of the individuals are missing.

The Saint-Martin-de-Cognac population

Sampling and chronological dispersion

Compared to the above-mentioned examples (cf. note 4), the calculation of the various mortality rates shows a very low proportion of non-adults in regard with the number of adults: 15q0 = 293‰; 20q0 = 320‰. In the same way, the proportion of individuals from 0 to 5: 1q0 = 64‰, 5q0 = 164‰, is remarkably low compared to the historical data. Under the Old Regime in France for instance, the ratio of children under 5 is of 5q0 = 250‰, or compared to some archaeological sites where the proportion of non-adults fits to the figures expected in old populations: 1q0 = 242‰ and 4q0 = 268‰ in Taforalt and 1q0 = 267‰ in Columnata. On the opposite, the ratios of individuals between 5 and 9, and between 10 and 14, point out a deceased population in accordance with historical demography for a life expectation at birth around 20.

The proportion of deaths in the 0 and 5 age groups: 5q0 = 163.73‰, corresponds, according to Ledermann's standard life-tables, to a life expectancy at birth included between 50 and 55, which is far too high for a population where a low life expectancy at birth and a high juvenile mortality are expected.

So for example, the particularly favoured upper class in Geneva in the 17th (Perrenoud 1975), or the population of the Ming Emperors children (Cartier 1973, Sellier 1996), have a life expectancy at birth equivalent to the one of our study, but unlike in Saint-Martin-de-Cognac (1q0 = 64.07; 5q0 = 163.73), juvenile mortality only hit a quarter of the children before the end of their first year and 450 to 500‰ of them did not live over ten.

These observations bring to light two striking facts concerning the population of Saint-Martin-de-Cognac:

- a contradiction between the death rates of each age group;
- a strikingly low representation of children under five in the buried population.

The under-representation of non-adults

The entire necropolis

For all periods taken together at Saint-Martin-de-Cognac necropolis, we have numbered 180 individuals under 19, which represent about 30% of the total population studied. This figure is of very limited value, since the number of children, teen-agers and age groups represented do in fact vary greatly along the different phases of use of the necropolis.

The comparison between the rates in each phase of use appears to be very interesting even though the small number of individuals for phases II, III, IV and V does not allow a true analysis, on the other hand some comments about the proportions of the buried can be made.

As shown by the chart below, the absence of young children is constant through all the periods of use of the necropolis, whereas at the same time the proportion of 5 to 9 and 10 to 14 individuals turns out to be too high.

Whereas the global proportion of non-adults is acceptable for phases IV and V, these results cannot be used because of the small number of individuals over long periods of use. The same remark can be made concerning the rates of the last three categories of phases II, III, IV, since such rates cannot be found in any known population.

The small quantity of graves studied in phases III and IV does not enable us to draw conclusions. On the contrary, we could eliminate a source of error in the repartition of the buried, this source being the consequence of the way the necropolis is used. All along the 2nd period, we can observe a second use of the sarcophagi of the 1st period, without being able to assent the relative dates of the occupants of the same grave. So, in order to compare the bias in these different phases, we have calculated a mortality table in which we consider on one hand the individuals in phase I, then on the other hand the individuals in phases I and II, as a global system of buried individuals.

	Phase I	Phase II	Phase III	Phase IV	Phase V	Phase VI	Total
1q0 in ‰	58	52	50	148	83	64	**64.07**
5q0 in ‰	135	180	201	370	249	161	**135.39**
5q5 in ‰	106	0	63	0	222	128	**104.28**
5q10 in ‰	48	0	0	9	95	117	**57.02**
5q15 in ‰	47	31	0	62	0	6	**37.7**
20q0 in ‰	**299**	**206**	**252**	**444**	**471**	**366**	**320.35**

Phases I and II: the under-representation of children

The mortality table calculated from the population buried in phase I and then from the population in phases I and II taken together, confirms the results obtained for each separate period: life expectancy at birth remains unchanged (e°0 = 36 years) and the death rates of infants (1q0 = 57‰) and children under 5 (5q 0 = 140‰) remain low. The only improvement observed when we consider the two chronological phases together concerns the last two age groups whose rates are close to the reference standard life-tables (e°0 = 25 years). The population buried in sarcophagi can be ascribed to an accurate chronological period, but it is a fact that a low representation of children can be established in both periods (*Figures 4, 5, 6, Tables 3, 4*).

Phase VI: another children's under-representation

The graphs draw after the deceased of phase VI can be superimposed to those of the previous periods: life expectancy is high (e°0 = 33 years), the 5–9 age groups are too important, end a very high number of children under 5 is missing (*Figures 7, 8, Table 5*).

These observations taken together and compared to what was said above concerning the general proportion of adults/non-adults, make us stick to the first assertion: that is, a very low representation of adults which gives a bias to the first two age groups (0 and 1–4 years).

In order to try and compare phases I and II, it is necessary to appraise and rectify the bias which only affects the group of children under 5. The high representation of children in the 5–9 age group cannot be accounted for, and it has to be consider as a random phenomenon because we do not know the total buried population.

Mortality revisited and application of the estimator's method (Bocquet, Masset 1977)

Phase I

The results of evaluations in the hypothesis of a stable population are represented in the chart below with standard errors and uncertainty level corresponding to life expectancy at birth of 68% and 95%.

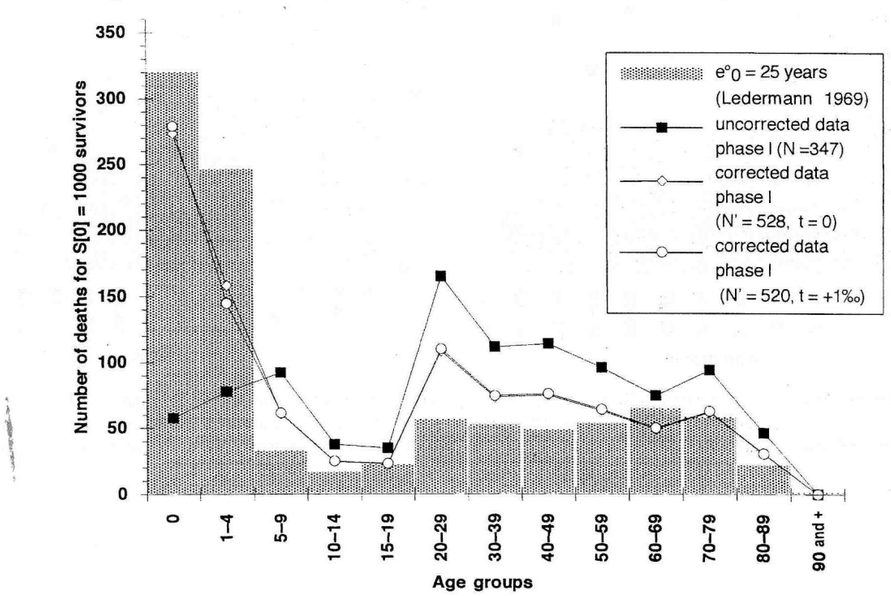

FIGURE 4. Saint-Martin-de-Cognac, phase I: death graph D(x, x+a) according to mortality tables (uncorrected data, corrected data from stationary pattern: t = 0 and constant pattern: t = +1‰).

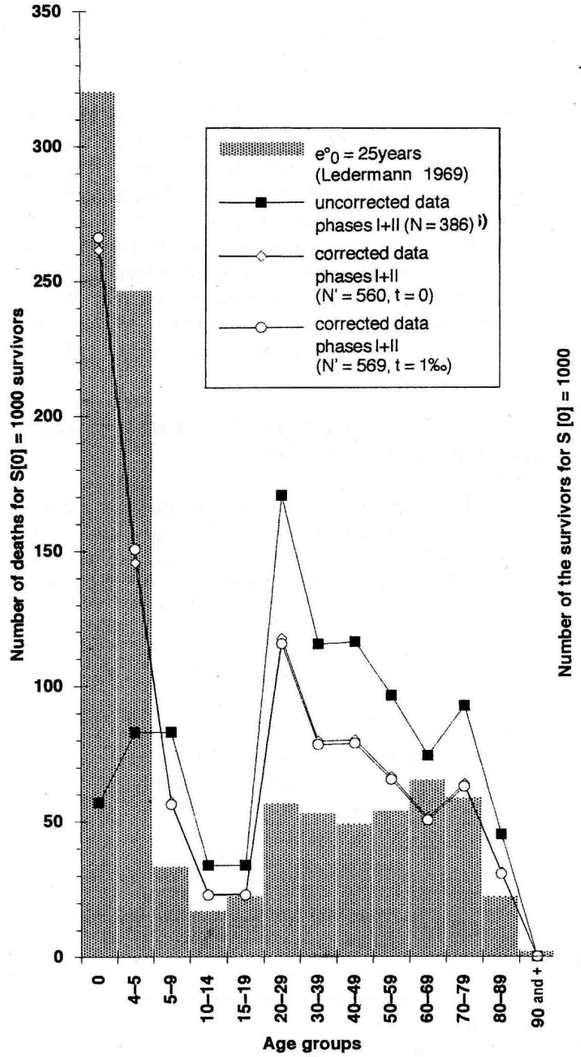

FIGURE 5. Saint-Martin-de-Cognac, phase I + II: death graph D(x, x+a) according to mortality tables (uncorrected data, corrected data from stationary pattern: t = 0 and constant pattern: t = +1‰).

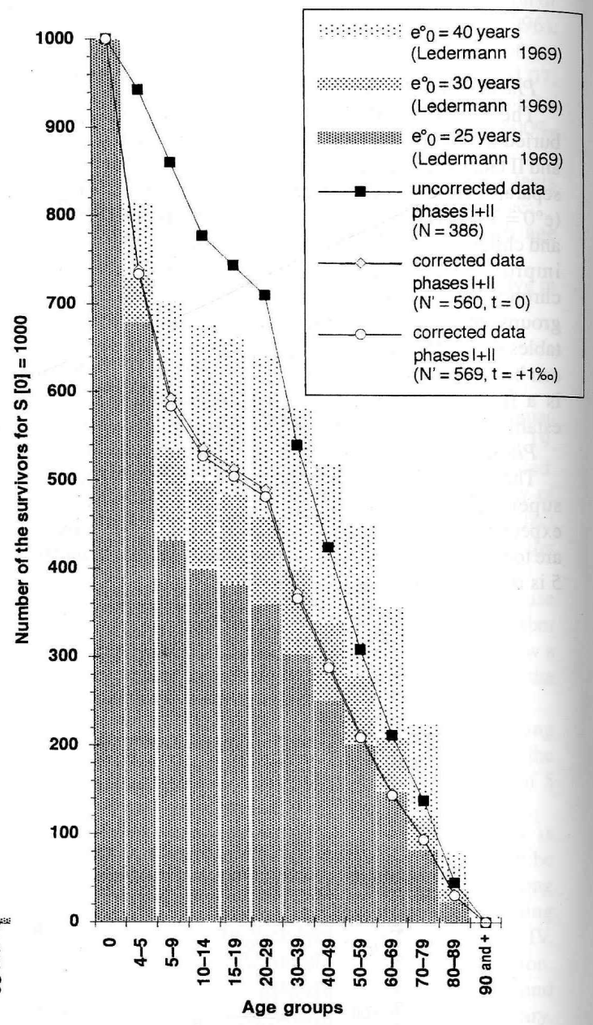

FIGURE 6. Saint-Martin-de-Cognac, phase I + II: the graph of the survivors S(x) according to mortality tables (uncorrected data, corrected data from stationary pattern: t = 0 and constant pattern: t = +1‰).

TABLE 3. Saint-Martin-de-Cognac, phase I: the mortality table calculated to the raw data for $S_{[0]}$ 1000 survivors. The adults are dispatched according to probability vectors (Masset 1982), N = 347.

Age groups	Raw deaths	Rates (a)q(x) in ‰	Survivors S(x)	Deaths D(x, x+a)	Life expectancy e°(x)
0	20	57.61	1000	58	36.26
1–4	27	82.53	942	78	37.44
5–9	32	106.62	865	92	36.63
10–14	13	48.48	772	37	35.71
15–19	12	47.03	735	35	32.40
20–29	57.11	234.86	700	165	28.87
30–39	38.69	207.95	536	111	26.20
40–49	39.49	268.03	424	114	21.77
50–59	33.29	308.62	311	96	17.91
60–69	25.92	347.60	215	75	13.67
70–79	32.65	671.12	140	94	8.29
80–89	16	1000.00	46	46	5.00
90 and +	0	1000.00	0	0	5.00
Total	**347.14**			**1000**	

(5)q(0) calculated	47	135.39
(0–14) i.e. (15)q(0)	92	265.02
(0–19) i.e. (20)q(0)	104	299.59

TABLE 4. Saint-Martin-de-Cognac, phase I + II: the mortality table calculated to the raw data for $S_{[0]}$ 1000 survivors. The adults are dispatched according to probability vectors (Masset 1982), N = 386.

Age groups	Raw deaths	Rates (a)q(x) in ‰	Survivors S(x)	Deaths D(x, x+a)	Life expectancy e°(x)
0	22	57.00	1000	57	36.32
1–4	32	87.93	943	83	37.48
5–9	32	96.41	860	83	36.90
10–14	13	43.34	777	34	35.57
15–19	13	45.31	743	34	32.07
20–29	65.72	239.93	710	170	28.47
30–39	44.52	213.81	539	115	25.88
40–49	44.78	273.55	424	116	21.56
50–59	37.18	312.66	308	96	17.80
60–69	28.64	350.43	212	74	13.62
70–79	35.73	673.02	138	93	8.27
80–89	17.36	1000.00	45	45	5.00
90 and +	0	1000.00	0	0	5.00
Total	**385.93**			**1000**	

(5)q(0) calculated	54	139.92
(0–14) i.e. (15)q(0)	99	256.52
(0–19) i.e. (20)q(0)	112	290.21

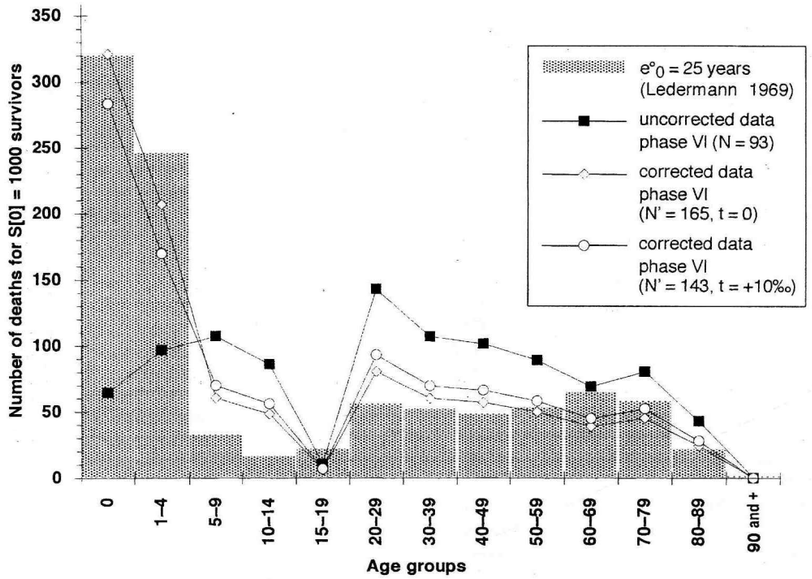

FIGURE 7. Saint-Martin-de-Cognac, phase IV: death graph D(x, x+a) according to mortality tables (uncorrected data, corrected data from stationary pattern: t = 0 and constant pattern: t = +10‰).

TABLE 5. Saint-Martin-de-Cognac, phase IV: the mortality table calculated to the raw data for $S_{(0)}$ 1000 survivors. The adults are dispatched according to probability vectors (Masset 1982), N = 93.

Age groups	Raw deaths	Rates (a)q(x) in ‰	Survivors S(x)	Deaths D(x, x+a)	Life expectancy e°(x)
0	6	64.52	1000	65	33.43
1–4	9	103.45	935	97	34.70
5–9	10	128.21	839	108	34.47
10–14	8	117.65	731	86	34.17
15–19	1.00	16.67	645	11	33.39
20–29	13.31	225.63	634	143	28.92
30–39	9.98	218.33	491	107	25.89
40–49	9.46	264.84	384	102	21.72
50–59	8.30	316.03	282	89	17.75
60–69	6.45	359.36	193	69	13.63
70–79	7.50	652.29	124	81	8.48
80–89	4.00	1000.00	43	43	5.00
90 and +	0.00	1000.00	0	0	5.00
Total	**93.00**			**1000**	

(5)q(0) calculated	15	161.29
(0–14) i.e. (15)q(0)	33	354.84
(0–19) i.e. (20)q(0)	34	365.60

The difference with the raw data is very important and attests very precarious living conditions where a high proportion of juvenile mortality can be observed. More than one quarter of the children born alive do not reach the age of 1 and nearly half of them do not live over 5. The total number of six children per woman corresponds to the necessary birth-rate for a renewal of generations. The death rates between 1 and 4, before 15 and before 20, established on evaluations, are close to the archaic mortality pattern and even though the proportion adults/non-adults is kept at an acceptable level, the proportion of children below five still remains a little below reality.

Phase VI

The strongest observation concerning these results is a dramatic cut in life expectancy when they are compared to raw data (e°0 = 33 years), and the uncertainty lag for this population. Nevertheless, if we carefully examine the results of the parameters that have been necessary for the use of estimators, it can be observed that ratio D5-9 /D 10-14 is low and that ratio D5-14 /D20 and + is too high. In this excavated area there exists definitely a selection in burials, as the proportion adults/non-adults observed corresponds to the top in the range of archaeological sites where a high infant death rate can be noticed: it is 618‰ in Westerhus in Sweden for instance (Gejwall 1960).

The corrected mortality chart

Phase I

The life expectancy at birth calculated in the corrected mortality chart is of 24.29 for the buried of phase I. If the proportion of non-adults conforms the data of traditional populations (20q0 = 539.23‰), the correction of estimators does not enable us to reach the exact figures of the standard life-tables. Over five and until adulthood, the graph rather fits with the reference one. For all age categories, the graph of uncorrected data appears to be quite different from the graph of corrected data (*Figure 4; Table 8*).

In conclusion the interpretation of the deceased population for this phase (from 347 registered individuals) will be as followed: 180 children under 5 are missing, including 124 infants and 56 children between 1 and 4. The total number of the buried has therefore been increased with 181 individuals, which means that about 34% of the deceased are missing.

Phase VI

The corrected death rate chart calculated after estimations of 1q0 and of 4q1 shows a proportion of infants and young children similar to the data of the e°0 = 25 years (Ledermann 1969). Nevertheless two anomalies remain: the poor life expectancy (e°0= 19) reveals qualid conditions and classes 5–9 and 10–14 are over-represented (*Figures 7, 8; Table 9*). Further, the number of buried children is very important (40%, whereas the first two age groups are under-represented) which reveals a high birth rate and betrays a dynamic population. With the data at our disposal, the persisting demographic anomalies are difficult to explain, the answer would only be given by a total excavation of the site.

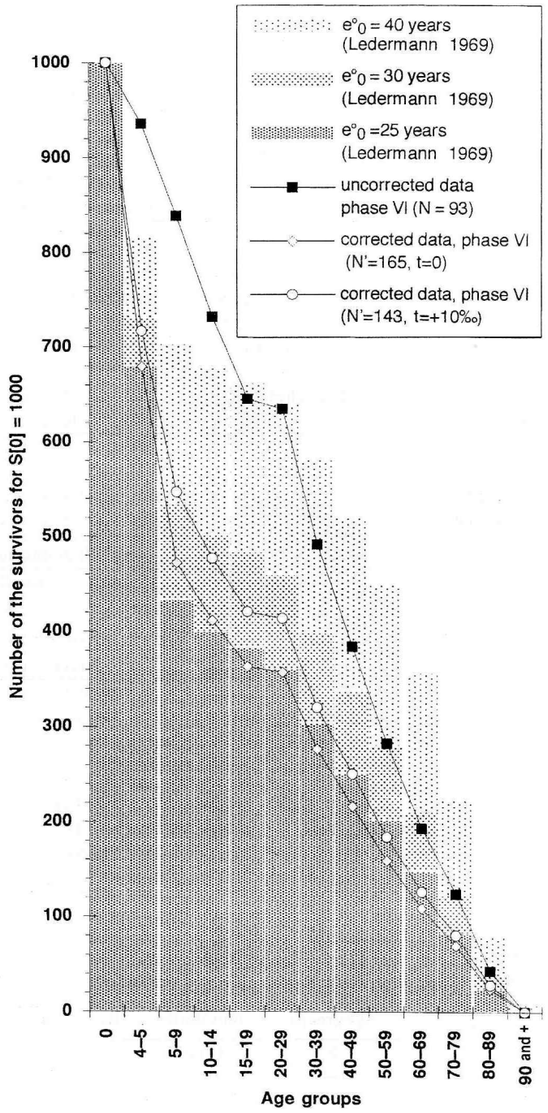

FIGURE 8. Saint-Martin-de-Cognac, phase IV: the graph of the survivors S(x) according to mortality tables (uncorrected data, corrected data from stationary pattern: t = 0 and constant pattern: t = +10‰).

In conclusion, the number of the population in phase VI exhibits a total lack of 72 children under five; of 89% infants and 74% of children under four. The total quantity of the deceased for the total number of the buried should be of 162 individuals instead of 93. This figure can only be approximate because of the results of the parameters used with estimators: D5-9/D10-14 and D5-14/D20 and + and because of a too low life expectancy.

TABLE 6. Estimates of life expectancy at birth (e°0), the infant probability of death (1q0), death probability below 5 (5q0), crude death rate (M) and crude birth rate (n), fertility rate (annual) 35F15, total fertility rate (per female) (DF) and death probability from 1 to 4 (4q1).

Data = D deaths (age in completed years)		
Total deaths N = 347.1	death D 5–9 = 32	D 5–14/D 20 and + = 0.185
death D 20 and + = 243.1	death D 5–14 = 45	D 5–9/D10–14 = 2.46
Estimations with basis of a stable population t = 0 (demographic estimators: Bocquet, Masset 1977)		
	Estimation	Interval of certitude 68% / Interval of certitude 95%
e°0 in years =	25.45 ± 2.89	22.56 – 28.34 / 19.67 – 31.23
1q0 in ‰ =	273.34 ± 21.43	251.91 – 294.77 / 230.48 – 316.20
5q0 in ‰ =	431.21 ± 50.19	381.02 – 481.40 / 330.83– 531.59
m = n in ‰ =	39.50 ± 3.92	35.58 – 43.42 / 31.66 – 47.34
35F15 in ‰ =	155.69 ± 12.94	142.75 – 168.63 / 129.81 – 181.57
DF (children/female)=	5.48 ± 0.45	5.03 – 5.93 / 4.58 – 6.38
4q1 in ‰ =	217.26 ± 46.03	171.23 – 263.29 / 125.20 – 309.32

TABLE 7. Estimates of life expectancy at birth (e°0), the infant probability of death (1q0), death probability below 5 (5q0), crude death rate (M) and crude birth rate (n), fertility rate (annual) 35F15, total fertility rate (per female) (DF) and death probability from 1 to 4 (4q1).

Data = D deaths (age in completed years)		
Total deaths N = 93	death D 5–9 = 10	D 5–14/D 20 and + = 0.305
death D 20 and + = 59	death D 5–14 = 18	D 5–9/D10–14 = 1.25
Estimations with basis of a stable population t = 0 (demographic estimators: Bocquet, Masset 1977)		
	Estimation	Interval of certitude 68% / Interval of certitude 95%
e°0 in years =	16.91 ± 4.21	12.70 – 21.12 / 8.49 – 25.33
1q0 in ‰ =	320.97 ± 26.64	294.33 – 347.61 / 267.69 – 374.25
5q0 in ‰ =	527.99 ± 59.62	468.37 – 587.61 / 408.75 – 647.23
m = n in ‰ =	54.75 ± 8.98	45.77 – 63.73 / 36.79 – 72.71
35F15 in ‰ =	197.19 ± 18.79	178.40 – 215.98 / 159.61 – 234.77
DF (children/female)=	6.90 ± 0.66	6.24 – 7.56 / 5.58 – 8.22
4q1 in ‰ =	304.87 ± 60.62	244.25 – 365.49 / 183.63 – 426.11

TABLE 8. Saint-Martin-de-Cognac, phase I: the mortality table calculated to the corrected data by demographic estimators (5)q(0) and (1)q(0) (Bocquet, Masset 1977) with t = 0.

Age groups	Raw deaths	Rates (a)q(x) in ‰	Survivors S(x)	Deaths D(x, x+a)	Life expectancy e°(x)
0	144.24	273.34	1000	273	24.29
1–4	83.31	217.26	727	158	32.24
5–9	32.00	106.62	569	61	36.63
10–14	13.00	48.48	508	25	35.71
15–19	12.00	47.03	484	23	32.40
20–29	57.11	234.86	461	108	28.87
30–39	38.69	207.95	353	73	26.20
40–49	39.49	268.03	279	75	21.77
50–59	33.29	308.62	204	63	17.91
60–69	25.92	347.60	141	49	13.67
70–79	32.65	671.12	92	62	8.29
80–89	16.00	1000.00	30	30	5.00
90 and +	0.00	1000.00	0	0	5.00
Total	**52.00**			**1000**	

(5)q(0) calculated	227.55	431.21
(0–14) i.e. (15)q(0)	272.55	516.49
(0–19) i.e. (20)q(0)	284.55	539.23

TABLE 9. Saint-Martin-de-Cognac, phase I: the mortality table calculated to the corrected data by demographic estimators (5)q(0) and (1)q(0) (Bocquet, Masset, 1977) with t = 0, N = 165.

Age groups	Raw deaths	Rates (a)q(x) in ‰	Survivors	Deaths D(x, x+a)	Life expectancy e°(x)
0	53.04	320.97	1000	321	19.41
1–4	34.21	304.87	679	207	27.35
5–9	10.00	128.21	472	61	34.47
10–14	8.00	117.65	411	48	34.17
15–19	1.00	16.67	363	6	33.39
20–29	13.31	225.63	357	81	28.92
30–39	9.98	218.33	276	60	25.89
40–49	9.46	264.84	216	57	21.72
50–59	8.30	316.03	159	50	17.75
60–69	6.45	359.36	109	39	13.63
70–79	7.50	652.29	70	45	8.48
80–89	4.00	1000.00	24	24	5.00
90 and +	0.00	1000.00	0	0	5.00
Total	**165.25**			**1000**	

(5)q(0) calculated	87.25	527.99
(0–14) i.e. (15)q(0)	105.25	636.91
(0–19) i.e. (20)q(0)	106.25	642.97

UNDER-REPRESENTATION OF CHILDREN, MORTUARY BEHAVIOUR AND HISTORICAL EVIDENCE

From the study of non-adult mortality, we can draw some demographic conclusions about the funeral practices of the inhabitants of Poitiers and Saint-Martin-de-Cognac. The striking phenomenon in the demography of the funeral areas studied, is the low representation of children under five, in contradiction with the death rate expected in these age groups which, even in the 18th century, reached 58% of the deceased in France (Blayo 1975).

Nevertheless, this under-representation of young children is common to all archaeological necropolises studied (Masset 1973a, 1973b, 1976, Sellier 1989, 1993). Several assumptions have been made in order to try and explain the low rate of young children; they are more particularly grounded on the specific destruction of bones and on socio-cultural factors.

In both French necropolises, the first factor is not valid. In Poitiers, there was no disturbance observed in the layers of stones that put an end to the use of the cemetery. At Saint-Martin-de-Cognac, we shall bear in mind the presence of several individuals in non-identified adult graves. Some of them only are represented only by dental or bone elements, but it is also the case for the remains of buried adults. As the majority of children have been buried in tombs which contained several individuals, we should explain why, in both necropolises, a partial destruction would affect specifically the children under five rather than of adults or of older children. Besides, it is well know that the conservation of bone elements in the soil very little depends on the age factor since the latter only accounts for 3 to 10% of the conservation variations of the whole population (Masset 1973b, 1976, 1990). This does not explain the 80% bias affecting children between 0 and 4 over the whole necropolis.

However, the partial study of the cemeteries does not exclude the possibility of a special area reserved to children, as it has been observed, for instance, in the modern period in Saint-Martin-de-Cognac, as well as in other medieval cemeteries located near the church (Aries 1997). Interestingly, this absence of children has been observed through the different periods analysed.

During the Middle Ages, the bias concerning children under 5 years has often been explained by socio-cultural reasons. Concerning early Middle-Ages, it was admitted that crimes against children were frequent and unimportant, either child murders or abortion. Sermons and ecclesiastical texts as well as secular ones, showing these practices, are a concern to those in charge with the Christian order. The denunciations of the Lerida council in 524, of the Toledo council of 589 (Spain), the Wisigoth's law or the Alaman's law bear witness of this fact (Riché 1966). In such circumstances, this will explain that children victims of such a fate were missing in the cemetery. The recognition of such crimes illustrates that children's lives were worth in the Middle Ages. Some authors see social reasons "...on fait disparaître avec l'enfant la preuve d'une relation coupable et surtout déshonorante" (Brissaud 1972). Others account for the relative indifference towards children in medieval society partly by daily life and its consequences (Flandrin 1981, Aries 1973). Many texts mention effects of starvation, infections and epidemics on young children, and all societies have dealt with this plague in the same way – by granting children a social and affective

recognition at a later age when the risk of losing them is becoming acceptable.

Whereas in general, books dealing with the way children are considered in Middle Ages are not in favour of love, we must nevertheless study the way how these files have been made up. This indifference towards children was emphasised in reports by Grégoire de Tours, Yves de Chartres (12th century), as well as in Penitentials of Middle Ages. If this mixture of chronological sources and references maintain confusion, none of them brings any precision concerning the frequency and the extent of these practices. If we only consider the legal sources, we can observe that the characteristics of crimes against children and the scarcity of their remissions are contrary to set ideas and show the respect paid to children in the Late Middle Ages. In a survey carried out for the whole Kingdom of France in the 14th and 15th centuries, abortion and child-murder represent actually respectively 1% and 2% of all murders committed against society (Gauvard 1991).

The lack of young children for the Poitiers Bishop's Palace is higher: 98% are missing in the 4 age-groups; in Saint-Martin-de-Cognac, for the 7th – 8th centuries period, 86% infants and 68% children under four are missing; for the 14th – 15th centuries 89% infants and 74% in the 1–4 age group are lacking.

In order to account for the bias of children under 5, the Church interdicts concerning the non-baptised are often mentioned. In Middle Age society, Christian baptism was given after weaning which was often pushed back to the age of 3 years in poor families (Bordier 1857) and this, in spite of the fact that the Church asked parents to have their children baptised early to spare them eternal death (Grégoire de Tours, *Histoire des Francs*).

The newborn deceased before baptism were subject to special practices that took the place of the refused ceremony, this because of the absence of social recognition (Klapisch 1973) and permission of burying them in the churchyard (Laget 1975): the little body was often put on the dunghill at the back of the house in a little village in the 14th and 15th centuries for instance (Lorren 1987). These Church interdicts probably account for the low representation of children in cemeteries. If we accept the idea, it would appear that the preponderance of the Church in people's daily life below the 7th century, had not changed the attitude of Saint-Martin-de-Cognac's inhabitants towards children, which seems unacceptable.

Even though we can totally exclude these practices as being a cause in the under-representation of very young children, it cannot be denied that they are not the only reasons in both necropolises. The low representation of children under 5 years can only betray a selection in the burials according to the age of the deceased in the parts of the cemeteries studied.

The over-representation of the 10–19 age group in the Old Bishop's Palace of Poitiers and of the 5–14 age group in Saint-Martin-de-Cognac are difficult to explain. In Poitiers, it is true that simultaneous burials contained individuals issued from these age groups, but since more of them displayed no evidence of violence on their skeleton, the probability of a mass murder can be rejected. The possibility of death being caused by a decease cannot be kept either, as no event of the kind can specifically affect an age group. We therefore, are in presence of a genuine demographic anomaly, well quantified, and results would have been more conclusive if both necropolises have been totally excavated and studied.

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