Reconstructing biological frameworks of populations in the past

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Reconstructing Biological Frameworks of Populations in the Past

„Since World War II . . . whole new fields, such as historical demography, and entirely new techniques, such as computer data processing, have appeared. . . . Historians have begun to raise questions previously unasked and to undertake research that once was thought impossible".

Robert I. Rotberg and Theodore K. Rabb, editors of *The Journal of Interdisciplinary History*, presenting the new journal in the first issue, Fall 1970, Vol. 1, Nr. 1, p. 3.

The following research note might serve as a modest illustration of this quotation. Between 1975 and 1978 the History Department of the Free University of West Berlin, with the financial support of the Deutsche Forschungsgemeinschaft and the Volkswagen Foundation, has established a data bank, the core of which consists of around 7,000 reconstituted families from eight neighboring Hessian villages (the so-called Schwalm region) from the 16th to the 20th century. For complementary analyses a number of further sources were taken into consideration, e. g. parish registers, or aggregated demographic materials (vital rates, censuses) for the city of Berlin or the village of Gabelbach, west of Augsburg in Bavaria[1]. The source material consulted, the quantitative methods applied for its processing, the thematic goals of the project, as well as first concrete results have been described extensively in a number of papers published in 1976 and 1977, so that in the framework of this paper we can omit such issues as collection and selection of the material, critique of the sources, methods of data processing, etc.[2].

In this note I would like to present some material from research work in progress and formulate a few thoughts, concentrating on one single point. In conscious reference to the title of the recent book by the British social anthropologist, Alan Macfarlane, *Reconstructing Historical Communities*[3], this single point can be de-

[1] I wish to express my gratitude to the Deutsche Forschungsgemeinschaft, Bonn/Bad Godesberg, and to the Volkswagen Foundation, Hannover, for their generous financial support in carrying out this research.

[2] Cf. the author's: Généalogie et demographie historique en Allemagne, in: Annales de Démographie Historique (1976), pp. 77–108; Historical Demography as Social History: Possibilities in Germany, in: Journal of Family History, 2 (1977), pp. 305–332; Historical Demography in Germany: A Research Note, in: Historical Methods Newsletter, 10 (1977), pp. 122–126; Mortalität in Berlin vom 18. bis 20. Jahrhundert, in: Berliner Statistik, 31 (1977), pp. 138–145.

[3] Macfarlane, Alan, in collaboration with Harrison, Sarah, and Jardine, Charles, Reconstructing Historical Communities, Cambridge 1977.

scribed as „reconstructing biological frameworks of populations in the past". Difficulties with the reconstruction of the biological framing conditions – which in my opinion, must constitute just as essential a part of Macfarlane's „reconstructing historical communities" as, for instance, the reconstruction of marital areas, administrative units, economic ties, ritual areas, etc. – come from the dilemma in which we continually find ourselves: the individual elements of which the biological frameworks are composed, e. g. fertility, fecundity, fecundability, masculinity, live births and death rates, stillbirths, infant mortality, life expectancy, etc., are not autonomous essentialities. They are all more or less two-faced. They are only partly biological phenomena; they are also stamped by social, economic, intellectual, culture-geographic, and other framing conditions or factors. One can never say with certainty, where the biological sphere ends and where the influence of the just mentioned conditions or factors begins. One should not be led astray by the numerous print-outs and plotted graphs of the computer with their exact percentage values and precise curves. The tension which results from this dilemma can be very fruitful for research; it can, however – because of the numerous problems, most of which can be solved only in inter-disciplinary cooperation – just as easily lead to premature resignation or to an one-sidedness of interpretation, which is no longer adequate to the respective topic.

Our first concrete exemple is the monthly distribution of the number of conceptions – reckoned backwards as nine months before birth. Here the question can be posed, whether, or to what extent, the often observed decline in the number of conceptions (in Catholic areas at the time of the Ancien Régime) in the month of March is due to human biology, or to the influence of the (Catholic) church, which during Lent may have urged a certain abstinence also in sexual matters upon the faithful[4].

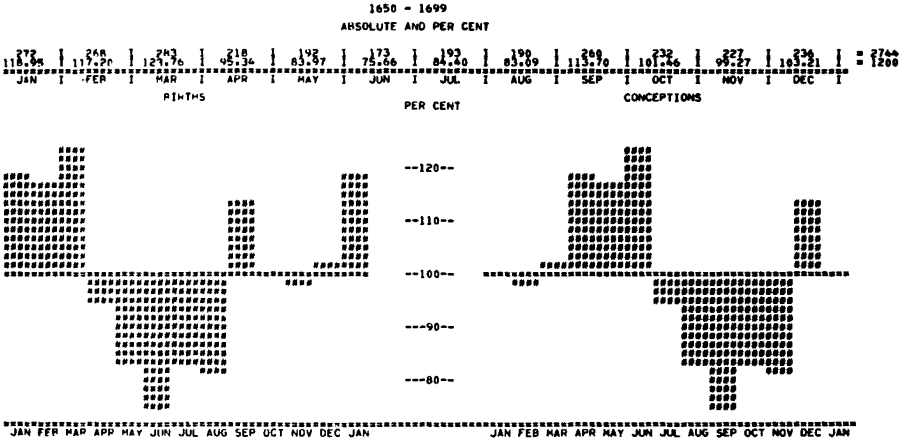
Or: how does one explain the likewise often demonstrated reduction in the number of conceptions (in agrarian societies of the European Ancien Régime) in mid and late summer as well as in autumn (August to November)? Is this primarily the effect of the greater intensity of labor in this season, which resulted in a decline in sexual activity in humans or is it part of a larger strategy of nature of yearly rhythms of sexual activity, the function of which might have been to bring as many children as possible into the world at a time when their chances of survival would have been the greatest. Doubtless, these chances were much better in the spring than in summer, on the one hand, because the mothers could better devote themselves to suckling children in winter and spring than in summer with its generally greater intensity of labor, and on the other hand, because a number of infectious

[4] Lebrun, François, Demographie et Mentalités: Le mouvement des conceptions sous l'Ancien Régime, in: Annales de Démographie Historique (1974), pp. 45–50; cf. also Smith, Daniel Scott, A Homeostatic Demographic Regime: Patterns in West European Family Reconstitution Studies in: Lee, Ronald D. (ed.), Population Patterns in the Past, New York 1977, p. 38.

diseases (especially e. g. diarrhea) in the summer regularly led to a greater number of infant deaths[5].

Given a sufficiently large data bank, the computer can serve as an extremely useful instrument for research work in progress in the clarification of such questions. In line with the preliminary theoretical considerations touched on above, it can collate the distribution of the monthly number of births or conceptions for particular space and time units, or for particular sequences of time units, but also for particular social or occupational groups, and it can present them graphically for an – often stimulating – illustration (cf. Figure 1).

Figure 1: Monthly Distribution of the Number of Births and Conceptions in the Schwalm Region 1650 to 1699. (As presented graphically by the computer, the deviations are from the monthly mean value of 100; the sum for 12 month being 1,200).



A second example with a similarly posed question concerns the distribution of stillbirths over the months of the year (cf. Table 1).

The most interesting part of the table is doubtless the rubric, „Stillbirths as a percentage of total births". It shows clearly the higher percentage of stillbirths in the winter months as compared to the summer months. The month of June represents the only exception in the rhythmic course of the year. For an interpretation here, it is necessary to weigh carefully a large number of factors, especially in view of the seasonly different labor-burden of women in agrarian societies in the household (different according to size and structure of the household, whether with or without servants), in the fields (e. g. for the hay harvest in June, but not for the

[5] Cf. the author's: Structures of Mortality in the 18th Century as Derived from Mass Statistical Analyses, in: Zeitschrift für Bevölkerungswissenschaft (1976), pp. 103–117.

Table 1: Monthly Distribution of Stillbirths in the Schwalm Region 1570–1960

Month	Stillbirths		Births	Stillbirths
	absolute	percent	absolute	as a percentage of total births
January	51	10.63	2 175	2.34
February	42	8.75	2 083	2.02
March	42	8.75	2 170	1.94
April	37	7.71	1 924	1.92
May	32	6.67	1 740	1.84
June	34	7.08	1 601	2.12
July	29	6.04	1 925	1.51
August	34	7.08	1 940	1.75
September	35	7.29	2 037	1.72
October	41	8.54	1 899	2.16
November	47	9.79	1 858	2.53
December	56	11.67	2 001	2.80
Total	480	100.00	23 353	2.06

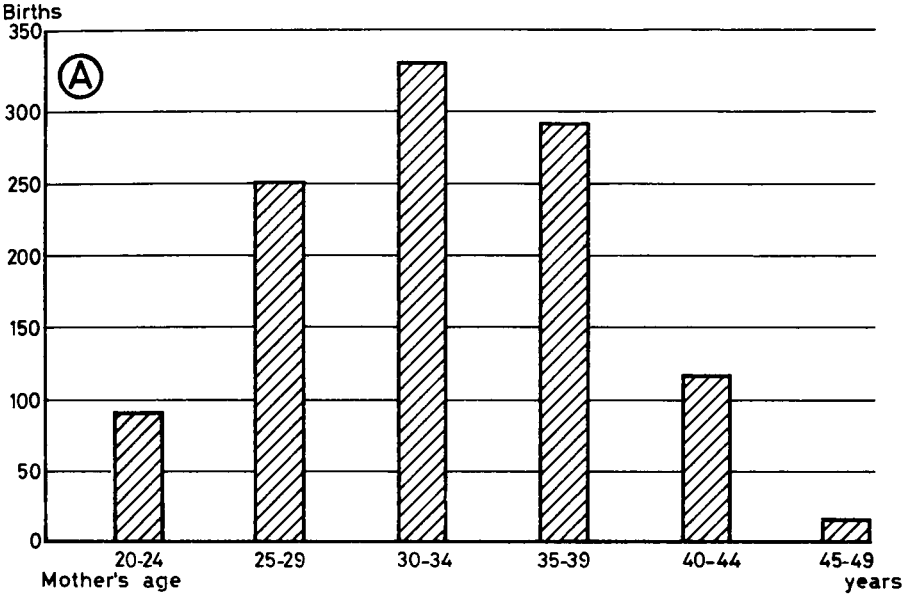
grain harvest in July and August), in the care of livestock. One must also take into consideration the seasonally conditioned differences in nourishment, in living and heating conditions, etc.[6]. If the data on stillbirths were great enough – in our material with 480 stillbirths all told for the entire period of time from 1570 to 1960, they are not – one could divide them into shorter time units. It might then be possible to ascertain, whether and when a change in the attitude of women, the family, or the society toward developing life took place, when and where more consideration was paid to pregnant woman, or when they themselves were better able to take care of themselves, and with greater probability to bring their children alive into the world[7].

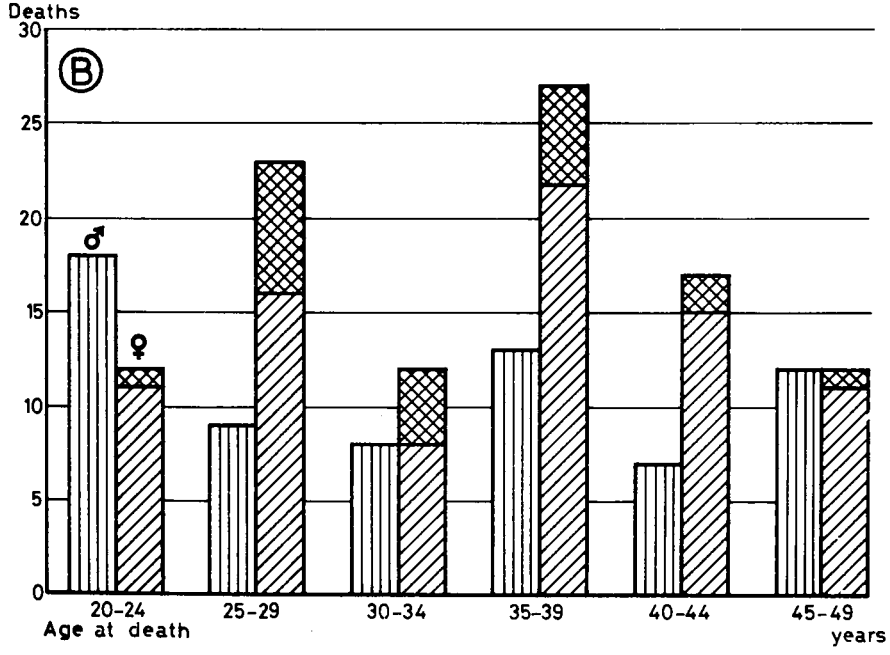
The example presented graphically in Figure 2 for the village of Gabelbach, 1680–1899 comes likewise from the border area between biology and women's living conditions.

[6] Cf. on this topic the two books by Léridon, Henri, Aspects biométriques de la fécondité humaine, Paris 1973, and Natalité, Saisons et conjoncture économique, Paris 1973, p. 76 (with an analogous monthly table for France for the years 1957–1959), p. 83.

[7] On the development of such parameters Edward Shorter bases an entire „New Agenda for psycho-medical history", the subtitle of his article Maternal sentiment and death in childbirth, in: Branca, Patricia (ed.), The Medicine Show. Patients, Physicians and the Perplexities of the Health Revolution in Modern Society, New York 1977, pp. 67–88.

Figure 2: Excess Mortality of Women Between the Ages of 25 and 44 in Gabelbach, 1680–1899.



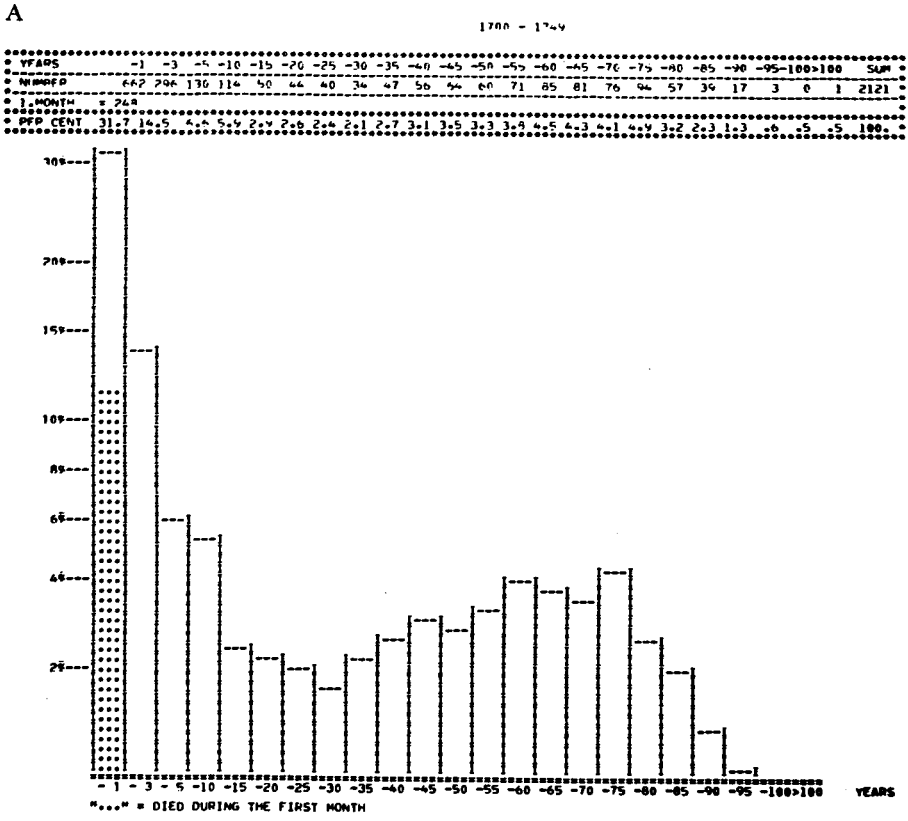


Deaths in childbirth (0-27 days after last birth)

The diagramm shows, above, the number of children, which women in different age groups brought into the world. Below, the number of deaths of men and women in these same age groups is presented. It is clear that more women between the ages of 25 and 44 years died than men of the same age; but it is also easy to see from the figure, that this fact is due only in part to the death in childbirth of women of childbearing age. Evidently the inner-familial and -household position of the wife and mother, who was charged with the care of infants, is just as essential. In those days these infants very often died of various infections diseases — a situation which often also led to an impairment of the health of the mother who cared for

Figure 3: Number of Deaths at Different Ages as a Percentage of Total Deaths in the Schwalm Region, 1700–1749 and 1750–1799.

A



them (whether through the additional labor-burden or through direct infection) and not seldom brought on her premature death[8].

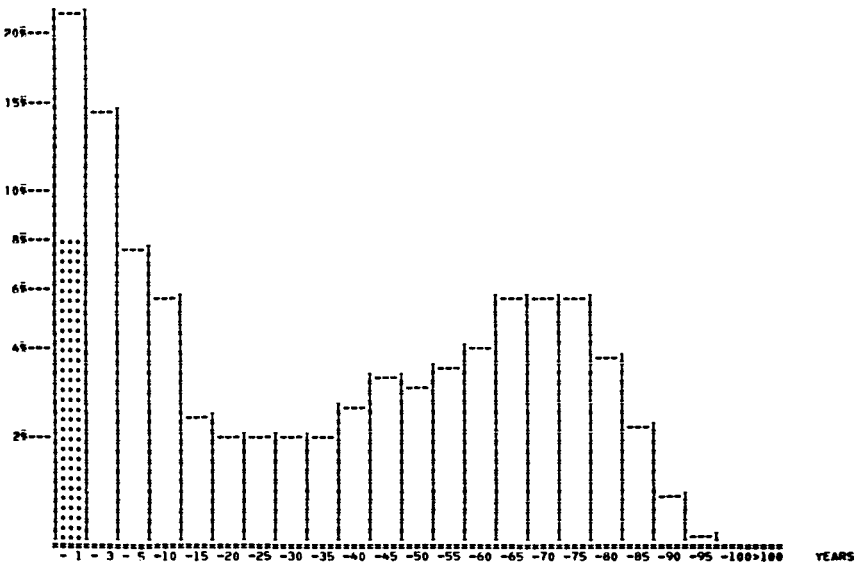
With this example, we have touched on a further central element of the biological framing conditions of human existence in general: the mortality patterns. One of the simplest methods to arrive at a more definite notion of the death patterns of a particular population at a particular time, consists in sorting the deceased according to their ages at death. For a graphic presentation, a logarithmic scale is to be recommended, since up to and even into the 20th century, mortality in the youngest age groups was incomparably greater than in all other age groups. In order to provide an orientation in the temporal succession of age specific death patterns in a somewhat simplified but very vivid and illustrative manner, the computer can be employed as a tool and can print out the corresponding diagrams in time-unit sequences (cf. Figure 3).

Figure 3: (continued)

B

1750 - 1799

YEARS	-1	-3	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60	-65	-70	-75	-80	-85	-90	-95	-100	>100	SUM
NUMBER	662	442	224	171	72	61	61	60	60	77	101	96	112	127	168	173	172	114	67	22	3	1	0	3046
1.MONTH = 246																								
PER CENT	22.2	15.0	7.9	6.1	2.9	2.5	2.5	2.5	2.5	3.0	3.8	3.7	4.2	4.7	6.0	6.2	6.1	4.2	2.7	1.2	.6	.5	.5	100.



"..." = DIED DURING THE FIRST MONTH

[8] On the problem of masculinity at different ages (number of men per 100 women) cf. Delille, Gérard, Un problème de démographie historique. Hommes et femmes face à la mort, in: Mélanges d'archéologie et d'histoire de l'École Française de Rome, Paris 1974, pp. 419–443.

With the application of this method to our example from the Schwalm region and in the comparison of the two time periods, 1700–1749 and 1750–1799, one can clearly see a segment of that fundamental change in the circumstances of death in the course of the last two or three centuries: the gradual decline of the earlier, extremely high infant mortality (from 1700 to 1749 more than 30 % of all deaths were among infants under one year of age) and the successive increase of deaths in ever higher ages, which in the end has led to the phenomenon, well known today, of the superannuation of entire populations (e. g. in Western Europe).

On the basis of our data bank material however, the computer was also able to provide us with more precise accounts of the mortality framework of populations in the past in the form of life tables and to present them graphically in temporal sucession. It thus shows how many individuals out of 1,000 born alive in a particular period were still alive at the age of 1, 2, 3, 4, 5, etc. respectively. We need not expound here on the immensely important role, which rising or sinking life expectancy at different ages plays for the economic, social and cultural development of a particular population. One need only think, for instance, of the increasing or decreasing problem of orphans and widows, of the influence on the age at marriage, of the varying quotas of life long celibacy, of increasing or decreasing population pressure (relation between population size and means of subsistence), of a greater or smaller immigration or emigration, as well as the consequences for the social, economic, and mental stability of the population.

On the basis of the life tables, it was possible to go even one step further. In connection with the study of Kjeldsen's on the „Evaluation of the impact of various diseases on mortality"[9], we present two life tables for the Schwalm region for the period 1600–1649, one on the basis of all dead persons and a second time excluding those deaths due to the plague, which was recurrent in that period (cf. Table 2 and Figure 4).

Figure 4 shows clearly that the average life expectancy was drastically reduced on account of the plague epidemics in the 1610's and in the 1630's. Interestingly, this observation does not apply to infants and small children – at least not in our figure. Here we are probably dealing with a problem of source material rather than with biological reality. In historical demography the notorious underregistration of deaths among infants and young children in these earlier times is a well known fact. The Schwalm region is certainly no exception in this regard. Plague years, however, seem to be excepted from this rule, for in these years, infants and small children who died „of the pestilence" are registered in the church books in great numbers.

[9] Kjeldsen, Kjeld, Evaluation of the impact of various diseases on mortality, in: Bulletin of the World Health Organization, 52 (1975), pp. 369–375. This article is based on Danish material for the years 1969 and 1971. Cf. also Preston, Samuel H., Demographic and Social Consequences of Various Causes of Death in the United States, in: Social Biology, 21 (1974), pp. 144–162.

Figure 4: Survivorship Proportions in the Schwalm Region, 1600–1649;
a) on the basis of all registered deaths,
b) with a specific registered cause of death (plague) excluded.

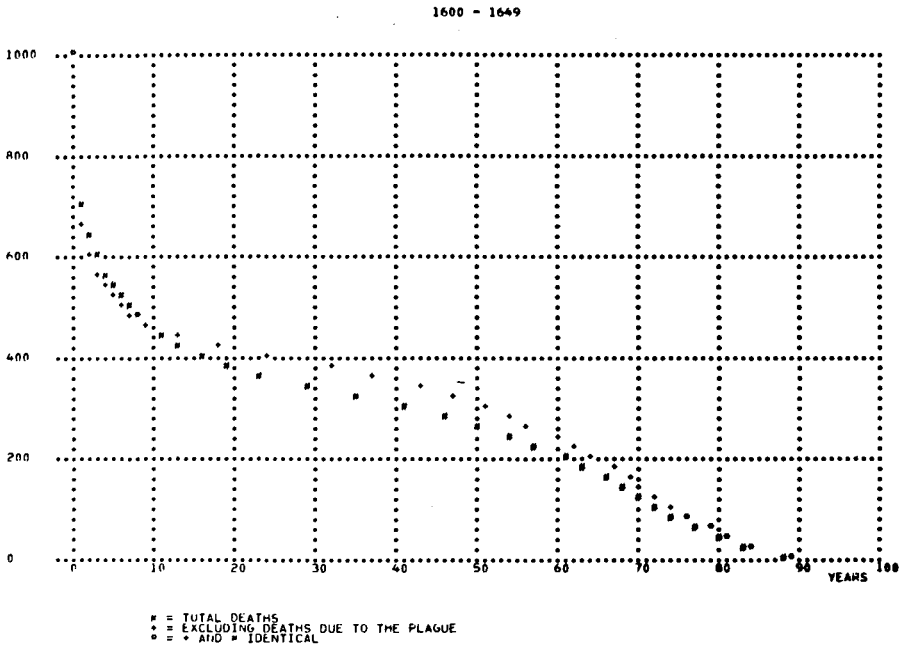
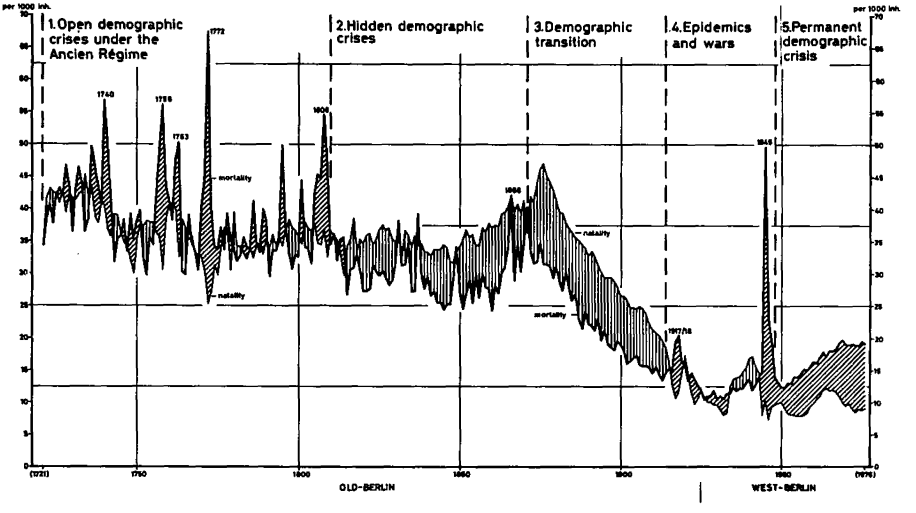


Table 2: Number of Deaths in the Schwalm Region, 1600–1649;
a) total, b) due to the plague

Period	Deaths	
	a) total	b) due to the plague
1600–1609	64	1
1610–1619	356	113
1620–1629	341	41
1630–1639	497	142
1640–1649	253	0
1600–1649	1,511	297

One final example from Berlin is still to be introduced. It shows the long range development of the crude birth and death rates per 1,000 inhabitants within the respective borders of the city[10] (cf. Figure 5).

Figure 5: Births and Deaths per 1,000 Mean Population in Berlin 1721–1976.



When one examines this graph, it is only natural at first to focus one's attention on the striking black peaks, which show a sudden increase in mortality up to double, triple or quadruple the normal level. The dates for the most important of these peaks are given in Figure 5: 1740, 1758, 1763, 1772, etc. up to 1945. It is in no case difficult to trace the respective increases in mortality to one or more of the three classic causes: war, famine, epidemic. The catastrophy at the end of World War II left its mark on the population of Berlin just as did the combination of the effects of war, hunger and pandemic influenza in 1917/18. Even where one's own memory or what one knows from hearsay are not sufficient, the sources necessary for the interpretation of such mortality maxima are abundantly available. Catastrophies of all kinds have always been amenable to the production of sources and make the historian's work easier. The high mortality of the early 1740's and 1770's is clearly related to bad harvests throughout Europe. During the Seven Years War (1756–1763) Berlin was occupied by the Austrians in 1757 and by the Russians in 1760; from 1806 to 1808 the city had to bear with a French occupation. Finally, 1866 represents the highpoint of a series of cholera waves, which began in the 1830's.

[10] For an exact description of the sources consult Berliner Statistik, 31 (1977), p. 145.

However historical research today does not so much inquire into such striking, individual events, but rather into longer range fundamental structural changes. For this purpose I have divided the entire era of 256 years observed here into five periods. The first period (from 1721 to approximately 1810) shows the last phase of a century-old model of mortality. In historical demography this is called „mortality of the type, Ancien Regime". While the natality curve remains comparatively stable, the mortality curve shows considerable fluctuation from year to year. There occured again and again open crises in which the number of deaths considerably exceeded the number of births.

A second phase shows itself in the years from 1811 to 1871. The range of the fluctuations in mortality was reduced to around a third of its previous extent, and the mortality curve remains throughout below the natality curve. Even mortality maxima such as that of 1866 no longer exceed natality. In the terminology of historical demography (French), it has become customary to designate such phenomena as *crises larvées*, i. e. hidden crises, which no longer resulted in a decrease in population.

A third period began in the 1870's and lasted until World War I. In the course of these four decades, mortality and natality declined from century-old average values of 30 or 40 per 1,000 mean population to approximately one third of their respective former values. This is not the place to go into detail about the causes of this demographic transition. As is well known, many different arguments are advanced as being of primary importance, for instance, the greater efficiency of state administration in securing the means of subsistence, long range improvements in the climate with a decrease in bad harvests, the increasing importance of medicine for the individual and the family, better physical hygiene, the decrease in infant mortality on account of lower birth rates, improvements in the area of drinking-water and sewage systems, innovations in medicine and medicaments, the development of a social welfare apparatus, and many others[11].

The fourth period, the time between the first and second World Wars, brought back irregular values like those of more than a century before. Comparable death surpluses had before been experienced only under the Ancien Régime. On the other hand, something fundamentally new begins to be seen in the last phase, in the years from 1950 to the present. There has never before been a permanent crisis, such as that of the last quarter century, in which mortality, for years on end, is double the birth rate. Such a development leaves a much more enduring mark on a population than any short-term crisis of the old type – no matter how open or obvious. It should not be overlooked that we are dealing with the effects of a situation specific to Berlin and with a superannuation, which at this time is extreme. Nonetheless this

[11] For a discussion of the different arguments cf. Lee, Robert W., Primary Sector Output and Mortality Changes in Early XIXth Century Bavaria, in: Journal of European Economic History, 6 (1977), pp. 133–162. With regard to the historical decline of fertility in Europe cf. a series of monographs issued by the Office of Population Research at Princeton University. (For Germany: Knodel, John, The Decline of Fertility in Germany 1871–1939, Princeton/N. J. 1974).

development can be observed as a tendency both in the Federal Republic of Germany and in the German Democratic Republic, where likewise for the past several years birth deficits can be demonstrated. It is not famine, war or epidemics which threaten society today but rather – as Pierre Chaunu says – the *Peste blanche* (the White Plague, i. e. suicide) and the prevention of life in the form of family planning and abortion. Death need no longer rage periodically among humans, as it did for centuries, so that – as Malthus said – a too quickly growing population adapts itself to the more slowly growing means of subsistence; an excess population no longer comes into existence.

A consequence of the thorough-going demographic transition in the course of the last two or three centuries is a radical change in the age at death. As late as 1875 in Berlin, 60.7 % of all live-born children did not live past their fifth birthdays, and only 5.1 % lived to be older than 70; in 1975 on the other hand, the number of those wo died at the age of 70 or more had risen to 68.1 % of all deaths, whereas the corresponding number of deaths of those under five years of age had sunk to 1.1 %. This fact alone is sufficient to show a fundamental change in the panorama of the causes of death. Infants and small children, in light of their short life-span, can for example never die of chronic illnesses to the same extent as people who have reached the biologically upper boundaries of life. Alongside the demographic transition, an epidemiologic transition has taken place[12].

In itself no justification is needed for the fact, that in a discussion of mortality patterns in a research note on „reconstructing biological frameworks of populations in the past", the *deaths* of human beings have relatively long been the focus of attention. Nevertheless I would like to avoid the appearance, that this might have been a goal in itself, that I might, so to speak, be pursuing a history without humans or that they interest me only after death has claimed them. While detailed investigations of death rates, live tables, the causes of death, etc. are necessary, they represent merely partial studies for a more encompassing history. And here other questions are of central importance, for instance: What does all this mean for the human being, the *living* human being? I mean by this not so much the mastering of the consequences of an essentially longer average life today, the social, economic and medical problems of an increasingly older society; rather I ask about the influence on our concepts, notions and attitudes. „Life-long" means something totally different today than it did in the 18th century; the same applies to the marriage vow „until death do ye part". Earlier there were more orphans; today more children of divorced parents. The century-old institution of marriage as a lasting tie attains a completely new temporal dimension, for which the longer-lived human is perhaps not yet ready. Generational conflicts can increase in a similar manner, simply because more generations live at the same time. It seems to me as though we have not at all yet gotten used to the longer lease on life allotted us. One century,

[12] On the epidemiologic transition cf. several articles by Omran, Abdel R., e. g. A Century of Epidemiologic Transition in the United States, in: Preventive Medicine, 6 (1977), pp. 30–51.

in the course of which the essential changes have taken place, has not been sufficient. Do we not act in many areas as if our life expectancy were on the average 40 or 50 years? One thinks of the often small commitment of the everyday man to the active provision for a healthy old age.

However, not only the time up to death has changed, death itself has changed. It no longer grips us so often in childhood, youth, in the flower of our years; it no longer tears us out of profession, responsibility, family obligations; it is no longer a mass phenomenon as it was in the times of the great epidemics. Today it comes furtively and individually, often as a release, an end to years of chronic pain, often seemingly suddenly after we have already died professionally, socially, familially.

We should today have more opportunity and time to adjust ourselves to death and to prepare ourselves for it, to consider it as the close of a long and fulfilled life. But parallel to the successful exertions to postpone death until ever older ages, another process has taken place, through which death – wherever possible – has been repressed: out of consciousness, out of the family, out of everyday life. Only in most recent years has a movement begun, which encompasses not only various branches of science but also the mass media, whose goal is to remove the taboo of the „forbidden death". It is to be hoped, that this is not merely a new variant of repression – similar to that involved in the marketing of sexuality – but rather the expression of attempts, better than before, to use the chances which have been made available to us through the fundamental changes in mortality patterns outlined here as an essential part of the biological framework of human beings during the last two or three centuries[13].

This last example may be taken as an illustration of what arouses my interest in reconstructing biological frameworks of populations in the past. It is not merely biology of man in history per se, not even working out and interpreting larger inter-relationships in this context, such as demographic or epidemiologic transitions; it is one step further: the intricate but stimulating field between biology and man, between birth, health, disease, life expectancy, death, and man's attitude toward birth, health, disease, life expectancy and death; his arrangements with biology, with his body's functions or dysfunctions, his changing reactions within changing biological frames.

[13] Once again here, many suggestions and impulses are derived from Ariès, Philippe, Western Attitudes toward Death from the Middle Ages to the Present, Baltimore 1974. In the meantime, Ariès has filled out his own framework with more research: L'homme devant la mort, Paris 1977, (642 pages!).