*The Stabilisation of Mortality in Pre-industrial Western Europe**

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The outstanding feature of mortality behaviour in western Europe in all centuries before the twentieth has been a great instability. In the late twentieth century, in contrast, crude death rates, age-specific mortality rates, and even the total number of deaths in a given place or area, fluctuate relatively little from year to year. This paper aims to examine the beginning of the transition from one type of mortality pattern to the other. By 'stabilisation', in other words, what is meant is the diminution of the violence of short-run fluctuations. From the highly unstable mortality of, say, the seventeenth century, to the remarkable steadiness of the late twentieth century is a long and uneven process of the damping-down of fluctuations: this paper looks at only the first phase of this transition. The beginnings of any major process are always interesting, though the greater part of this stabilisation was, in fact, achieved within the chronological limits indicated in the title.

The sources used for studying mortality fluctuations are annual time-series of deaths or burials. These relate to parishes, towns,

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regions and, occasionally, whole countries. They have been obtained by counting and aggregating entries in parish and other registers. It is well known, of course, that parish registers, the principal source of these mortality series, are incomplete records of deaths. But while under-registration may tend to vary just sufficiently in the long run to jeopardise their use for certain demographic purposes, there is no reason to suppose that it will have fluctuated sufficiently to distort the pattern of mortality in the short run. It would require extremely violent changes in the extent of under-registration to turn, say, a peak of mortality into a trough of burials, or even to shift such a peak from one year to another. Certainly there are grounds for supposing that under-registration might vary in one way in the short run: towards a severe peak of mortality, under-registration might well increase. The effect, however, of peak under-registration of this kind is to under-estimate the severity of a crisis rather than to distort the short-run pattern. There are instances of registration ceasing altogether on the deaths of those responsible for it. In these cases a gap may invalidate the use of that register entirely. Occasionally, the failure of registration in a crisis speaks as clearly as the full written record: there are blanks in the registers of a dozen parishes in the City of Genoa in 1657 and 1658, but the number of annual burials when the registers resume in 1659 runs for several decades after at just about half the pre-gap level; one must assume that nearly half the population was carried off in those two years.[1]

The study of a large number of annual mortality series of this kind immediately reveals the complexity of the pattern of short-run fluctuations. A principal feature of the short-run fluctuations is the severe peak of mortality to which the French demographic historians have attached the slightly over-dramatic label '*crise de mortalité*' — mortality crisis. Mortality crises may be traced through the annual series at four geographical levels — at the extreme of localisation, occurring, that is, in only a single parish,

1 G. Felloni, *Per la storia della popolazione di Genova nei secoli XVI e XVII*, « Archivio Storico Italiano », 110 (1952), Table III.

or in a single town which may, administratively, consist of a number of parishes; at a regional level, leaving aside for the moment the question of definition of a region (in some cases it is a region carefully delineated according to geographical, political or economic criteria: in other cases it is simply an area selected by a historian for study according to his own particular criteria); at a national level; and, finally, at a subcontinental level, embracing, that is, the whole area of western Europe under consideration.

A prime need, therefore, in the assessment of the demographic importance of short-run fluctuations is for information about the geographical coverage of the recurring crises. The annual series tell us something about their frequency at local, regional and national levels, and, subject to the limitation mentioned a moment ago, they will also tell us something of their severity.

Broadly, therefore, this paper attempts initially to examine the chronological changes in the frequency and severity of mortality crises at local, regional and national levels. Since the pattern revealed by the available series is so confused, however, some rough forms of measure are desirable if any useful generalisations about changing patterns of geographical coverage, frequency and severity are to emerge. The severity of a crisis may be assessed by noting the extent to which mortality rose in comparison with 'normal' mortality. Given that even non-crisis mortality fluctuated rather severely in the short run, the establishment of a level of 'normal' mortality is bound to be somewhat arbitrary. For the practical purposes of this paper it is taken as being the mean of the ten years astride (but not including) the crisis — i.e., the mean of the quinquennia before and after the crisis. This way it makes no serious difference if a crisis fits into a single calendar year or spills over into two or even more years. The severity of crises is measured by the *crisis mortality ratio* (CMR) which indicates the percentage excess of mortality over and above the 'normal'. Thus, to give an example, the 1,626 deaths in the City of Basle in the crisis of 1667 compared

with a mean of the two quinquennia 1662-6 and 1668-72 of 337, and showed an excess of 1,289 deaths, or 382% of the normal. By any standards, of course, for a city of around 14,000 inhabitants, this was a severe crisis, killing, as it did, about 12% of the total population in a single year.[2] Given that CMRs of up to 1000 or even 1250 were reached from time to time in crises in single parishes or cities, and bearing in mind that, in the late twentieth century peak mortalities in western Europe rarely produce CMRs of more than a per cent or two above the normal, the probable under-registration in crisis years is unlikely seriously to vitiate crisis indicators registering this order of magnitude.[3]

In terms of the long-run rates of growth of national or sub-continental populations, what matters, however, is the proportion of actual growth achieved in the short periods between crises that is cut back by the recurring crises. And what determined this involves, of course, the frequency and geographical spread of the crises as well as their severity. Some assessment must be made, in the first place, of frequency in combination with severity. By frequency, of course, what we really want to know is comparative frequency, i.e., the change in frequency over time. To assess this, the whole period covered by these annual series has been divided into quarter-centuries with a view to tracing changes in in the loss of life due to crises, i.e., to mortality over and above the 'normal'. For single parishes and towns any year in which the CMR exceeds 50 has been arbitrarily counted as a crisis, to allow for the fact that for most of this period it was quite normal for annual mortality in non-crisis years to fluctuate by up to as much as 50% above or below the secular mean. A CMR of this magnitude, however, would fail to catch in its net many regional

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2 A. Burkhardt, *Demographie und Epidemiologie der Stadt Basel während der letzten drei Jahrhunderte, 1601-1900* (Basel, 1098), p. 89.

3 Since devising these crude measures, two further attempts, both using English material, to measure the same variable have appeared. [R. E. Jones, *Parish Registers and Population History: North Shropshire, 1538-1837* (London University, PhD thesis, 1973), p. 198; and R. Schofield, *'Crisis mortality'*, « Local Population Studies », 9 (1972), Table, p. 17].

and national crises, since crisis mortality tends to be of proportionately lesser magnitude the larger the area studied. For regions and countries, therefore, any year in which the CMR exceeds 30 has been — again arbitrarily — counted as a crisis. In both single places and regions the *aggregate of crisis mortality* (CMA) in any quarter-century is then simply the sum of the CMRs of all crises defined in one or other of these two ways.

The question of geographical spread can only be satisfactorily dealt with by examining as many series as possible in as many areas as possible. National figures, such as we have, for example, for the Scandinavian countries[4] from, broadly, the mid-eighteenth century on, while they will not delineate geographically the exact location of crisis mortality, will indicate the aggregate effect. Thus the crisis of 1772-3 in Sweden produced a CMR of 150, and since this is an average for the whole country, it may be imagined that it will have involved local mortality in some areas appreciably higher than this. In default of national figures for whole countries outside Scandinavia until the nineteenth century, we must make do with regional figures where these have been compiled. To overcome this difficulty for Scotland, regional and national indexes of mortality have been calculated.[5] These are not, of course, based on a complete aggregation of the burials of all parishes — the failure of far too many registers to be kept or to survive, prevents that; they are based on a varying number of surviving registers, weighted according to the average number of burials in each of them in successive periods.[6]

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[4] Conveniently brought together in H. GILLE, *Demographic history of the Northern European Countries in the 18th century*, « Population Studies », III (1949), p. 61, and given for each Norwegian diocese separately in M. DRAKE, *The growth of population in Norway, 1735-1855*, « Scandinavian Economic History Review », XIII (1965), p. 133. There is also a short series for Finland (1722-49) in E. JUTIKKALA, *Finland's population movement in the eighteenth century*, in D.V. GLASS & D.E.C. EVERSLEY (eds.), « Population in History » (1965), p. 555.

[5] CMAs derived from four of them are shown in Table I.

[6] The original parish registers are all in National Register House, Edinburgh. Full details of the many registers on which these indexes are based, together with a description of the method of calculating the indexes will be given in the forthcoming volume, *Scottish Population History*, currently in preparation by the Scottish Historical Demography Unit of Edinburgh University.

The geographical distribution of crisis mortality, its impact on national crisis mortality, and hence its contribution to the reduction of aggregate growth rates may be illustrated from these Scottish figures, for it is only here that we have at the moment series at all three levels — parochial, regional and national. In the serious crisis of the 1690s, for example, it emerges that though it was concentrated mainly in the three years of 1697-9, unusually high mortality prevailed in one part of Scotland or another from 1694 to 1700. For seven years, that is, off and on, mortality was significantly above the normal. The index of Scottish mortality shows CMRs of 58 and 53 for 1697 and 1699 respectively. But a national CMR of around 55 was never evenly distributed across the length and breadth of a country. The worst years in the north-east were 1697-9, when the CMRs rose to 136, 88 and 95 respectively; in the eastern Lowlands the worst years were 1697 and 1699, giving CMRs of 37 and 68; but in the western Lowlands, however, 1695 and 1697 were the bad years with CMRs of 53 and 93 respectively. Even these more severe regional crises, however, were aggregates of parochial series whose varying chronologies again damped the effect of the more acute local fluctuations. The parish of Spott in East Lothian, for example, suffered a CMR of 400 in 1699, when the CMR of its region rose only to 68. On the other hand, Old Machar, a suburb of Aberdeen, produced CMRs of 105, 89 and 128 for the three years 1697-9, broadly comparable to the figures for the north-east Scotland regional index.

Crisis mortality, in other words, tended to be sharper, the more local the area studied. Chronological variations from one area to another, often reflecting no more than the pace of movement of an army or an epidemic, broaden the chronological base of a crisis at regional level. Total mortality, in any one crisis, of course, is the cumulative function of severity and ubiquity. For the moment, the dearth of regional mortality series, compared with the comparative plenty of parochial and urban series, means that generalisations about the spatial dimension of the short-run fluctuations must be rather inadequately based.

We can now turn to a closer examination of the trends in mortality fluctuations as revealed by the study of a number of mortality series from those western European countries for which long series are available. In Table I the results of calculations of CMAs for a number of parishes, towns and regions are set out for as many complete quarter-centuries as the extant series cover. The table is based on an extremely small number of examples. Many other places for which series are available are not included because they have gaps in them, because they run for rather short periods, because they fail to cover the complete quarter-centuries selected, or because their very small populations tended to produce much more erratic measures of CMR.[7] It is not

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7 The series consulted include: for France — Beaumont et Marcheroux, 1690-1799 [J. GANIAGE, *Trois Villages d'Ile de France au XVIII^e siècle* (Paris, 1961), pp. 130-32]; Saint-Pierre-Eglise, 1657-1790 [J. LELONG, *Saint-Pierre-Eglise*, « Annales de Démographie Historique » (1969), p. 127]; Tournon, 1668-1729, Beaulieu, 1670-1699, Velliers, 1675-1693, Charost, 1677-1711 [M. LACHIVER, *Une étude et quelques esquisses*, « Annales de Démographie Historique (1969), pp. 232-3]; Villedieu-les-Poeles, 1711-89 [M.-H. JOUAN, *Les originalités démographiques d'un bourg artisanal normand au XVIII^e siècle: Villedieu-les-Poeles, 1711-1790* « Annales de Démographie Historique » (1969), p. 122]; Coulommiers, 1669-1715, Chailly-en-Brie, 1669-1714 [J.-C. POLTON, *Coulommiers et Chailly-en-Brie*, « Annales de Démographie Historique » (1969), p. 31]; Toulouse, 1790-1813 [J. COPPOLANI, *Bilan démographique de Toulouse de 1789 à 1815*, in « Contributions à l'Histoire Démographique de la Révolution Française » (Commission d'Histoire Economique et Sociale de la Révolution Française: Mémoires et Documents, XVIII, Paris, 1965), p. 230]; Calvados, 1801-1815 [J. CL. PERROT, *La Population du département du Calvados sous la révolution et l'Empire*, in *ibid.*, p. 168]; Brittany, 1770-1787 [Y. BLAYO & L. HENRY, *Données démographiques sur la Bretagne et l'Anjou de 1740 à 1829*, « Annales de Démographie Historique » (1967), p. 163]; Ruille-le-Gravelais, 1700-1790, Valenciennes, 1737-1848, Quarouble, 1703-1792, La Gorgue, 1695-1792 [MICHEL MORINEAU, *Les faux-semblants d'un démarrage économique: agriculture et démographie en France au XVIII^e siècle* (Paris, 1970), pp. 311-13, 364-65]; Bessin, 1730-1792 [M. EL KORDI, *Bayeux au XVII^e et XVIII^e siècle* (Paris & The Hague, 1970), p. 280]: for England — Exeter, 1661-1800 [R. PICKARD, *The Population and Epidemics of Exeter in Pre-Census Times* (Exeter, 1947)]; Carlisle, 1779-1813 [H. LONSDALE, *The Life of John Heysham, M. D.* (London, 1870), p. 129: for Italy — Genoa, 1586-1700 (G. FELLONI, *Per la storia della popolazione di Genova nei secoli XVI e XVII*, « Archivio Storico Italiano », 110 (1952), Table III: for Spain — Cassa, 1589-1717, Palamos, 1576-1717, Sitges, 1627-1705, Vilafranca, 1616-1720 [J. NADAL & E. GIRALT, *La Population Catalane de 1553 à 1717* (Paris, 1961), pp. 206-210]; Cadiz, 1800-1837 [W. H. SYKES, *Statistics of Cadiz*, « Journal of the Royal Statistical Society », I (1838), p. 339]; twelve Catalonian parishes, 1780-1820 [J. NADAL, *La Población española: siglos XVI a XX* (Barcelona, 1966), p. 123]: for Holland — Jisp, 1655-1695, Broek, 1696-1810 [A. M. VAN DER WOUDE, *Het Noorderkwartier. Deel III*, « A. A. G. Bijdragen », 16 (1972)]: and for Norway — four bishoprics, 1735-1855 [M. DRAKE, *The growth of population in Norway, 1735-1855*, « Scandinavian Economic History Review », XIII (1965), p. 133].

unreasonable to say, however, that the mortality fluctuations illustrated by these additional series broadly bear out those demonstrated by the series used in Table I. It should be borne in mind that there is bound to be a certain uncertainty in the trends of series based on crises of rather random frequency — possibly once in periods ranging from 5 to 30 years — and slotted into quarter-centuries arbitrarily located between round dates. Thus, changes in CMA levels from one quarter-century to the next are not necessarily very meaningful, being determined as much by the accidental location of a crisis on one side or other of the quarter-century dividing lines. For example, the tendency for the fourth quarter of the seventeenth century to show higher CMAs in the Scottish regions may be explained partly in terms of a rather severe crisis in the year 1675 itself (the first year of the fourth quarter) which drove up the national CMR to 57. But the secular downward trend of CMAs nevertheless emerges, quite unmistakeably, to substantiate, it is hoped, the assertion implicit in the title given to this paper.

It would seem that the most significant reduction in crisis mortality occurred during the second half of the seventeenth century, though the decline continued in most parts through the eighteenth century. In France, crisis mortality remained a little higher than in some of the other areas represented during much of the eighteenth century, though even here the level was lower than in preceding periods. Some areas showed a small reversal of the generally downward trend in the second quarter of the eighteenth century: this often turns out to be due to the severe crises around the years 1740-42. It is to be hoped that in the course of time more series will become available for the sixteenth and early seventeenth centuries which will make it possible to judge better whether the severe instability of the seventeenth century was a new phenomenon or merely a continuation of chronic instability of earlier periods. The very sparse material at present available remains equivocal on this issue. Schofield's recent figures for a wide sample of English parishes, though still thin, as he insists, on the sixteenth century, nonetheless tend to

TABLE I

CRISIS MORTALITY AGGREGATES 1600-1824 *
PARISHES AND TOWNS
(Aggregates of crisis mortality ratios < 50)

Country	Parish/Town	1600-24	1625-49	1650-74	1675-99	1700-24	1725-49	1750-74	1775-99	1800-24
ENGLAND	Norwich [1]					0	99	0	0	54
	Leeds [2]	322	403	0	59			0	0	
	Ulverston [3]					182	131	400	297	
	Dalton [4]					0	193	290	251	
	Exeter [5]				193	68	193	0	121	
FRANCE	Tourouvre [6]					415	154	245	129	
	Bas-Quercy [7]							228	214	
	Le Louroux-Béconnais [8]	323	813	326	133	436	296	145	0	
	La Chapelle d'Aligné [9]		799	252	87	55	228	149		
	St. Pierre d'Angers [10]			332	52	0	0	77		
	Sainghin-en-Mélantois [11]					455	640	0	525	195
	Crulai [12]				504	479	205	358	270	
	Lourmarin [13]				837	237	67	136	54	0
	Dole [14]						271	51		
	Tamerville [15]		505	274	107	214	118	270	0	
	Meulan [16]				176	370	317	216	126	61
	Bléré [17]					127	223	82		
Mean of French parishes & towns			705	296	271	264	229	163	165	85

* A blank entry indicates that there are no adequate data. An entry of 0 means that there were no crises of 50 or 30 CMR severity respectively for parishes/towns and regions in the quarter-century in question.

[1] J. K. EDWARDS, *Norwich Bills of Mortality, 1707-1830*, « Yorkshire Bulletin of Economic and Social Research », 21 (1969), pp. 110-112.

[2] To 1699, M. DRAKE, *An elementary exercise in parish register demography*, « Economic History Review » 2nd ser .XIV (1962); 1750-1799 F. BECKWITH, *The population of Leeds during the Industrial Revolution*, « Publications of the Thoresby Society », XLI, « Miscellany, 1943-1951 » (Leeds, 1954), pp. 179-182.

[3] and [4] I am indebted to Dr. J. D. Marshall of the University of Lancaster for these unpublished series.

[5] R. PICKARD, *The Population and Epidemics of Exeter in Pre-Census Times* (Exeter, 1947).

[6] H. CHARBONNEAU, *Tourouvre-au-Perche aux XVII^e et XVIII^e siècles* (Paris, 1970), pp. 259-261.

[7] P. VALMARY, *Familles paysannes au XVII^e siècle en Bas Quercy* (Paris, 1965), pp. 176-177.

[8], [9] and [10] F. LEBRUN, *Les Hommes et la Mort en Anjou aux 17^e et 18^e siècles* (Paris, 1971), pp. 507-510.

[11] R. DENIEL & L. HENRY, *La population d'un village du Nord de la France, Sainghin-en-Mélantois, de 1665 à 1851*, « Population », 20 (1965), p. 597.

[12] E. GAUTIER & L. HENRY, *La Population de Crulai, Paroisse Normande* (Paris, 1958), pp. 243-244.

[13] THOMAS F. SHEPPARD, *Lourmarin in the Eighteenth Century: a Study of a French Village* (Baltimore, 1971).

[14] A. LEFEBRE-TEILLARD, *La Population de Dôle au XVIII^e siècle* (Paris, 1969), pp. 74-75.

[15] PH. WIEL, *Tamerville*, « Annales de Démographie Historique » (1969), pp. 186-189.

[16] M. LACHIVER, *La Population de Meulan du XVII^e au XIX^e siècle* (Paris, 1969), pp. 217-221.

[17] H. LACHIVER, *Une étude et quelques esquisses*, « Annales de Démographie Historique » (1969), pp. 232-234.

Continued: TABLE I - *Crisis Mortality Aggregates 1600-1824 - Parishes and Towns.*
(Aggregates of crisis mortality ratios < 50)

Country	Parish/Town	1600-24	1625-49	1650-74	1675-99	1700-24	1725-49	1750-74	1775-99	1800-24
SWITZERLAND	Basel [18]	1237	961	581	103	0	50	0	0	170
	Geneva [19]				57					
HOLLAND	Edam [20]			130	265	0	166	0	0	
	Beemster [21]			341	210	51	0	0	113	
	Alkmaar [22]					57	0	0	0	
	Assendelft [23]					187	0	157	129	
Unweighted mean of all parishes & towns		627	698	279	214	176	167	128	124	96

REGIONS

(Aggregates of crisis mortality ratios < 30)

Country	Region	1600-24	1625-49	1650-74	1675-99	1700-24	1725-49	1750-74	1775-99	1800-24
ENGLAND	Bedfordshire [24]				144	81	327	0	0	
	Wapentake of Morley [25]	182	174	0	0					
	Shropshire [26]						367			
FRANCE	Rural communes [27] (Britanny & Anjou)							115	91	92
SCOTLAND	North-East [28]			171	135	70	237	41	30	0
	Western Lowlands [28]				417	92	31	65	0	0
	Eastern Lowlands [28]			207	191	0	0	0	0	0
	Eastern Borders [28]				384	33	202	81	0	0
Unweighted mean of 4 Scottish regions				189	282	49	117	47	7	0

[18] A. BURCKHARDT, *Demographie und Epidemiologie der Stadt Basel während der letzten drei Jahrhunderte, 1601-1900* (Basel, 1908), pp. 88-93.

[19] A.-M. PIUZ, *La disette de 1693-1694 à Genève et ses conséquences démographiques*, in « Mélanges publiés par la Faculté des Sciences économiques et sociales de l'Université de Genève (Geneva, 1965).

[20], [21], [22] and [23] A. M. VAN DER WOUDE, *Het Noorderkwartier. Deel III*, « A. A. G. Bijdragen », 16 (1972), pp. 635-639.

[24] I am indebted to Dr. N. Tranter of the University of Stirling for this unpublished series.

[25] M. DRAKE, *loc. cit.*, pp. 438-441.

[26] S. SOGNER, *Aspects of the demographic situation in 17 parishes in Shropshire, 1711-1760: an exercise based on parish registers*, « Population Studies », XVII (1963), p. 145.

[27] Y. BLAYO & L. HENRY, *Données démographiques sur la Bretagne et l'Anjou de 1740 à 1829*. « Annales de Démographie Historique » (1967).

[28] For sources, see p. 17 above.

confirm that in England mortality fluctuated even more violently in the sixteenth than in the seventeenth century.[8] The same conclusion is borne out by a comprehensive series for over one hundred Shropshire parishes recently presented by R.E. Jones.[9]

The material for the sixteenth century, however, is at present far too scanty to permit the extension of generalisations about seventeenth-century fluctuations backwards into that century. Such evidence as there is, covering, as it does, little more than the second half of the century, nonetheless opens a door to an interesting problem. Given that changes in the secular levels of mortality were more likely in the pre-industrial period to influence long-run population growth rates than were secular changes in fertility, there might seem to be a conflict between the existence of even more severe fluctuations of mortality in the sixteenth than in the seventeenth century, and our general assumption (scarcely yet proved, however) of faster European population growth rates in the sixteenth than in the seventeenth century. This is a problem which cannot be resolved until a great deal more information on the earlier period is made available.

Given that some reduction of the instability of mortality — a diminution of the severity, frequency and ubiquity of crises — was a common feature in the experience of most western European countries during, broadly, the seventeenth and eighteenth centuries, we can now turn to the question of how the diminution of the crises may be explained.

There can be, of course, no single explanation of this phenomenon because, in the first place, there was quite a wide variety of types of crisis. Goubert,[10] Ruwet,[11] Meuvret[12] and others have

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8 R. SCHOFIELD, *'Crisis' mortality*, « Local Population Studies », 9, (1972, Table, p. 17).

9 R.E. JONES, *op. cit.*, p. 198.

10 P. GOUBERT, *La mortalité en France sous l'Ancien Régime. Problèmes et hypothèses*, in « Problèmes de Mortalité (Liège, 1965), pp. 88-89.

11 J. RUWET, *Crises de mortalité et mortalité des crises à Aix-la-Chapelle (XVII^e^-début du XVIII^e^ siècle)*, in « Problèmes de Mortalité », pp. 389-393.

12 J. MEUVRET, *Réflexions d'un historien sur les crises démographiques aigües avant le XVIII^e^ siècle*, in « Problèmes de Mortalité », pp. 93-97.

all suggested typologies for crises, and for the present purposes a three-fold classification derived from their suggestions seems most relevant. Since the chronologies of the diminution and ultimate disappearance of the different types of crises may differ substantially, separate examination of them is obviously important. The first type was one induced by military activity, or, possibly, by major civil unrest; second was Goubert's famine type: in this type of crisis the proximate cause of most deaths was almost certainly one or other infectious or deficiency disease, but even apart from price indicators, there is nearly always some indication in other contemporary records that extreme scarcity of food was what had created the widespread susceptibility to disease, particularly among the poorest classes; and, third, the 'straight' epidemic, in which, for the time being, there is no need to differentiate between the different types of infectious diseases, only to notice, as Goubert did, that this type of crisis is not associated with any temporary food shortages.

The 'military' type of crisis is often overlooked, yet in the disturbed circumstances of the seventeenth century it was obviously not without importance: it may well also have been in the sixteenth and earlier centuries. In this case mortality among civilian populations was raised partly by armies (and particularly their horses) consuming civilian food stocks, but mainly by infected soldiers, armies and refugees on the move spreading disease — often typhus — through civilian populations in wide areas. The best documented example is the crisis of 1658-9 in south Jutland and north Schleswig.[13] Several armies were present in this area in these years — Swedes, Poles and Prussians — and Lassen has shown how the infection they spread caused loss of life in a fairly clearly defined area on a terrifying scale. Populations in many parishes were reduced by between 40 and 90%, though it is likely that the higher figures were caused by migration out of the stricken areas as well as by epidemic mortality. In the triangle between Haderslev, Ribe and

[13] A. Lassen, *The population of Denmark in 1660*, « Scandinavian Economic History Review », XIII (1965).

Vejle (about 80 kilometres each side), Lassen estimates that mortality averaged 80%. The area was only re-populated when outsiders began to immigrate in after the armies had withdrawn.

Less is known precisely about the heavy mortality of this kind in Germany and the Rhineland caused by the movements of armies in the Thirty Years' War. The population of Wurtemberg, for example, is believed to have fallen from 450,000 to 100,000, while that of the Palatinate is alleged to have declined by 70%.[14] Some annual mortality figures are available for a few cities, where crisis mortality from this cause, however, may have been lower than in the countryside. Though the mortalities cannot be specifically related to war, Dresden in 1632-3 experienced a crisis of 1090 CMR severity, and Breslau, in the single year 1633, one of 1077.[15] Liège, very much in the battle zone of both the latter part of the Thirty Years' War and the wars of Louis XIV, experienced some of its most severe mortality crises during these periods.[16] Heavy mortality in Flanders in 1667 has been directly attributed to troop movements in the War of Devolution.[17] In France, the years of the Frondes were also years of exceptionally high mortality. Jacquart has drawn attention to infection spread by soldiers and refugees in the Paris region, producing what he believed to be the highest mortality of the century in this part of France in 1651 and 1652.[18] The same cause, for example, is believed to underlie serious epidemic outbreaks in Catalonia in the 1650s.[19] It seems very probable that the bubonic plague epidemic that devastated parts of Lowland Scotland and Kintyre between 1644 and 1647 was introduced and spread by the armies of the Covenanters and Leslie.

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14 C. V. WEDGWOOD, *The Thirty Years War* (London, 1938), pp. 512-513.

15 F. PRINZING, *Epidemics resulting from Wars* (Oxford, 1916), p. 78.

16 E. HÉLIN, *Les recherches sur la mortalité dans la région Liègeoise (XV^e-XIX^e siècles)*, in « Problèmes de Mortalité », p. 166.

17 H. VAN WERVEKE, *La mortalité catastrophique en Flandre au XVII^e siècle*, in « Problèmes de Mortalité », p. 461.

18 J. JACQUART, *La Fronde des Princes dans la région parisienne et ses conséquences matérielles*, « Revue d'Histoire Moderne et Contemporaine », 7 (1960).

19 J. NADAL & E. GIRALT, *La Population Catalane de 1553 à 1717* (Paris, 1961), pp. 42-43.

Also in this category, as indicated above, was crisis mortality arising from major civil disturbances. A good example of this comes from Geneva in 1686, when mortality among refugees from France after the Revocation of the Edict of Nantes who had crowded into that obvious protestant refuge drove the CMR up to 47.[20]

These examples of the military type of mortality crisis all come from the seventeenth century. Armies continued to march around Europe at least until 1763 and again between 1792 and 1815, yet there is strikingly little evidence of their movements leading to heavy civilian mortality during the eighteenth century. True, Lassen, for Denmark, finds evidence of the association of military movements with mortality peaks right up to 1773,[21] and Hélin ascribes serious crisis mortality in Liège in 1794-5 to war conditions.[22] Elsewhere, however, the apparent lack of correlation may be due to lack of evidence, particularly from Germany, where much of the movement took place, but it may also, towards the end of the eighteenth century, be due to improved camp hygiene: this was the age of Lind and Pringle, and of the construction of barracks and cantonments. But there are no signs in the eighteenth century of military mortality crises of the severity and ubiquity of the period 1620-1660. Dupâquier believes that there was no serious mortality spread by soldiers and armies in France after the death of Louis XIV.[23] One type of crisis, albeit one of the least significant demographically, had declined if not disappeared by the eighteenth cenury.

The second, 'famine', type of crisis was, however, much more important demographically in the pre-industrial age. There

20 A.-M. Piuz, *La disette de 1693-1694 à Genève et ses conséquences démographiques*, in « Mélanges publiés par la Faculté des Sciences économiques et sociales de l'Université de Genève » (Geneva, 1965), p. 181.

21 A. Lassen, *Fald og fremgang; traek af bevolkningsudviklingen i Danmark, 1645-1960* (Aarhus, 1965), pp. 280-283, quoted by M. Drake, *Population and Society in Norway, 1735-1855* (Cambridge, 1969), p. 73.

22 E. Hélin, *Le déroulement de trois crises à Liège au XVIII^e siècle*, in « Problèmes de Mortalité », p. 169.

23 J. Dupâquier, *French population in the 17th and 18th centuries*, in Rondo E. Cameron (ed.), « Essays in French Economic History » (Homewood, Ill., 1970), p. 162.

are many well-documented examples of this. Jutikkala, for example, has traced the effects in 1696-7 of the great harvest failures of the mid-1690s in Finland.[24] He estimated that the loss of population in these two years of intense food shortage amounted to between 24 and 33% of the whole population. Goubert has made us familiar with the demographic consequences of the famine of 1693-4 in the Beauvaisis district of northern France.[25]

Two such crises, probably the most severe of all mortality crises in the modern era, have come to light in Scotland. The first was in 1623, and there is evidence from a number of Border and Lowland parishes and towns. In Dunfermline, for example, burials, which seemed to run between 25 and 30 per year in 'normal' years in the 1620s, rose to 123 in 1622 and to the appalling figure of 442 in 1623, a CMR of probably about 1400. In Kelso, where burials between 1620 and 1622 had averaged 90 annually, 417 were buried in 1623. In Dumfries, where an average of 91 had been buried between 1619 and 1621, 488 people were buried in the first 10 months of 1623. They presumably included the parish clerk, for registration ceased temporarily at that point. Although a proportion of these deaths, which might have been as much as a quarter, were those of refugees from the surrounding countryside, the mortality might have amounted to between 15 and 25% of the total population of these places. There is plenty of evidence that the basic cause of this crisis was harvest failure and food scarcity. Food prices rose, grain was imported in significant quantities from the Baltic, but everywhere there were complaints that, to quote but one contemporary observer, 'there was a great death of persons of all rankes, but speciallie of the poore, which dyed through famine in the fields and the hie wayes'.[26] Like many of these famines, it was harvest failure in successive years that was at the root of the trouble, and in this case cattle murrain added to the problems.

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24 E. JUTIKKALA, *The Great Finnish famine in 1696-97*, « Scandinavian Economic History Review », III (1955).

25 P. GOUBERT, *Beauvais et le Beauvaisis de 1600 à 1730* (Paris, 1960), pp. 75-81.

26 D. CALDERWOOD, *The History of the Kirk of Scotland* (edited for the Wodrow Society, Edinburgh, by T. Thomson, 1845), vol. VII, p. 594.

There is some evidence that 1623 also saw a famine crisis in parts of the north of England. Burials in Leeds, for example, were almost twice their normal level in that year,[27] and many parishes in Cumberland and Westmorland suffered severely.[28] The most serious famine crisis of Scotland's seventeenth century, however, was that of the late 1690s. There is not a great deal of evidence that this great famine crisis affected England to anything like the same extent as Scotland, while, on the continent, Aix-la-Chapelle seems not to have suffered very badly from it, though Ruwet classifies it as a subsistence crisis.[29] Both Basle[30] and Geneva[31] in Switzerland enjoyed remarkably low mortality throughout this period, while in France, seriously and widely affected by the famine, some villages in some parts escaped heavy mortality. Yet many other parts of western Europe seem to have experienced severe food shortages leading to crisis-scale mortality in some part of the decade of the 1690s. Reference has already been made to the Finnish disaster of 1696-7; many parts of France seem to have experienced a similar crisis in 1693 and '94.[32] One part of Dalarna in Sweden suffered severely in this way in 1698,[33] while Catalonia experienced acute famine in 1694-5 which produced a CMR of 679 in the parish of Cassá.[34]

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27 M. Drake, *An elementary exercise in parish register demography*, « Economic History Review », 2nd, ser. XIV (1962), p. 440.

28 Andrew B. Appleby, *Disease or famine? Mortality in Cumberland and Westmorland, 1580-1640*, « Economic History Review », 2nd. ser. XXVI (1973), pp. 424-430.

29 J. Ruwet, *Crises de mortalité et mortalité de crise à Aix-la-Chapelle (XVII^e - début du XVIII^e siècle)*, « Problèmes de Mortalité », p. 403.

30 A. Burckhardt, *Demographie und Epidemiologie der Stadt Basel während der letzten drei Jahrhunderte, 1601-1900* (Basel, 1908), p. 89.

31 A.-M. Piuz, *La disette de 1693-1694 à Genève et ses conséquences démographiques*, in « Mélanges publiés par la Faculté des sciences économiques et sociales de l'Université de Genève » (Geneva, 1965), p. 181.

32 P. Goubert, *Beauvais*, pp. 75-81; J. Meuvret, *Les crises de subsistances et la démographie de la France d'Ancien Régime*, « Population », I (1946), and *Demographic crisis in France from the sixteenth to the eighteenth century*, in D. V. Glass and D.E.C. Eversley (eds.), « Population in History » (London, 1965), pp. 513-519; D. Leymond, *La communeauté de Duravel au XVIII^e siècle*, « Annales du Midi », 79 (1967), p. 368.

33 N. Friberg, *Dalarnas befolkning på 1600-talet. Geografiska studier på grundval av kyrkböckerna med särskild hansyn till folkmångsförhallandena*, « Geografiska Annaler » 35 (1953).

34 J. Nadal & E. Giralt, *La Population Catalane*, pp. 208-210.

There was probably never again in western Europe a famine so severe and so widespread as that of the 1690s. This is not, of course, to deny that there continued to be famines of some severity and in many parts until well into the eighteenth century. The years 1740-2, for example, produced fairly lethal famines in Ireland[35] and Scandinavia,[36] while mortality in Scotland ran at 25% above 'normal' in each of the three years 1739, '40 and '41. Harvest failures in France of 1709-10 and 1740-1 drove mortality in some districts almost as high as those of the 1690s. Goubert sets the 1740s as the end in France of the era of subsistence crises,[37] while Meuvret is inclined to place it during the reign of Louis XV,[38] indicating his belief that the failures of 1740-1 were not universally destructive of life. The peak years of grain prices in eighteenth-century Sweden — 1757-8 and 1763-5 — when, in many regions, prices doubled, were also reflected in noticeable but not dramatic rises in the national mortality level,[39] and Dorothy Swaine Thomas has taken the view that subsistence crises endured in Sweden until the 1780s.[40] In England, on the other hand, having regard to the fact that the harvest failures of the 1690s did not apparently produce widespread high mortality, there would appear to be grounds for asserting that the last famine crisis was as far back as 1597 were it not for the mortalities (which work on parish registers is increasingly revealing) in the years 1727-9 and 1740-1. Gooder has argued convincingly that the high mortality in Warwickshire in the late

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35 M. DRAKE, *The Irish demographic crisis of 1740-41*, « Historical Studies », VI (1968).

36 See annual mortality figures in H. GILLE, *Demographic history of the Northern European Countries in the 18th century*, « Population Studies », III (1949), p. 61.

37 P. GOUBERT, *Cent Mille Provinciaux au XVII^e siècle* (Paris, 1968, p. 105. Elsewhere he places the disappearance of subsistence crises in France after the reign of Louis XV, or, more precisely, after the famine of 1739-43 [P. GOUBERT, *Les fondements démographiques*, in F. BRAUDEL & E. LABROUSSE (eds), *Histoire Economique et Sociale de la France*, Vol. II (Paris, 1970), pp. 60-66]. Otherwise he prefers to speak of 'l'atténuation progressive des famines' (*ibid.*, p. 60).

38 J. MEUVRET, *Les crises de subsistence...*, « Population », I (1946), p. 278.

39 L. JÖRBERG, *A History of Prices in Sweden, 1732-1914*, Vol. I (Lund, 1972); H. GILLE, *loc. cit.*, p. 61.

40 D. S. THOMAS, *Social and Economic Aspects of Swedish Population Movements, 1750-1933* (New York, 1941), p. 84.

1720s may well have been associated with real local food shortages;[41] and this moderate peak of mortality of 1727-8 was also apparent in Worcestershire, Nottinghamshire, Bedfordshire, Norwich, and north Lancashire (areas for which we have mortality figures),[42] though there is no trace of it in Exeter.[43] 1727-8 was one of the few pairs of years in the first sixty years of the eighteenth century when substantial grain imports took the place of the usual exports.[44] Mortality was certainly high, too, in many parts in one or more years from 1739-42 — series from Bedfordshire, Exeter, Leeds and Norwich all bear this out.[45]

But if the famine crisis remained a feature of the eighteenth, as of the seventeenth, century, its effect on mortality was much reduced. At some point, it seems, between the late seventeenth and late eighteenth centuries, according to chronologies that varied from country to country and region to region, harvest failures generally ceased to be seriously, or at least consistently, lethal. The process of change was a gradual one. Between the darkness of the early killing famines and the light of later freedom from this form of mass-death in western Europe there was a long period of penumbra in which subsistence crises continued, but less frequently and with generally diminished consequences for mortality.

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41 A. Gooder, *The population crisis of 1727-30 in Warwickshire*, « Midland History », I (1972).

42 D. E. C. Eversley, *A survey of population in an area of Worcestershire from 1660 to 1850 on the basis of parish registers*, « Population Studies », X (1957), pp. 408-409; J. D. Chambers, *The Vale of Trent, 1670-1800*, « Economic History Review », Supplement 3 (1957), pp. 330-331; J. K. Edwards, *Norwich Bills of Mortality, 1707-1830*, « Yorkshire Bulletin of Economic and Social Research », 21 (1969), pp. 110-112; for other areas see Thomas Short's widely based figures (Thomas Short, *New Observations, Natural, Moral, Civil, Political and Medical, on City, Town and Country Bills of Mortality* (London, 1750), p. 88. I am also indebted to Drs J. D. Marshall and N. Tranter for their kindness in making available to me unpublished series relating to burials in the Furness districs of north Lancashire and Bedfordshire respectively.

43 R. Pickard, *The Population and Epidemics of Exeter in Pre-Census Times* (Exeter, 1947).

44 Import and export figures are conveniently brought together in D. G. Barnes, *A History of the English Corn Laws from 1660-1846* (London, 1930).

45 F. Beckwith, *The population of Leeds during the Industrial Revolution*, « Publications of the Thoresby Society », XLI, « Miscellany, 1943-1951 » (Leeds, 1954), p. 179; J. K. Edwards, *loc. cit.*, and unpublished figures from Drs Marshall and Tranter (see n. 42 above).

Why, then, did harvest failures, which, after all, were dependent upon short-run climatic fluctuations that in themselves were unlikely to have changed much in character between the seventeenth and eighteenth centuries, cease to cause mortality crises on the same severe scale, or even in some parts at all? This is a difficult question to answer for so wide an area as the whole of western Europe; yet, because the evidence points to it being a western European phenomenon, and because the question is clearly of considerable relevance to the diminution of the frequency and severity of the recurrent mortality crises of the pre-industrial period in general, some attempt must be made to answer it. A useful distinction may be made between developments which tended to improve the regularity of food supplies on the one hand; and developments, on the other, which tended to reduce mortality from a given food supply. Probably both trends were important in the eighteenth century.

Using the invaluable local price material of the Scottish fairs Rosalind Mitchison has pointed to a tendency in Scottish agrarian history of the seventeenth and eighteenth centuries which may well have been the experience of other parts of western Europe.[46] She showed how, in an economy still backward, at least by English standards, for most of this period, and suffering by reason both of this backwardness and of the geographical nature of the country from peculiar difficulties in the transportation of bulk foodstuffs like grain, disparate movements in regional grain prices, a common symptom of these economic weaknesses, were being sharply reduced, if not largely eliminated in this period. Price regions widened steadily from the late seventeenth century; by the 1730s prices in all regions moved in close sympathy, and there were seldom any very significant disparities. No longer was it possible for one locality to experience crisis mortality from starvation while another not far away suffered scarcely at all by virtue of greater good fortune with weather and harvest. Yet, as Rosalind Mitchison points out, this ' unity of marketing was achieved well

[46] R. MITCHISON, *The movements of Scottish grain prices in the seventeenth and eighteenth centuries*, « Economic History Review », 2nd ser. XVIII (1965).

before the conspicuous improvements of transport later in the eighteenth century'.[47]

Not only, however, were regional price disparities tending to diminish, but — equally important from the point of view of the ability of populations to weather harvest failures — the failures were not driving prices proportionately quite as high as they had done in the seventeenth century. This latter trend is observable also in price series for England, Scotland, Flanders and Sweden.[48]

Nadal has produced for Spain in the 1850s — where economic conditions may still reasonably be said to have been 'pre-industrial' — an extremely interesting illustration of the demographic significance of this reduction in the amplitude of fluctuations of grain prices in years of harvest failure.[49] The grain harvest of 1856 in Spain was severely deficient: the effect of this deficiency was to cause prices to rise between the lowest price of the summer of 1856 and the maximum of early spring of 1857 by no more than 55% in the whole coastal periphery of the country: inside that coastal ring was a broad belt in which prices rose between 55 and 90%; in the centre of the peninsula was a large core in which prices rose by between 90 and 140%. Nadal showed a close correlation between these price zones and zones formed, in the same harvest-year, by varying population growth rates. In almost all the areas of maximum price rise, population growth rates were negative, while in all areas of low

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47 The effect of the transport improvements, when they came later, was observed, for example, by Knox: in 1782 and 1783, years of acute shortage, grain shipped along the Forth-Clyde Canal from England, Germany and Danzig 'prevented a real famine, and saved the lives thousands in that populous country'. [Quoted by HENRY HAMILTON, *An Economic History of Scotland in the Eighteenth Century* (Oxford, 1963), p. 240]. Similarly, the ability to import Dutch rye was believed to be responsible for relieving famine due to harvest failures in Liège in 1726 and 1772-73 to prevent famine leading to demographic catastrophes, as formerly. (E. HÉLIN, *Le déroulement de trois crises à Liège au XVIII^e siècle*, in « Problèmes de Mortalité », p. 496).

48 For England, three major wheat price series are brought together in B.R. MITCHELL & PHYLLIS DEANE, *Abstract of British Historical Statistics* (Cambridge, 1962), pp. 484-487. For Scotland, see R. MITCHISON, *loc. cit.* For Flanders, see C. VERLINDEN, *Documents pour l'Histoire des Prix et des Salaires en Flandre et en Brabant: XV^e-XVIII^e siècle* (Bruges, 1959). For Sweden, see L. JÖRBERG, *op. cit.*

49 J. NADAL, *La Poblacion española: siglos XVI a XX* (Barcelona, 1966), pp. 147-151.

price rise, population growth rates were normal at around 1-1½% per annum.

But it was not only the improved distribution within a country that was responsible for this price-levelling; the international grain trade penetrated all countries, and many parts of them, too. Throughout the modern pre-industrial period the Baltic served to meet much of the residual demand of western Europe for grain. Though these shipments in general declined quite substantially between, broadly, the mid-seventeenth and mid-eighteenth centuries, they were more than made good by the rise of English exports. There was thus a constant and possibly growing reservoir of grain supplies for international distribution in western Europe throughout the period. More important, however, in the context of subsistence crises in the west, was the ability of these supplies, drawn from peripheral areas of possibly different short-run climatic conditions, significantly to meet the deficits of harvest failures in areas of the west. In this role the Baltic was more important than England: the graph of English corn exports shows periodic short, sharp *declines* from the long-run trend marking the occasions when serious harvest deficiencies obliged the home market to absorb the normal export surplus. The Baltic graph, however, in contrast, shows periodic short, sharp *rises* of exports in years of harvest deficiency in the west, but latterly particularly in years of the failure of English exports. Thus, peak years of Baltic exports in the later seventeenth and early eighteenth centuries produced exports almost as high as the peaks of the early seventeenth century.[50] This 'stop-gap' role of the Baltic may have contributed, with other factors, to the reduced amplitude of fluctuation of grain prices in the eighteenth century compared with the seventeenth, as well as, of course, to reduced famine mortality.

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[50] For the Baltic exports to the West, see J. A. FABER, *Het probleem van de dalende graanaanvoer uit de Oostzeelanden in de tweede helft van de zeventiende eeuw*, « A.A.G. Bijdragen », 9 (1963); P. JEANNIN, *Les comptes du Sund comme source pour la construction d'indices généraux de l'activité économique en Europe (XVI^e-XVIII^e siècle)*, « Revue Historique », 231 (1964), pp. 313, 328-329. For English exports and imports, see D. G. BARNES, *op. cit.*, pp. 299-300.

Whether the grain entered a port from a distant area like the Baltic, or merely came along the coast from a neighbouring region, there seem to be grounds for believing that inhabitants of the littoral were more commonly the beneficiaries than those of the interior. Nadal's study of mid-nineteenth century Spain demonstrates this, while in his study of sixteenth and seventeenth-century Catalonia with Giralt he argues similarly, though a little more cautiously.[51] Several scholars of seventeenth and eighteenth-century France support it.[52] Drake, too, noticed that crisis mortality consistently reached higher peaks in the largely interior Norwegian diocese of Akershus than in the coastal diocese of Bergen between 1735 and 1815.[53]

An alternative to moving the food, of course, was moving the people. Famine was traditionally a great instigator of migration. In seventeenth-century Scotland every famine put people on the road in search of food, mostly a movement from country areas to towns, though many, from both Highlands and Galloway, took ship for the green and plenty of Ireland when famine threatened. Towns were where the markets were, where there were grain merchants, millers and bakers: the logic of rural starvation impelled people towards what they believed was urban plenty. In the Scotland of the 1690s many died even on the road to the towns. So long as people moved in these circumstances on foot, they had little hope of escaping from the famine area: to do that they needed to go further and faster. The growth in the scale of transatlantic migration in the eighteenth century began to make this possible, and there were a few occasions — one must not exaggerate the importance of this phenomenon — when food scarcity was the proximate cause of emigration. This was certainly the case in the Scottish Highlands and Islands in the late 1790s. Dorothy Swaine Thomas showed how 'the severe hardships suf-

51 J. NADAL, *op. cit.*, pp. 147-151; J. NADAL & E. GIRALT, *op. cit.*, pp. 29-30.

52 P. GUILLAUME & J.-P. POUSSOU, *Démographie Historique* (Paris, 1970), p. 151, quoting J. Meuvret, M. Reinhard, and P. Gouhier.

53 M. DRAKE, *Population and Society in Norway, 1735-1855* (Cambridge, 1969), p. 39; for the amplitude of annual fluctuations of mortality in the separate dioceses of Norway, see *ibid.*, App. 4, Table 3, pp. 173-176.

fered during recurrent harvest failures' led to an increase in emigration in early nineteenth-century Sweden, though she also demonstrated that this push weakened by the middle decades of the century.[54] This rather drastic step did at least reduce, in any one locality, the number of people between whom a limited amount of food was to be shared.

It is certainly also the case that the agricultural system of western Europe in general was, for one reason or another, contriving to increase its production just marginally faster than the increase of the population, or to minimise its annual fluctuations. Attempts have been made, in this context, to trace the main trends of secular climatic change.[55] Climatic influences on harvests are, of course, extremely complex: it is not so much a question of trends in mean annual rainfall and temperature, as at what point in the harvest year more or less rain fell or the sun shone with more or less heat. In any case, likely secular changes over a period as short as, say, a century would be extremely small, and for areas of moderate climate, like much of western Europe, it is hard to believe that these changes could have been very significant. There were, however, areas of more extreme climate on the periphery of western Europe where even a marginal climatic change could have made a great deal of difference. In much of Scandinavia other than Denmark, for example, the growing season between spring thaw and autumn frosts is barely long enough at the best of times to accommodate the average grain crop. The northern limit of cultivation, of course, is set by the mean length of the growing season, and Utterström has shown, from the schedule of dates of the break-up of the ice on Lake Malaren in central Sweden, how there was during the eighteenth and early nineteenth centuries a significant shortening of the growing season.[56] At the other end of the western European climatic range,

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54 D. S. THOMAS, *Social and Economic Aspects of Swedish Population Movements, 1750-1933* (New York, 1941), p. 88.

55 E. LE ROY LADURIE, *Times of Feast, Times of Famine: a History of Climate since the Year 1000* (London, 1972).

56 G. UTTERSTRÖM, *Some population problems in pre-industrial Sweden*, « Scandinavian Economic History Review », II (1954), p. 109.

the hot, dry, Mediterranean lands are extremely dependent upon the exiguous summer rainfall: even a small variation in the mean summer rainfall can make or break the arable viability of some of these regions. Ladurie has shown how secular climatic movements could shift the date of the *vendanges* — the agreed dates for the commencement of the vine harvest in Languedoc[57] — though it is fair to add that he has also admitted that one could explain this trend by a growing preference for wines with a higher alcoholic content which greater maturity and sweetness of the grapes yields.[58]

These are early days in the historiography of secular climatic changes, and, for the moment, the information we have tends to lack precision, and even to point in disparate directions. Lebrun, for one, found no evidence of significant secular climatic improvement in Anjou[59] — a temperate area, however, and it is in respect of the areas of more extreme climates — Scandinavia, the Mediterranean littoral, and the higher Alpine valleys — that the more persuasive claims have been made. 'The Little Ice Age', a period originally located in the last three or four millenia, has been narrowed down to a period of about 250 years astride the seventeenth and eighteenth centuries.[60] The evidence for the existence of this 'ice age' is exiguous, to say the very least, and the possibility that it affected secular demographic growth must be slender. Marginally colder summers, like marginally abbreviated growing seasons or marginally colder winters, would be unlikely to influence the level of harvests except at the northern periphery. The quantity of rainfall and its timing are far more potent influences on harvests in most of western Europe. More seriously, if the 'little ice age' explains anything, it must be a relative diminution of food supplies: yet it coincided with periods of *both* high mortality fluctuations and diminished population growth (late sixteenth and seventeenth centuries) *and* lesser mortality

57 E. Le Roy Ladurie, *Les Paysans de Languedoc* (Paris, 1966), pp. 18-41.

58 E. Le Roy Ladurie, *Times of Feast*, p. 63.

59 F. Lebrun, *Les Hommes et la Mort en Anjou aux 17e et 18e siècles* (Paris, 1971), pp. 127-143.

60 M. Reinhard & A. Armengaud, *Histoire générale de la population mondiale* (Paris, 1961), p. 115.

fluctuations and accelerated population growth (eighteenth and early nineteenth centuries). It is very hard to see that, even if its existence could be more convincingly demonstrated, its causal nexus with demographic trends can be proved.

In the meantime, the agricultural system of western Europe itself was contriving to raise production marginally above the minimum requirements of growing populations by the introduction during the eighteenth century of new food crops. Of these the most important in the demographic context were undoubtedly for northern countries the potato, and, further south, maize, rice and buckwheat. These crops assisted demographically in two ways: first, by increasing the foodstuff yield per acre, they permitted a growth of population in a particular area beyond what would otherwise have been possible. Had these areas not turned to the potato and maize as supplements to former predominantly single grain diets, their populations must have been kept down either by emigration or heightened mortality. In the latter case the positive check would have operated by higher crisis mortality in years of grain harvest failure. The demographic role of the potato in Scotland, for example, was almost certainly to retain populations that would otherwise have emigrated. As in Ireland, it was a once-for-all gain, and when its introduction had duly permitted the 20 or 30% increase of population, or whatever the growth was that it could accommodate, the former pressures returned, and, once again, could only be resolved by renewed emigration or a build-up of mortality crises. Maize introduced into south-west France on a considerable scale in the first half of the eighteenth century replaced the fallow in a two-course rotation of wheat and fallow, and so, as Arthur Young noticed when in France in the 1780s,[61] added enormously to the total product.

In those countries where we know the potato was important —Ireland, Scotland, Sweden and Norway — chronologies of its introduction seem to have varied. In spite of its importance in Irish history, historians there do not seem to be agreed yet as

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61 ARTHUR YOUNG, *Travels in France during the Years 1787, 1788 and 1789* (edition New York, 1969), p. 256; D. LEYMOND, *La communauté de Duravel au XVIII^e siècle*, « Annales du Midi », 79 (1967), pp. 377-380.

to when it really began to become an important element in diet.[62] In Scotland, it seems to have appeared as a field crop around the 1740s and to have become widespread in certain areas from about the 1780s.[63] In Norway and Sweden its general adoption was even later — mainly after 1815.[64] In general, its importance in holding at bay the imminent threat of renewed famine crises may be said to have begun to become operative broadly from the last third of the eighteenth century onwards.

Second, the new crops performed the invaluable role of diversifying extremely restricted subsistence diets. Peasant societies, based — as so many in western Europe were in pre-industrial times — largely on monocultures, were too vulnerable to crop failures. A second crop, even when it did not necessarily increase the calorific product of a given holding, offered a greatly increased chance of the availability of some food in the event of weather unfavourable to particular crops. A recent study of Duravel in south-west France emphasises the ability of maize to do well in a wet summer which would be crippling to wheat.[65] Nadal and Giralt have stressed the importance of the potato as a second crop in preventing grain crop failures from leading automatically to high mortality in eighteenth-century Catalonia,[66] and the potato was, it seems, partly responsible for reducing demand for grain in Holland in the second half of the eighteenth century.[67] In similar vein, Slicher van Bath stresses the importance of green vegetables in relieving the population of Holland from reliance on a single grain crop.[68] Drake has expressed the view that for

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62 K. H. Connell, *The Population of Ireland, 1750-1845* (Oxford, 1950); M. Drake, *The Irish demographic crisis of 1740-41*, « Historical Studies », VI (1968), pp. 121-122; L. M. Cullen, *Irish history without the potato*, « Past and Present », 40 (1968).

63 A. J. Youngson, *After the Forty-Five* (Edinburgh, 1973), pp. 164-165.

64 M. Drake, *Population and Society in Norway*, pp. 59-65; G. Utterström, *Population and agriculture in Sweden, circa 1700-1830*, « Scandinavian Economic History Review », IX (1961), p. 181.

65 D. Leymond, *loc. cit.*, p. 381.

66 J. Nadal & E. Giralt, *op. cit.*, pp. 30-31.

67 B. H. Slicher van Bath, *Report on the study of historical demography in the Netherlands*, « A. A. G. Bijdragen », 11 (1964), p. 189.

68 B. H. Slicher van Bath, *Report on the study of historical demography in the Netherlands*, in « Problèmes de Mortalité », p. 193.

much of the eighteenth century in Ireland the potato was more important as an animal food than as a human food, but that it was a valuable standby for the humans when other crops failed.[69] In bad years it was the pigs that went short rather than the people, a situation which freed Ireland from subsistence crises for eighty years after 1741. Could it be that the trouble — the mid-nineteenth-century trouble — in Ireland was that instead of continuing to use the potato in augmentation of grain — a practice which, by substantially reducing crisis mortality from recurring grain harvest failures, had initially encouraged the more rapid growth of population in the eighteenth and early nineteenth centuries — they slid too quickly under continued population pressure into the substitution of a potato monoculture for a grain monoculture, and duly, in the 1840s, paid the same price as have other societies similarly forced into monocultures?

These demographic consequences of the introduction of new, 'inferior' crops are by no means inconsistent, as least so far as France is concerned, with Morineau's denial of an agricultural revolution of the eighteenth century.[70] Though Morineau's measure of grain yields per acre (hectare) is almost certainly too narrow a measure of total agricultural production, he is surely right in suggesting that crops like maize and potatoes are indicative of *declining* living standards, and that their introduction was encouraged by the great grain failures of 1693-4 and 1737-41. However, even if total agricultural production, conformable to Morineau's thesis, was not thereby increased (and his exclusively *grain* yields do not, of course, measure this), short-run output may have been sufficiently stabilised by the changing structure of production to have had the important demographic consequences outlined above.

Finally, attention has been drawn recently to what may have been a major element in reducing crisis mortality from harvest failure during the eighteenth century — improvements in both

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[69] M. Drake, *The Irish demographic crisis of 1740-41*, « Historical Studies », VI (1968), 123.

[70] M. Morineau, *Les faux-semblants d'un démarrage économique: agriculture et démographie en France au XVIII^e siècle* (Paris, 1970), pp. 70-72.

the will and the capacity of societies to relieve famine by administrative measures. Here again is another large area where there are gaps in our knowledge, but Lebrun's recent detailed study of Anjou is particularly instructive in this respect. He has shown how the combination of effort by central and local authorities to organise food supplies in years of scarcity played a real part in keeping down crisis mortality. In particular, Intendants from the late seventeenth century did much, from time to time and from place to place, to assist by organising and co-ordinating relief efforts. The bad harvests of 1737 and 1738 were prevented from causing heavy mortality in Anjou by relief measures taken by the Intendant and municipalities, while in the local harvest failures of 1741-2, 1748 and 1753, massive purchases of grain from areas of surplus by municipalities for resale at low prices served the same end. In 1770 the Intendant of Anjou subsidised grain merchants to enable them to sell large quantities of grain below the market price in a bid to help bring down prices. Lebrun's conclusion was that 'an improved organisation of relief' reduced the fatality of famines from the early eighteenth century onwards.[71] Professor Piuz has also shown, in an interesting study of the great scarcity of 1693-4 in Geneva, how the superior economic and administrative organisation of that city, even at that early date, prevented mortality from rising significantly in spite of very real shortages of food which brought death on a large scale to many other parts of western Europe.[72] Vigorous action by some of Bordeaux's leading businessmen, encouraged and organised by a central government agent delegated specially for the task, to acquire, store and supply grain in the bad harvests of 1747 and 1748 kept the price rise to modest proportions — no more than 50% — and must therefore have assisted in restraining the extent of mortality.[73] It seems that the extremely high mortality in the Scottish parish of Spott in the famine of the late 1690s can be shown to be related very specifically to

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71 F. Lebrun, *Les Hommes et la Mort en Anjou aux 17e et 18e siècles* (Paris, 1971), pp. 140, 367-373.

72 A.-M. Piuz, *loc. cit.*

73 M. Marion, *Une famine en Guyenne (1747-48)*, « Revue Historique », 46 (1891).

untypical neglect of their responsibilities by the heritors of the kirk session there.[74] It may not be without significance in this context that when, as happened in the great famine of Ireland in the 1840s, a government determined, on largely ideological grounds, to minimise the extent of its administrative intervention, mortality once again rose to levels redolent of the seventeenth rather than the nineteenth century.[75]

A different type of administrative improvement could have been effective quarantining. It may well be the case that a vigorous quarantine prevented the 1720 Marseilles plague epidemic from entering Britain.[76] Though plague appeared in Marseilles on six further occasions between 1722 and 1840, it was always contained. It has been argued that the geographical diffusion of the 1720 epidemic into Provence was in part due to laxness of enforcement of quarantine — but the last example of such laxness.[77]

There may be a case, then, for believing that administrative measures contributed in some degree in reducing the lethal impact of harvest failures during the eighteenth century, and even, in some parts, from the late seventeenth century: some local historians clearly think so. Yet this is clearly a very difficult hypothesis to substantiate, not merely because it is an aspect of an administrative trend which is itself extremely difficult to assess or measure. Massive intervention in the grain market had been a feature of municipal government for a long time before the eighteenth century, as Braudel has shown, for example, in respect of many of the Mediterranean cities.[78]

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74 R. M. MITCHISON, *The making of the Old Scottish Poor Law, 1574-1751*, forthcoming article in « Past and Present ». I am grateful to Mrs. Mitchison for the opportunity of seeing a draft of this article before publication.

75 CECIL WOODHAM-SMITH, *The Great Hunger. Ireland 1845-49* (London, 1962).

76 C. F. MULLETT, *A century of English quarantine*, « Bulletin of the History of Medicine », XXIII (1949).

77 P. GUILLAUME & J.-P. POUSSOU, *Démographie Historique* (Paris, 1970), p. 154. Even in the plague area, where extremely strict restrictions on movement were enforced, as at Lourmarin, it was possible to fend off the epidemic. (THOMAS F. SHEPPARD, *Lourmarin in the Eighteenth Century: a Study of a French Village* (Baltimore, 1971).

78 F. BRAUDEL, *The Mediterranean and the Mediterranean World in the Age of Philip II*, Vol. I (London, 1972), pp. 328-332.

Though the sufficiency or otherwise of harvests continued to fluctuate during the eighteenth century with a violence only a little diminished in comparison with earlier centuries, these fluctuations in food supplies, it seems, tended to have a very much reduced effect on mortality for reasons associated with institutional, administrative, agricultural and commercial developments of the period. Certainly the virtual removal of periodic famines as causes of high mortality was a major contribution to the stabilisation of mortality in the pre-industrial period.

In spite, however, of these economic and administrative improvements, mortality continued to be high and to fluctuate: instability remained; it was merely reduced. This was, of course, because the third type of mortality crisis — the epidemic owing nothing to military or economic circumstances — continued to recur, now perhaps, in the eighteenth century, the more obvious for being largely unaccompanied by the two other types of crisis. Epidemics causing what the French historical demographers have called *surmortalités* were, of course, the constant accompaniment to life, above all to urban life in pre-industrial times. In two works Bennassar has traced in great detail the ravaging of areas round Valladolid in central Spain and in the north-east around Bilbao in the years 1597-9 which produced in many urban and rural parishes mortalities amounting to 15 to 20% of their populations in at least one year of the three of the epidemic.[79] Dysentery afflicted Aix-la-Chapelle severely in both 1668-9 and 1689-90,[80] and influenza England in 1557-8.[81] Epidemics independent of food shortages continued to be a feature of the eighteenth century — smallpox in Sweden in 1779 and 1784,[82]

79 B. BENNASSAR, *Valladolid au siècle d'or. Une ville de Castille et sa campagne au XVI^e siècle* (Paris, 1967), pp. 199-207; B. BENNASSAR, *Recherches sur les grandes épidémies dans le nord de l'Espagne à la fin du XVI^e siècle* (Paris, 1969), pp. 36-44.

80 J. RUWET, *Crises de mortalité et mortalité de crise à Aix-la-Chapelle (XVII^e - début du XVIII^e siècle)*, in « Problèmes de Mortalité », pp. 398, 400-402.

81 F. J. FISHER, *Influenza and inflation in Tudor England*, « Economic History Review », 2nd ser. XVIII (1965), 125-7.

82 G. UTTERSTRÖM, *Some population problems in pre-industrial Sweden*, « Scandinavian Economic History Review », II (1954), 160.

dysentery in Anjou in 1779,[83] in Basle in 1727 and 1767,[84] typhus and dysentery in south-eastern Norway in 1808-10,[85] and yellow fever in Mediterranean Spain in 1809 and 1818,[86] to give but a very few examples out of many.

It is true that, with the disappearance of bubonic plague, the mortality crises arising from epidemics seemed, on the whole, in the eighteenth century, not to be so acute, and it may be that the last western European plague epidemic, in Provence in 1720-2, produced the sharpest epidemic mortality in any one part of eighteenth-century France. But it is possible, too, that with the disappearance of plague and the diminution of subsistence crises by the middle of the eighteenth century in most parts, epidemic mortality was changing its character. True, epidemics were not causing such conflagrations of mortality, but they were, it has been suggested, keeping total mortality relatively high by diffusing it over longer periods. Following the lead given in Meuvret's seminal article of 1946,[87] French demographic historians of the eighteenth century are now talking increasingly of *crises larvées* — aborted, suppressed or diffused crises. Possibly, as Lebrun has suggested, what was happening was that improved social organisation prevented the very poor from actually dying from starvation during a famine, but it did not rescue them from their more permanent state of under-nourishment which left them vulnerable to both endemic and epidemic disease.[88] This kind of social action, in other words, levelled the unevennesses of mortality without actually reducing it in aggregate. 'The intervention of the authorities', said Lebrun, 'by distributing the grain supply a little more equally, simply produced a rather different pattern of destitution'. The experience of Duravel (Quercy) was probably typical of many parts of southern France

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[83] J. LEBRUN, *op. cit.*, pp. 376-383.

[84] A. BURCKHARDT, *op. cit.*, pp. 56-57.

[85] M. DRAKE, *Population and Society in Norway*, p. 72.

[86] W. H. SYKES, *Statistics of Cadiz*, « Journal of the Royal Statistical Society », I (1838).

[87] J. MEUVRET, *Le crises de subsistances et la démographie de la France d'Ancien Régime*, « Population », I (1946).

[88] J. LEBRUN, *op. cit.*, pp. 491-492.

in this period. After seventy years free of serious crises following the great famine of 1693-4, its population growth once again began to press on its agricultural resources in the last third of the eighteenth century. Death rate crept up towards birth rate, but without the great peaks of mortality of the former century. Population growth was slowed down; mortality ran high but relatively stable.[89] 'The price of wheat', as Meuvret put it, 'continued to play its part, but it did not kill immediately, nor all at once. It operated gradually'.[90]

Epidemic mortality could hardly, in the total absence of any understanding of the cause and spread of infectious disease and of techniques of cure, have been effectively reduced by medical action, and any analysis along these lines must come up against the rock-like unshakeability of the thesis of Professor McKeown and its colleagues.[91] Yet a comparison of the mortality arising from the epidemics of infectious diseases in the seventeenth with that from those of the eighteenth century does seem to indicate somewhat reduced mortality: and one is driven to believe that, in spite of McKeown, something was done, some actions were taken, which prevented the epidemics from exacting such a high toll. It would apparently be useless to point to the fact that in France, as the recent studies of Goubert for Britanny[92] and Lebrun for Anjou[93] have shown, administrative reform was alerting doctors to a great many of the possible climatic, economic and environmental hazards already, then, known to be associated with infectious diseases (including, for example, ergot in rye), and was even rushing doctors and medical supplies to areas affected by epidemics. When the doctors got to the seat of the epidemics, according to McKeown, they were totally bereft of techniques for curing the disease; but it is hard to avoid the feeling that merely because people and

89 D. Leymond, *loc. cit.*, 369-370.

90 J. Meuvret, *loc. cit.*, 650.

91 T. McKeown, R. G. Brown & R. G. Record, *An interpretation of the modern rise of population in Europe*, « Population Studies, XXVI (1972).

92 P. Goubert, in J.-P. Desaive, J.-P. Goubert, E. Le Roy Ladurie, J. Meyer, O. Muller & J. P. Peter, *Médecins, Climat et Epidémies à la fin du XVIII^e siècle* (Paris, 1972), pp. 225-252.

93 J. Lebrun, *op. cit.*, chaps. 6 and 7.

states were beginning to care about the mortality in epidemics, some people were being prevented from catching an infectious disease and others were being prevented from dying after catching the disease. Marginally improved nutrition, nursing and care, an absence of fatalism and indifference to suffering: these might have gone some way to prevent mortality rising above what was unavoidable given the medical ignorance of the day. And the very reduction of the commonness of mortality crises consequent upon the removal of the other two types of crisis may itself have contributed not a little to the heightened social determination to do something about the mortality arising out of the remaining type of crisis.

Quite apart, of course, from society's ability to cure this or that disease, the mere change in the pattern of incidence of different diseases might have considerable relevance to the problem of changing levels of severity of crises. Take, for example, the contrast between the plague of the sixteenth and seventeenth centuries and the smallpox of the eighteenth — a gross over-simplification of a much more complex pattern of change, of course, but nonetheless an important element within this complexity. Even if the geographical spread, frequency of attacks, and incidence of infection were similar, the fact that the case fatality in bubonic plague ran commonly at around 50-90%, but in smallpox consistently at around only 15%, must inevitably have produced a substantial reduction in the severity of mortality crises.

Looking at the whole phenomenon of western European mortality in the pre-industrial era, one thing, at least, is clear. Its sheer capriciousness makes nonsense of the attempts so commonly made by historians to interpret secular demographic change in terms of a representative crude death rate which can be matched against a similarly representative crude birth rate. The ever-present instability nullifies the usefulness of the concept of a 'normal' death rate. Right through to the nineteenth century what was most normal about western European mortality was its instability. This instability was shared by the populations of all western European countries, a common experience which

both justifies and requires historical treatment as a whole. But if the instability of pre-industrial times was carried over into the succeeding industrial age, it was nonetheless a much reduced instability. Two of the three Malthusian positive checks of war, famine and disease — periodic, not constant, checks, it should be noted — had largely disappeared, and the third was much muted. The economic environment of mortality in Malthus's day was already very different from that of, say, the reign of the Roi Soleil. As Ladurie expressed it at the conclusion of his monumental study of the Languedoc peasantry, '[Malthus] was a prophet of the past; he was born too late, into a world too new'.[94]

[94] E. Le Roy Ladurie, *Les Paysans de Languedoc* (Paris, 1966), Vol. I, p. 654.