

The Socio-Economic Relations of Warfare and the Military Mortality Crises of the Thirty Years' War

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Introduction

Michael Flinn wrote that the Thirty Years' War, fought in central Europe between 1618 and 1648, "remains the classic study of the military causation of mortality crises".¹ Despite these words, the Thirty Years' War has rarely been studied from this perspective. In what follows, I seek to explain the enormous demographic loss experienced during the War. In doing so, I find that the socio-economic relations of warfare and, in particular, the nature of civil-military relations during the War form a key element of the explanation. The wider import of this paper is therefore that the new approach to the history of mortality, in which the contributions of social action and personal behaviour to mortality changes have been investigated and highlighted, is one which promises a significantly deeper and more successful account of the military mortality crises which punctuated the past and continue to afflict the present.

In the next section I first establish the scale of the demographic loss and introduce the conventional explanations for it. I then examine the possible components of demographic loss, quickly focusing on mortality, and demonstrating that plausible estimates of battle mortality are insufficient to explain any substantial part of the demographic loss. Contemporary records, of which I introduce a new analysis, indicate that the leading cause of death in the civilian mortality crises of the War were plague and hunger, in other words the leading causes of crisis mortality in peacetime as well as wartime early modern Europe. This raises the question to what extent the mortality crises during the War were, in fact, caused by the conflict or merely coincident with it. I will suggest that the War was indeed causal for a large part of the mortality of the period and that an acceptable explanation of the demographic loss must explain how the War

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¹ M W Flinn, *The European demographic system 1500–1820*, Brighton, Harvester Press, 1981, p. 53.

intensified, multiplied and/or lengthened the usual mortality crises of early modern Europe.

Three models explaining the impact of warfare on civilian mortality can be distinguished in the existing literature on the Thirty Years' War. These are the "synergy" model in which undernutrition causes deaths from disease, the "hunger" model in which undernutrition leads directly to excess mortality, and the "transmission" model in which troop movements and civilian distress migration cause unusually high fatality rates by increasing the transmission of infectious disease. The latter two models presage a new account in which the "socio-economic relations of warfare" are central to understanding the dynamics and scale of this military mortality crisis. I argue that nutrition-infection synergies explain little in the case at hand but that an examination of the economic and social relations between the civilian population and the military forces active in the War reveals the dynamics that led to both a heightened incidence of subsistence crises and a heightened exposure to fatal epidemic disease. The final section contextualizes the "socio-economic relations of warfare" model within recent contributions to demography and demographic history and indicates briefly how the "socio-economic relations" model can help us understand variations in wartime civilian mortality.

Losses and Reasons: The State of Research

The demographic history of the Thirty Years' War continues to circle around the figure of Günther Franz and his conspectus of the demographic impact of the War, first published in 1940. This suggested that "in the 30 years of crisis, about 40 per cent of the rural population fell victim to the War and epidemics. In the cities, the losses may be estimated at only 33 per cent".² With a German population of perhaps 15 million in 1618, Franz's conclusion implies a loss approaching 6 million people. Franz's own book makes it clear that his summary is inaccurate, however, even disregarding, for the moment, the numbers he gives. It consists of a survey of a very large number of local demographic studies. From these Franz sought estimates of pre-war and post-war populations, defining "post-war" as the point at which population movements in response to the conflict had ceased.³ The result is therefore an estimate of *demographic loss* which includes all the possible effects on population including changes in mortality from whatever cause, reductions in fertility and permanent net migration. Hence, to say that "40 per cent fell victim to war and epidemics" is potentially misleading.

S H Steinberg made an early attack on Franz's study which was pursued with an aggression which seems to have obstructed both a close reading of Franz's

² G Franz, *Der Dreissigjährige Krieg und das deutsche Volk*, 4th ed., Stuttgart, Gustav Fischer, 1979, p. 59, translation from J Theibault, 'The demography of the Thirty Years' War re-visited: Günther Franz and his critics', *Ger. Hist.*, 1997, 15: 1–21, p. 4.

³ Franz, op. cit., note 2 above, p. 2.

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work and accurate arithmetic.⁴ Nevertheless, Steinberg's bluster appears to have brought about a timid retreat among Anglophone writers and for many years it has been conventional to repeat "conservative" "estimates" of demographic loss of "15 or 20 percent",⁵ numbers apparently pulled out of thin air.⁶ The reasons for reducing Franz's estimates have been various. The more substantial criticisms are, first, that the local studies on which he relied usually reported changes in the number of households, not the number of people; second, that the method by which Franz moved from local estimates of population loss to regional and national totals is unclear; and third, that the fiscal surveys that form a major source for the demographic studies he surveyed were distorted in an attempt to reduce consequential tax burdens. It is certainly possible that an increase in household size occurred but to explain the entire apparent population loss in this way would require wholly improbable changes. Franz's movement from local to regional and national estimates appears to have been purely judgemental and it is possible that the coverage of the local studies on which Franz relied were biased towards the worst cases. Nevertheless, critics have been unable to bring forward new data to substantiate this claim. The last of these criticisms is less powerful than it might appear. As John Theibault points out, tax-gatherers, who were the main compilers of the records, were not naïve and had an incentive to counter downward distortions.⁷ Moreover, demographic studies based on parish registers and other non-fiscal records tell a story broadly consistent with those based on tax data.⁸ The most important of these studies is Edward Eckert's examination of plague and pestilential mortality in central Europe in the 1560–1640 period based on 807 parish registers, supplemented by printed sources based on parish and civic records, giving mortality data on about 850 communities.⁹ Eckert contrasts his estimates of mortality for five German provinces during the worst period of the War, 1631–6, with Franz's estimates of population loss and concludes "the estimates are of the same order of magnitude confirming that Germany suffered a mortality crisis of exceptional intensity".¹⁰

I can see no way to avoid this conclusion. It may appear less startling if set in context. Massive demographic losses during periods of early modern warfare were not unique to Germany. Ireland appears to have suffered catastrophic losses in the

⁴ S H Steinberg, *The 'Thirty Years War' and the conflict for European hegemony 1600–1660*, London, Edward Arnold, 1966; Theibault, op. cit., note 2 above, pp. 6–7.

⁵ C R Friedrichs, 'The war and German society', in G Parker (ed.), *The Thirty Years' War*, 2nd ed., London, Routledge, 1997, pp. 186–92, on p. 188.

⁶ Friedrichs cites C McEvedy and R Jones, *Atlas of world population history*, London, Allen Lane, 1978, pp. 67–72 as his source. McEvedy and Jones give no evidence of their own, simply citing some of Franz's Anglophone critics, none of whom have come forth with alternative estimates based on clear methodologies.

⁷ Theibault, op. cit., note 2 above, p. 13.

⁸ K Blaschke, *Bevölkerungsgeschichte von Sachsen bis zur industriellen Revolution*. Weimar, Böhlau, 1967; P Stephan, 'Geburtlichkeit und Kindersterblichkeit in einem Dorf im 17. und 18. Jahrhundert', *Ärztl. Jugendkd.*, 1984, 75: 178–89; J Theibault, *German villages in crisis: rural life in Hesse-Kassel and the Thirty Years' War, 1580–1720*, Atlantic Highlands, NJ, Humanities Press, 1995, pp. 166–74; Theibault, op. cit., note 2 above, pp. 14–16.

⁹ E A Eckert, *The structure of plagues and pestilences in early modern Europe: central Europe, 1560–1640*, Basel, Karger, 1996.

¹⁰ *Ibid.*, p. 154.

wars following the 1641 Rebellion.¹¹ Poland in the period following the 1648–51 rebellion of Bogdan Chmielnicki presents another case.¹²

The Components of Demographic Loss

Fertility

Few writers on the demographic impact of early modern warfare have had much to say about the consequences for fertility. Myron Gutmann's work forms an exception. His evidence suggests war delayed marriage and that undernutrition caused by war brought infertility, increases in spontaneous abortion and miscarriage.¹³ Restricted to the period after 1665 by the lack of data, he shows a clear decline in the number of baptisms during war-induced "years of crisis" in the 1670s (the Dutch War), and in the 1690s (the War of the League of Augsburg). "Yet childbearing was never as severely reduced as mortality was increased. While the deadliest years . . . cost twice the normal number of people their lives, the worst birth losses were about one third in 1676 . . . and less than 30 percent in 1694".¹⁴

Theibault's study of the Werra region in Hesse-Kassel tells a different story. Focusing on the village of Grandenborn for which extensive demographic data exist, Theibault shows it was hit by two major mortality crises, in 1626 and in 1636. In the ten years between the two, the number of baptisms fell to an average of about 60 per cent of its pre-crisis level, and remained in excess of the number of burials. In the ten years after the second crisis, however, the number of baptisms collapsed to less than 25 per cent of the pre-1626 average. While baptisms remained in excess of burials in the period after 1636, the excess was insufficient to allow the population to recover its pre-crisis levels within any moderate period of time. "The vital signs of population growth were almost non-existent".¹⁵

An analysis of baptismal data for Augsburg shows a similar, though less extreme case. Between 1601 and 1631 the number of baptisms almost exactly matched the number of deaths except in the "plague" years of 1607, 1627 and 1628. But when Gustavus Adolphus finally brought the War to Augsburg in 1632, and the plague with it, not only did burials rise, but between 1632 and 1635 the number of baptisms fell to an average of about 65 per cent of the previous norm. With the return of

¹¹ P J Corish, 'The Cromwellian regime, 1650–60', in T W Moody, F X Martin and F J Byrne (eds), *A new history of Ireland*, vol. 3, *Early modern Ireland 1534–1691*, Oxford, Clarendon Press, 1976, pp. 353–86; L M Cullen, 'Economic trends, 1660–91', *ibid.*, pp. 387–407, on pp. 387–8; R Gillespie, 'The Irish economy at war, 1641–1652', in J H Ohlmeyer (ed.), *Ireland from independence to occupation 1641–1660*, Cambridge University Press, 1995, pp. 160–80, on pp. 176–7.

¹² A Gieysztor, S Kieniewicz, E Rostworowski, J Tazbir, and H Wereszycki, *Histoire de Pologne*, Warsaw, PWN-Editions Scientifiques de Pologne, 1971, p. 277; *idem*, *History of Poland*, 2nd ed.,

Warsaw, PWN-Editions Scientifiques de Pologne, 1979, p. 223; N Davies, *God's playground: a history of Poland in two volumes*, vol. 1, *The origins to 1795*, Oxford, Clarendon Press, 1981, p. 467; W W Hagen, 'Subject farmers in Brandenburg-Prussia and Poland: village life and fortunes under manorialism in early modern central Europe', in M L Bush (ed.), *Serfdom and slavery: studies in legal bondage*, London, Longman, 1996, pp. 296–310, on p. 307.

¹³ M Gutmann, *War and rural life in the early modern Low Countries*, Princeton University Press, 1980, p. 193.

¹⁴ *Ibid.*, p. 177.

¹⁵ Theibault, *op. cit.*, note 8 above, p. 169.

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peace in 1636, mortality declined substantially, baptisms remained low, at only 55 per cent of the pre-war average though they stood slightly in excess of burials until the War returned in 1646. During the final phase of the War, in 1646–8, a surprising rise in baptisms failed to compensate for the rise in deaths.¹⁶

The absence of secure population figures and of data on age and gender structures renders baptismal information difficult to interpret and computations of birth *rates* impossible. However, comparisons of baptismal and burial data such as those summarized above do at least suggest that, in the circumstances of the Thirty Years' War, recovery from the more severe of the mortality crises it induced could not be achieved easily by a subsequent excess of births over deaths.

Emigration

The level of net emigration from Germany during the Thirty Years' War is not easy to establish. As we shall see below, there is no doubt that the War precipitated numerous population movements, some on a large scale, but many of them temporary. The level of *permanent* net migration from Germany is difficult to assess in the face of a general paucity of relevant statistical data. The possibility that it was high has seemed increasingly plausible in recent years as historians have come to appreciate the surprising amount of migration that occurred in normal times, especially among the landless.¹⁷

The main poles of attraction for those wishing to escape the Thirty Years' War, or dispossessed by it, would have been the towns and cities of the surrounding countries, including Switzerland and, especially, the prosperous and growing cities of the Low Countries. Analyses of the birthplaces of non-native inhabitants of such urban areas during the latter years of the War, frequently available only for burgesses or guild members or other corporate memberships, typically show a substantial German contingent. In those cases where it is possible to compare the size of the non-native population over time, an increase in the German contingent during the Thirty Years' War is often evident. In Leiden, for example, the proportion of burgesses born in Germany rose from about 8 per cent in the 1574–1619 period to about 19 per cent in the period 1620–99.¹⁸ As soon as one remembers that these percentages are proportions of small totals, whether that total be the number of burgesses or the whole urban population, the conclusion that permanent emigration to places outside the area of Franz's Germany was small becomes inescapable.

So far, we have seen that those few historians who have attended to the impact of the War on fertility have been impressed by its powerlessness to regenerate

¹⁶ A Schreiber, 'Die Entwicklung der Augsburger Bevölkerung vom Ende des 14. Jahrhunderts bis zum Beginn des 19. Jahrhunderts', *Arch. Hyg.*, 1939–40, 123: 90–177, pp. 110–11.

¹⁷ R Mols, *Population in Europe 1500–1700*, London, Fontana, 1972, pp. 48–50; C Pfister,

'The population of late medieval and early modern Germany', in Bob Scribner (ed.), *Germany: a new social and economic history*, vol. 1, 1450–1630, London, Arnold, 1996, pp. 33–62, on p. 56.

¹⁸ Mols, *op. cit.*, note 17 above, pp. 50–2.

populations in the face of some of the mortality losses sustained and that net, permanent emigration can have formed only a small part of the overall demographic loss. For these reasons, the explanation of Germany's demographic catastrophe must be sought in the impact of the War on mortality.

Mortality

Battle deaths we know were too few to account for much. We can say this despite some suggestions that they exceeded two million for all belligerents combined, a number which would, were it credible, go a long way towards explaining a demographic catastrophe.¹⁹ These suggestions are based on the methodology first used by Pitirim Sorokin. Sorokin took estimates of casualty rates from major battles and applied these to estimated army strengths in each year of the War and summed the results. The final figure is based on the idea that casualties can be calculated *as if* all arose from *one* battle involving the *whole* of every army involved *each* year. Since estimated casualty rates are frequently a quarter or a third of those engaged in battle, the armies concerned were very large, and the War lasted for thirty years, this procedure generates a huge total for casualties. Sorokin himself suggested 1,075,000 for "Austria-Hungary" (i.e. the German belligerents) for the War as a whole.²⁰ Double that to take account of non-German belligerents and one reaches a figure such as that given by Jack Levy.

Sorokin's methodology has been or can be faulted at many points. First, while the armies involved in the Thirty Years' War were very large by the standards of the day, with an estimated 210,000 men under arms at the end of the conflict,²¹ this number never fought in a single action. Even in the major battles (Breitenfeld in 1631, Rain in 1632, Lützen also in 1632, Nördlingen in 1634 and Jankov in 1645) only some 30,000 to 70,000 men were engaged.²² Second, Quincy Wright early suggested that Sorokin's estimates involved an exaggerated assessment of the frequency of battles in seventeenth-century warfare.²³ Here it is possible to offer some defence for Sorokin. There are obvious difficulties in deciding precisely when a "battle" becomes so small that it should be treated as a mere "skirmish". Consequently, lists of the War's battles vary substantially in length, from the "important" twelve noted by Geoffrey Parker to the eighty-six "great" battles counted by Gaston Bodart.²⁴ Against the larger of these figures Sorokin's assumption looks acceptable or even conservative. Third, Sorokin's figure for

¹⁹ E.g. J S Levy, *War in the modern great power system, 1475–1975*, Lexington, University Press of Kentucky, 1983, table 4.1.

²⁰ P A Sorokin, *Social and cultural dynamics*, vol. 3, *Fluctuations of social relationships, war, and revolution*, New York, Bedminster Press, 1937, p. 566.

²¹ G Parker, *The Thirty Years' War*, London, Routledge & Kegan Paul, 1984, p. 191; cf. p. 208.

²² F Tallett, *War and society in early modern Europe, 1495–1715*, London, Routledge, 1992,

table 1; Parker (ed.), *The Thirty Years' War*, 2nd ed., op. cit., note 5 above, p. 116.

²³ Q Wright, *A study of war*, 2 vols, University of Chicago Press, 1942, vol. 1, p. 232, note 46 and Appendix XXI, table 2.

²⁴ Cf. Parker (ed.), op. cit., note 5 above, pp. xix–xlv; H Langer, *The Thirty Years' War*, Poole, Blandford Press, 1980, p. 8; G Bodart, *Losses of life in modern wars: Austria-Hungary; France*, Oxford, Clarendon Press, 1916, p. 9.

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“casualties” includes, at least in principle, the wounded as well as the dead. Wright, claiming to follow Bodart,²⁵ suggests that perhaps a quarter of casualties died in this era so one may be justified in dividing Sorokin’s estimate by four to obtain an approximate figure of battle deaths. Fourth, as Boris Uralnis has pointed out, some, perhaps 15 per cent, of the men dying in combat would have died during the War in any case, which reduces the *excess* mortality due to the War in proportion.²⁶

Sorokin’s methodology, although bold, suffers from serious flaws which seem, on the whole, likely to generate a substantial overestimate of battle deaths. Other estimates are considerably lower. Uralnis suggested that approaching 200,000 soldiers of all belligerents were killed in battle, with twice as many again dying from disease (a cause of death excluded in Sorokin’s methodology) giving a total reported as 600,000.²⁷ Amending this figure to allow for the fact that some of these men would have died anyway reduces the estimated excess mortality among all soldiers to half a million, of German soldiers to perhaps a quarter of a million, in round figures. If one agrees with Wright that Sorokin’s estimates of battle casualties must be divided by a factor of about four to obtain an estimate of battle deaths, one arrives at a number in the region of 250,000, about the same as Uralnis’s figure for excess soldier mortality but substantially in excess of his estimate of combat deaths. However, none of these estimates exceeds about 5 per cent of the demographic loss to be accounted for and indicates that battle deaths may be ignored as a significant source of population loss in Germany. In France, where the data are rather more reliable, it has been estimated that deaths in military service, including those from disease, accounted for about 1.1 per cent of all mortality in the seventeenth century as a whole.²⁸ In Germany, where warfare blighted seventy-seven years of the century rather than the forty-seven in France, one would expect a higher figure but any plausible multiple would produce a figure which was still a small proportion of the total demographic loss.

The above paragraphs are all concerned with deaths among soldiers. Violent deaths of civilians perpetrated directly by the military appear to have been quantitatively quite insignificant.²⁹ Schmölz and Schmölz’s study of Landsburg am Lech, based on parish registration data, notes that 30 civilians were murdered by Swedish soldiers in 1632–3; Kisskalt’s study of southern and central Bavaria, again based on parish registers, notes 7 deaths at the hands of soldiers in Weiden, 40 in Bayreuth, and 13 in Monheim.³⁰

If battle fatalities were insignificant, we are left with deaths from hunger,

²⁵ Wright, *op. cit.*, note 23 above, vol. 1, pp. 243–4. A close reading of Bodart, *op. cit.*, note 24 above, p. 20, suggests a fairer summary of the very limited evidence he reviews would be that a third or more of casualties were deaths.

²⁶ B Uralnis, *Wars and population*, Moscow, Progress Publishers, 1971, p. 241.

²⁷ *Ibid.*, pp. 45, 150, 226.

²⁸ Wright, *op. cit.*, note 23 above, vol. 1, pp. 243–4.

²⁹ Eckert, *op. cit.*, note 9 above, p. 150.

³⁰ F Schmölz and T Schmölz, ‘Die Sterblichkeit in Landsberg am Lech von 1585–1875’, *Arch. Hyg. Bakt.*, 1952, **136**: 504–40, p. 525; K Kisskalt, ‘Epidemiologisch-statistische Untersuchungen über die Sterblichkeit von 1600–1800’, *Arch. Hyg. Bakt.*, 1953, **137**: 37–41.

disease and combinations of the two. How important was hunger in comparison with disease and what diseases were implicated? To answer these questions I examined Gottfried Lammert's 1890 catalogue of death from sickness, hunger and military action during the Thirty Years' War.³¹ His work is a listing with brief details and some narrative contextualization of the mass mortalities in Germany from 1600 to 1650. It combines the results of the local histories available before 1890 together with the results of Lammert's own researches in contemporary and near-contemporary chronicles and municipal and church records. He was primarily interested in the history of epidemic disease and medicine and it is possible that this biases his work towards deaths from disease. He did not attempt a critical evaluation of his sources and this, together with the Romantic pessimism prevalent in the German historiography of the time, suggests a high degree of caution is necessary in using his work. Nevertheless, neither internal evidence nor marked inconsistency with other sources indicate that the results of Lammert's labours must now be jettisoned.

Lammert's catalogue is enormous and to ease the task I took a simple, systematic one-in-four sample of all page references in the index of places to build up a picture of mortality during the War. The results are given in Table 1. The final column of Table 1 contains a letter for each reported mortality in Lammert's catalogue forming a horizontal bar chart which gives an immediate overview of the fluctuating incidence of mass mortality in Germany in the first half of the seventeenth century. The letters indicate the reported cause of the mortality; they are decoded at the foot of the table.

Table 1 represents the result of an extensive exercise in "retrospective diagnosis". The reliability of such diagnoses is, of course, one of the enduring controversies of historical demography. Friedrich Prinzing, one of the pioneer historians of military mortality crises, stated pessimistically that "in most cases ... [during the Thirty Years' War] it is impossible to state with certainty just what the individual diseases were".³² Optimists have argued that a number of diseases of interest, for example, bubonic plague and smallpox, have highly distinctive sets of symptoms and when these are described by experienced contemporaries a retrospective diagnosis can often be made with some confidence.³³ Eckert has stressed the familiarity of plague to central Europeans at the time and that few adults can have been unaware of its symptoms and characteristics.³⁴ However the retrospective differential diagnosis of

³¹ G Lammert, *Geschichte der Seuchen-, Hungers- und Kriegsnoth zur Zeit des Dreissigjährigen Krieges*, Wiesbaden, Dr. Martin Sändig, 1971 (original publication, Wiesbaden, 1890).

³² F Prinzing, *Epidemics resulting from wars*, Oxford, Clarendon Press, 1916, p. 25.

³³ This appears to have been the predominant view for some time: L Bradley, 'Some medical aspects of plague', Cambridge Group for the History of Population and Social Structure, *The plague reconsidered: a new look at its origins and*

effects in 16th and 17th century England, Matlock, 'Local Population Studies' for the S.S.R.C. Cambridge Group for the History of Population and Social Structure, 1977, pp. 11–23, on pp. 18–19; J D Post, *Food shortage, climatic variability, and epidemic disease in preindustrial Europe: the mortality peak in the early 1740s*, Ithaca, Cornell University Press, 1985, p. 229; P Slack, *The impact of plague in Tudor and Stuart England*, London, Routledge & Kegan Paul, 1985, p. 8.

³⁴ Eckert, *op. cit.*, note 9 above, p. 23.

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typhus, relapsing fever and typhoid fever is an impossible task; hence the grouping together of these diseases in Table 1. For similar reasons, one has to simply accept reports of "dysentery" as they stand, despite the ejection of this term from modern medical discourse. Nevertheless, frequent contemporary references to "the bloody flux" indicate that for seventeenth-century Germans the disease was symptomatically well defined. Respiratory infections, including influenza and pneumonia, are notably absent from the Table. This is consistent with Eckert's assessment based on the evidence of parish burial registers that such diseases were "improbable major factors" in seventeenth-century mortality crises.³⁵

If the reader is willing to suppress his or her qualms on this matter, Table 1 allows the following summary. The pre-war disease environment was dominated by bubonic plague and there were widespread epidemics in 1607 and 1610–11 with a resurgence in 1613. Epidemics of other diseases were extremely rare in comparison. The first two decades of the century were free of any widespread deaths attributed to hunger by contemporaries. The War had no significant impact on the pattern of death and disease until 1622. From 1622 to 1625, epidemics of typhus and dysentery occur a little more frequently than before, although plague continues to dominate with a widespread epidemic in 1625–6. The first reports of hunger and famine in the sample occur in 1623 and they continue to 1627 but remain exceptional. The big changes start in 1631 after the entry of Sweden into the War. Deaths caused by hunger and famine occur with increasing frequency, rising to a peak in 1634 but continuing for the rest of the decade. A widespread and prolonged plague epidemic occurred simultaneously. In the 1640s Germany was largely free of plague and other major epidemics but intermittent hunger mortalities continued to the final year of the War. "Poxes", appearing in the records as *Blattern* or *Pocken* and corresponding to smallpox, measles and other exanthems, were of significance only towards the end of the War and appear always to have had a minor role. The chronology of distress in Table 1 conforms broadly to the emphasis of conventional historical writing. Before the 1630s, this was just another European War. It was the agony of the Swedish intervention of 1630–5 which set this conflict apart and made Germany a byword for misery and death.³⁶

Cause or Coincidence?

Epidemics of plague were of course nothing new in Germany, nor were subsistence crises. Eckert has identified cycles of "continental" plague epidemics occurring approximately once every ten years in central Europe in the 1560–1640 period and

³⁵ *Ibid.*, p. 48.

³⁶ Compare the reviews of the condition of the German people from the standpoints of 1620–1, 1630, and 1637 given in C V Wedgwood, *The Thirty Years War*, London, Jonathan Cape, 1938, pp. 146–7, 255–7, 410–14. At a local level, Theibault's study of Hesse-Kassel documents a qualitative increase in the severity of the War's

impact which he dates to 1626 for this area (*op. cit.*, note 8 above, p. 150). It was only in the 1630s that English pamphleteers began to notice the War and "the appalling consequences of a particularly appalling war became familiar horrors" (B Donagan, 'Codes and conduct in the English Civil War', *Past and Present*, 1988, 118: 65–95, p. 67).

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Table 1
Analysis of Lammert's catalogues of mortalities: Germany 1600–50

Year	Number of places in sample	Reported causes of mortality
1600	1	S
1601	5	PPPPS
1602	2	SU
1603	2	UW
1604	3	PPP
1605	4	PPPP
1606	7	PPPPU UU
1607	25	PPPPP PPPPP PPPPP PPPPP PPTUU
1608	2	PP
1609	5	PPPPP
1610	12	PPPPP PPPPP PU
1611	40	PPPPP PPPPP PPPPP PPPPP PPPPP PPPPP PPPPU UUUUW
1612	9	PPPPP PPPP
1613	21	PPPPP PPPPP PPPPP TUUUW W
1614	1	P
1615	0	
1616	1	P
1617	4	PTDD
1618	0	
1619	3	PPU
1620	8	PPPPP S
1621	2	UU
1622	4	TTUW
1623	9	HPPPP DDUW
1624	9	HPPPT DDS
1625	37	HPPPP PPPPP PPPPP PPPPP PPPPP PPPPP PPPT DU
1626	34	PPPPP PPPPP PPPPP PPPPP PPPPP PPPPU UUUW
1627	8	HPPPP PUU
1628	14	PPPPP PPPPP PPU
1629	7	PPPPP PO
1630	9	PPPPP PPU
1631	9	HHPPP PPTD
1632	23	HHPPP PPPPP PPPPP TTUW MMM
1633	30	HHHHH PPPPP PPPPP PPPPP PTTTT SUUUM
1634	42	HHHHH HHHHP PPPPP PPPPP PPPPP PPPT TDOU UUUMM MM
1635	36	HHHHH HHPPP PPPPP PPPPP PPPPP PPPPT DUUUW
1636	20	HHPPP PPPPP PPPPP PPSSW
1637	18	HHPPP PPPPP PPPPP PSU
1638	6	HHHPP P
1639	5	HPPPP
1640	7	HPPPP SW
1641	3	HSW
1642	1	U
1643	2	PP
1644	1	H
1645	4	PPPM
1646	3	HPS
1647	0	
1648	7	HHPPT SO
1649	3	PPP
1650	1	P

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Summary

Period	Reported causes of mortality	Number and percentage of Reports	
1618–48	D: Dysentery, etc.	8	2%
1618–48	H: Hunger, etc.	43	12%
1618–48	M: Military action	9	3%
1618–48	P: Plague	224	64%
1618–48	S: Smallpox, measles, etc	9	3%
1618–48	T: Typhus, etc.	15	4%
1618–48	O, U, W: Unknown and other	40	12%
1618–48	All reported causes	348	100%

Codes:

D: dysenteric diseases.

H: "hunger" or "famine" or "scurvy" or "shortage of food" or "destitution" (1637).

M: references to military action without further explanation of cause of deaths, e.g. "Swedish plundered" (1632), "Croatian troops (1632), "plundered" (1633), "destruction" (1634), "military atrocities by the Swedes" (1634), "Swedish troops" (1645).

P: "plague", "slight plague", "mild plague", "black death".

S: smallpox, measles, etc. ("Blattern", "Pocken").

T: typhus, relapsing fever, or typhoid fever ("hitzige Fieber", "Hitzige Kopfkrankheit", "Ungarische Krankheit", "Hauptkrankheit", "Lagerpest", "petechialtyphus", "Hauptweh", "Kriegstyphus", "ungesunde Kopfweh", "Kriegspest").

U: unknown or undefined disease ("plague-like disease", "plague-like epidemic" "epidemic", "disease", "epidemic caused by flooding").

W: unknown or undefined.

O: other: "scarlet fever" (1629), "coughing fits amongst young and old" (1634), "ergotism" (1648).

Other notes:

Where more than one cause of death is given the first to occur in the following list is taken: hunger, etc., smallpox, etc., dysentery, typhus, etc., other disease, plague, unknown disease, unknown cause of death. This procedure heightens the visibility of the changes wrought by the War. Reports of animal diseases have been excluded.

Source: G Lammert, *Geschichte der Seuchen-, Hungers- und Kriegsnoth zur Zeit des Dreissigjährigen Krieges*, Wiesbaden, Dr. Martin Sändig, 1971 (original publication, Wiesbaden, 1890).

more frequent "maritime" epidemics affecting the North Sea and Baltic Sea coasts.³⁷ It would have been remarkable if Germany had escaped the plague during the thirty years after 1618 even in the absence of war. Nor would a subsistence crisis during

³⁷ Eckert, op. cit., note 9 above, pp. 69, 75.

this period have been a surprising event even had Germany been at peace; crises of this kind continued to occur in Germany until the early nineteenth century.³⁸ This raises the question to what extent the mortality crises during the War were, in fact, caused by the hostilities.

In the Europe of this period, peacetime subsistence crises were, of course, almost always precipitated by poor harvests caused by abnormal weather conditions. Agrarian histories and meteorological and harvest chronologies indicate a sequence of poor harvests due to adverse weather conditions (not war-related factors) between 1622 and 1628.³⁹ The European-wide harvest failure of 1635 seriously affected Germany, as did poor harvests in 1636. Harvests in the 1640s were, however, described as “good”, “very good” or “ample”.⁴⁰ Yet this chronology fits the temporal distribution of reports of “hunger” less than perfectly. Although Table 1 shows some reports of hunger in the 1620s that coincide with poor harvests, the upsurge of such accounts in the 1630s begins before the harvest failure of 1635. In 1634, for instance, Lammert described harvests as “sufficient” but only in “areas spared by troops and mice”.⁴¹ Reports of hunger continue for several years after the return to fuller harvests in 1637 and even into the 1640s, though with lesser frequency. In 1648, for instance, the harvest was generally good. To re-arrange a conclusion of Wilhelm Abel, it would appear that “Nature did not create privation by itself, the War contributed too”.⁴²

Few would go beyond this in asserting the independent impact of poor harvests. However, the view that the demographic losses during the Thirty Years’ War were largely due to the independent impact of plague, especially the epidemic of 1632–7, has been advanced by Karl Kisskalt who drew attention to very heavy plague mortality in Milan, Verona and Venice during the epidemic of 1629–31.⁴³ Although his argument is weakened by the fact that at exactly this time northern Italy was itself involved in the War of the Mantuan Succession,⁴⁴ none of the cities he refers

³⁸ W Abel, *Massenarmut und Hungerkrisen im vorindustriellen Europa*, Hamburg, Paul Parey, 1974.

³⁹ Because I am concerned here with poor harvests arising independently of the War, I have ignored the grain price data, often used to make inferences about the state of harvests.

⁴⁰ Lammert, op. cit., note 31 above, pp. 57–97, 247–71; Wedgwood, op. cit., note 36 above, pp. 216, 255; Abel, op. cit., note 38 above, pp. 149, 152; *idem*, *Geschichte der deutschen Landwirtschaft*, Stuttgart, Eugen Ulmer, 1967, p. 242. The text is concerned with Germany as a whole. The details given by Elsas for Augsburg, Leipzig, Munich and Speyer; by Bäumler for Weiden; and Rödel for Mainz largely confirm Lammert’s and Abel’s assessments: M J Elsas, *Umriss einer Geschichte der Preise und Löhne in Deutschland vom ausgehenden Mittelalter bis zum Beginn des 19. Jahrhunderts*, 2 vols, Leiden, A W

Sijthoff’s, 1936–49; D G Bäumler, ‘Medizinalstatische Untersuchungen über Weiden (Oberpfalz) von 1551 bis 1800’, *Arch. Hyg.*, 1938, 120: 195–243; W G Rödel, *Mainz und seine Bevölkerung im 17. und 18. Jahrhundert*, Stuttgart, F Steiner, 1985.

⁴¹ Lammert, op. cit., note 31 above, p. 154.

⁴² Abel, op. cit., note 38 above, p. 151.

⁴³ Kisskalt, op. cit., note 30 above. C M Cipolla, *Before the industrial revolution: European society and economy 1000–1700*, 3rd ed., London, Routledge, 1973, table 5.3, presents data on this epidemic for 17 cities in northern Italy, showing crude death rates in 1630–1 varying from 10 per cent in Empoli to 61 per cent in Verona with a weighted average of 40 per cent. These 17 do not include Casale or Mantua, which were besieged during the War of the Mantuan Succession.

⁴⁴ Parker, op. cit., note 5 above, pp. 95–8.

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to was attacked or besieged during this war. Kisskalt's general point that high mortality from plague epidemics occurred in peace as well as in war at this period has to be accepted.

Some indication of the scale of population decline that can be attributed to "normal" peacetime epidemics and subsistence crises can be gained by reference to the demographic simulation work by Alberto Palloni.⁴⁵ Palloni modelled a number of different "crisis regimes" distinguished by the underlying rate of natural growth in non-crisis period, the frequency of mortality crises, their intensity and their duration. Crisis incidence was modelled as a random variable with a Poisson distribution. The application of Palloni's results to early modern Germany is unfortunately not straightforward: he appears to have had in mind a small population, perhaps a village or town, when defining the various regimes he chose to simulate. In a small population, we know that mortality crises, when they occurred, could be of a devastating intensity. But for any one locality, such crises were rare. For a larger territory, comprising many heterogeneous places, the intensity of local mortality crises was diluted by the many localities which escaped them. Only very rarely did an intense crisis affect the whole, or even a large part, of a nation.⁴⁶ Thus over small areas it seems appropriate to model crises as infrequent but of high intensity; in larger territories it would be appropriate to model crises according to, perhaps, a two-fold regime: one of high intensity but extremely low frequency superimposed on another of high frequency (local crises occurring somewhere in the territory in many years) but of very low intensity (the territory-wide mortality rate is little affected).

Simulations for the two-fold regime suggested here for larger territories were not carried out by Palloni but it is clear that the results of such an exercise would lie between the results he reported for two other regimes. Both are based on an assumed 0.22 per cent annual growth rate in non-crisis periods, appropriate for the largely stagnating pre-War German population.⁴⁷ The first is defined by high crisis frequency (100 crises per 1,000 years), high crisis intensity (increases in crude death rates of 80 to 90 per cent and pessimistic assumptions about crisis and post-crisis fertility), and long crisis duration (five years of elevated crude death rates). The expected population change after fifty years under this regime was found to be a loss of 37 per cent with a standard error of 11 per cent. The second regime is defined by low frequency (30 crises per 1,000 years), low intensity (increases in crude death rates of 18 to 20 per cent and optimistic fertility assumptions) and short duration (two years of elevated mortality). The expected population change after fifty years under this regime was found to be a gain of 3 per cent with a standard error of 2 per cent. I suggest, therefore, that a reasonable expectation of population change in early modern Germany between say 1600 and 1650 in the absence of the Thirty Years' War lies somewhere between a loss of 37 per cent and a gain of 3 per cent. These

⁴⁵ A Palloni, 'Comment', *Popul. Dev. Rev.*, 1988, 14: 145–58.

⁴⁶ S C Watkins and J Menken, 'Reply', *Popul. Dev. Rev.*, 1988, 14: 159–70, p. 169; E A Wrigley

and R S Schofield, *The population history of England 1541–1871: a reconstruction*, Cambridge University Press, 1989, table 8.12.

⁴⁷ Pfister, *op. cit.*, note 17 above, pp. 41–2.

are uncomfortably wide limits but their mid-point, a loss of 17 per cent, gives us some guide to the population loss that the ordinary hazards of early modern European peacetime life might generate over fifty years. As the estimated actual loss is of the order of 40 per cent over thirty years, this suggests that the “special factor” of the Thirty Years’ War is indeed required to explain the demographic losses of this period.

The Mechanisms of Demographic Loss

Before considering how the Thirty Years’ War may have caused mortality, it may help to illustrate the condition of Germany in the latter phases of the War. The diary of William Crowne, kept for the Earl of Arundel during his 1636 embassy to the Emperor Ferdinand II, allows us to look at Germany through the eyes of a contemporary.⁴⁸ This source is untainted by many of the biases that may be suspected in other documents of the period: it is written neither by a victim nor a perpetrator of the violence; it is not an attempt to prove a point about the War, it is not a plea for relief of taxation or other burdens; indeed the comments on the state of Germany are off-hand and incidental to Crowne’s main concern: to celebrate the honour and status of the Earl. Unlike much of the pamphlet literature of the time, the diary, published in 1637, did not seek to sensationalize in the quest for sales, or to demonstrate the wickedness of Protestant or Catholic.

The Earl left England in April, returning in December. His embassy took him across Holland, up the Rhine and the Main and then south-east to the Danube, finally arriving in Vienna in late June and Prague in July. The military context was provided by the first moves in a Franco-Habsburg phase of the conflict that was to last until the end of the War. During 1636, fighting was concentrated in the Rhineland through which Crowne and Arundel travelled, and in the east in an area distant from Arundel’s journey. The most significant engagement Arundel encountered was the siege of Hanau on the Main. The garrison, captained by Sir James Ramsay in the Swedish service, had been besieged by Imperial forces since the autumn of 1635. On his outward journey, Arundel passed within three miles of the town, Crowne writing that “we considered ourselves to be in considerable danger for we could hear the rapid discharge of the great guns”.⁴⁹ By the time of his return, in November, Hanau had been relieved. Crowne reported what was no doubt told them by Ramsay, who entertained Arundel and his party, that “[F]or a year and a half, Hannaw endured all the hardship of a siege by the Emperor’s forces, including a terrible plague from which

⁴⁸ W Crowne, *A true relation of all the remarkable places and passages observed in the travels of the Right Honourable Thomas Lord Howard . . .*, London, 1637, reprinted in and edited by F C Springwell, *Connoisseur and diplomat: the Earl of Arundel’s embassy to Germany in 1636 as recounted in William Crowne’s*

diary, the Earl’s letters and other contemporary sources with a catalogue of the topographical drawings made on the journey by Wenceslaus Hollar, [London], Maggs Bros Ltd, 1963, pp. 54–135.

⁴⁹ *Ibid.*, p. 60.

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22,000 people died in the space of seven weeks".⁵⁰ As Lammert noted, this number is surely exaggerated.⁵¹ The *Hessisches Städtebuch* notes the presence of plague and "Hungertyphus" during the siege, estimating that a third of the population died. Population estimates for Hanau in the seventeenth century are unavailable but the normal population of the old town did not exceed 3,000 before the middle of the eighteenth century although during the siege its population was swollen by refugees and "strangers", as well as by Ramsay's garrison.⁵²

The insecurity of life and property pervade Crowne's diary. Arundel's party passed through zones of active conflict protected by safe conducts provided by local commanders but their main fears focused on bands of "rogues" and "Crabbats" (Croats) "who lurked about the woods through which we passed".⁵³ They spent one night "walking up and down with carbines in our hands, and listening fearfully to the sound of shots in the woods around us".⁵⁴ Later, Crowne reported that "[I]n the woods alongside our route [between Würzburg and Frankfurt] we kept seeing bands of Croats who were pillaging and robbing the whole countryside".⁵⁵ In August, two of the Earl's senior servants and their local guide were murdered, possibly by Nuremberger soldiers, possibly by "Croat marauders".⁵⁶ Equally apparent is the extent of the destruction wrought by the War: few bridges had been left standing and the Earl's party passed through village after village that had been "pillaged and destroyed"; "[f]rom Cologne to Frankfurt all the towns, villages and castles are battered, pillaged and burnt and at every one of our halts we remained on board, every man taking his turn on guard duty".⁵⁷

But most shocking to the party was the hunger. Sometimes, this is recounted in stock phrases: "So difficult are conditions here that poor people are found dead with grass in their mouths".⁵⁸ Elsewhere, the comments are less stereotyped: at Rüdeshheim near Mainz, "His Excellency gave some relief to these poor wretches who were so starved that they struggled with one another for the food which he gave them".⁵⁹ Similarly at Mainz: "So violently did these poor people struggle when provisions were sent from our ship that some of them fell into the Rhine and were in danger of being drowned".⁶⁰ Beyond Würzburg they passed through Neustadt an der Aisch "which must have been a fine city, though now it lies pillaged and with many houses burnt to the ground. Here, seeing wretched children sitting at their doors almost dying of hunger, His Excellency ordered that food and money should be given to their parents".⁶¹ On his return, Arundel went ashore at Mainz "to see if it were in a better state than it had been on our outward visit. Alas, it was in the same sorry state as before, with various poor wretches lying on dunghills, almost starved to death and scarcely able to crawl to receive alms from His Excellency".⁶²

⁵⁰ Ibid., p. 88.

⁵¹ Lammert, op. cit., note 31 above, p. 201.

⁵² E Keyser (ed.), *Hessisches Städtebuch*, Stuttgart, W Kohlhammer, 1957, p. 220.

⁵³ Crowne, op. cit., note 48 above, p. 62.

⁵⁴ Ibid., p. 60.

⁵⁵ Ibid., p. 87.

⁵⁶ Ibid., p. 80 and pp. 127–8, note 179.

⁵⁷ Ibid., pp. 57, 59.

⁵⁸ Ibid., p. 58.

⁵⁹ Ibid., p. 59.

⁶⁰ Ibid., p. 59.

⁶¹ Ibid., p. 61.

⁶² Ibid., p. 88.

In contrast, plague, with which all the party would have been familiar, especially after the English epidemic of 1625, is treated as no more than a normal hazard of life. At Arnhem on the outward journey Arundel “promulgated certain orders which we were all to observe particularly on account of the prevalence of plague in this district”.⁶³ At Wesel, they spent the night on board their boats rather than enter the town “for at this time more than thirty people a day were dying of the plague”.⁶⁴ They took the same precaution at Bonn on their return journey.⁶⁵ In December they passed through Nijmegen, learning that “12,000 of their townspeople had died of the plague but now, thanks be to God, they are almost free of plague there”.⁶⁶

Crowne’s diary makes no attempt to explain the horrors he observed. For this we must turn to models of the demographic loss and military mortality crises. The historical literature on the Thirty Years’ War contains two that are distinguishable. In the first, the “synergy model”, the plunder and destruction of the War led to poor nutritional status which lowered resistance to infection by, and heightened the severity of, fatal epidemic diseases resulting in abnormally high levels of morbidity and abnormally high case fatality rates combining to produce “crisis” levels of mortality. In the second, the “transmission” model, an increased rate of disease transmission arose from troop movements and refugee fluxes.⁶⁷

The “Synergy” Model

What one might call the “generalized” synergy model, in which undernutrition increases the susceptibility to, or the severity of, all infections, although used to great rhetorical effect by Thomas McKeown (1976), has now been jettisoned by historical demographers in favour of a “restricted” model in which synergies between undernutrition and infection are admitted to exist for only a subset of diseases.⁶⁸ Proponents of the restricted synergy model attempt to classify the diseases of historical demography in three groups: those definitely synergistic with undernutrition, those showing no synergy, and a residual class where little is known or the evidence appears equivocal; the latter is an unfortunately large class.

The first stage in the application of the synergy model is therefore the identification of the diseases present in the historical episode of interest. As we saw above, it is clear that bubonic plague, typhus and, possibly, relapsing fever, dysentery and

⁶³ *Ibid.*, p. 55.

⁶⁴ *Ibid.*, p. 55.

⁶⁵ *Ibid.*, p. 90.

⁶⁶ *Ibid.*, p. 92.

⁶⁷ Both these models appear in Flinn’s account, *op. cit.*, note 1 above, pp. 52–3.

⁶⁸ T McKeown, *The modern rise of population*, London, Edward Arnold, 1976; A G Carmichael, ‘Infection, hidden hunger, and history’, in R I Rotberg and T K Rabb (eds), *Hunger and history: the impact of changing food production and consumption patterns on society*, Cambridge

University Press, 1985, pp. 51–66; Post, *op. cit.*, note 33 above, p. 228; *idem*, ‘Nutritional status and mortality in eighteenth-century Europe’, in L F Newman (ed.), *Hunger in history: food shortage, poverty, and deprivation*, Oxford, Blackwell, 1990, pp. 241–80, on pp. 242–5, 257; J Walter and R S Schofield, ‘Famine, disease and crisis mortality in early modern society’, in J Walter and R Schofield (eds), *Famine, disease and the social order in early modern society*, Cambridge University Press, 1989, pp. 1–73, on pp. 18–19.

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typhoid, and to a much lesser extent smallpox and other “poxes”, were the main killers in the mortality crises of the War. The second stage is an assessment of the degree of synergy, if any, between undernutrition and the diseases of interest. While it has become conventional in demographic history to take the assessments of the Bellagio Conferees as authoritative, doubts about some of their conclusions suggest a more searching examination of the evidence is warranted.⁶⁹ For bubonic plague, the evidence is indirect. Medical scientists have not regarded a possible link between nutritional status and the human susceptibility to, or rate of fatality from, cases of bubonic plague as sufficiently interesting to warrant investigation.⁷⁰ Demographic historians have observed that “The [well-nourished] rich . . . died of the plague as did the [frequently undernourished] poor when the disease was present”⁷¹ and have dismissed the often but not invariably observed link between poverty and the incidence of plague fatalities as the result of “variations in standards of housing and hygiene which might attract or repel the rats and fleas which carried plague”.⁷² Only Stephen Ell has argued for a nutritional factor in susceptibility to the disease and he advanced the now apparently mistaken hypothesis that the link is antagonistic, not synergistic.⁷³ It is often suggested that the extreme pathogenicity and virulence of the plague bacillus renders the nutritional status of an infected patient irrelevant

⁶⁹ Conferees [at the Bellagio Conference], ‘The relationship of nutrition, disease, and social conditions: a graphical presentation’, in Rotberg and Rabb, *op. cit.*, note 68 above, pp. 305–8. S Zurbrigg, ‘Hunger and epidemic malaria in Punjab, 1868–1940’, *Econ. Polit. Wkly. (India)*, 25 January 1992, 27 (4): PE-2–PE-26, has put forward a carefully constructed argument based on epidemiological data for a nutritional synergy in the case of malaria, where the Conferees considered synergy definitely absent. Consultation of the monumental work by F Fenner, D A Henderson, I Arita, Z Jezek, and I D Ladnyi, *Smallpox and its eradication*, Geneva, World Health Organization, 1988, p. 196, reveals that synergies between nutritional status and smallpox, which the Conferees classed as definitely without synergy, have never been researched.

⁷⁰ The standard and encyclopaedic but now dated work by R Pollitzer, *Plague*, Geneva, World Health Organization, 1954, does not treat this topic; L F Hirst, *The conquest of plague: a study of the evolution of epidemiology*, Oxford, Clarendon Press, 1953, notes briefly the conjunction between famine and plague observed by some early authors but argues that the squalor and the consequent presence of rats in famine conditions is the causal factor, not low nutritional status. A search of the medical database *Medline* covering 1966–98 reveals

that the disease remains an active area of research but only one study which considers plague in relation to overall nutritional status, a note by Richard Pankhurst, the historian of Ethiopia. Standard medical manuals, e.g., A S Benenson (ed.), *Control of communicable diseases manual*, 16th ed., Washington, American Public Health Association, 1995, simply state that susceptibility to the disease is “general”.

⁷¹ A B Appleby, ‘The disappearance of plague: a continuing puzzle’, *Econ. Hist. Rev.*, 1980, 33: 161–73, p. 166.

⁷² P Slack, ‘The local incidence of epidemic disease: the case of Bristol 1540–1650’, in *The plague reconsidered*, *op. cit.*, note 33 above, pp. 49–62, on p. 54; *idem*, *op. cit.*, note 33 above, pp. 91–3, 116–17, 121–3, 133–40, 159, 166.

⁷³ S R Ell, ‘Immunity as a factor in the epidemiology of medieval plague’, *Rev. infect. Dis.*, 1984, 6: 866–79. The hypothesis was that dietary iron deficiencies provided some immunity to the disease and this explained its supposed relatively high incidence among adult males. Ell appears to have mistaken the age and gender incidence of the disease and the hypothesis flies in the face of the very high morbidity and case fatality rates among pregnant women, almost certainly suffering from anaemia in this period. On age and gender incidence, cf. Ell, *op. cit.*, and R S Schofield, ‘An

to the outcome. Jean-Noel Biraben's review of the historical evidence during the second pandemic in Europe supports these conclusions.⁷⁴

The evidence in regard to typhus is more controversial. Typhus has frequently been associated with famine conditions, as the term "famine fever" indicates, and its presence has sometimes been used by modern historians as evidence of "low nutritional status".⁷⁵ This assumption of a causal association receives some limited support from early experimental studies of rats, including some by Hans Zinsser and colleagues, which suggested that any one or more of a wide range of specific vitamin deficiencies may increase the severity of the disease subsequent to infection.⁷⁶ However, it is not clear that it is possible to generalize from studies of rat models and the current position among medical scientists is thus one of agnosticism.⁷⁷ Among historians, the general view has long been that the occurrence of typhus epidemics is to be explained by overcrowding in cold and unhygienic conditions such as those experienced by refugees fleeing wars and famines. Hence the empirical conjunction of such epidemics with these phenomena.⁷⁸

While historians have emphasized the role of overcrowding and questioned the relevance of undernutrition in the genesis of typhus epidemics, the reverse is the case with epidemics of relapsing fever. Although caused by different agents, the epidemiology of relapsing fever is almost identical to that of typhus and the two diseases frequently occur together. While it has never been identified as an important source of mortality during the Thirty Years' War, it would be unwise to assume it

anatomy of an epidemic: Colyton November 1645–November 1646', in *The plague reconsidered*, op. cit., note 33 above, pp. 95–126, and S R Ell's own 'Three days in October of 1630: detailed examination of mortality during an early modern plague epidemic in Venice', *Rev. infect. Dis.*, 1989, 11: 128–39. On plague and pregnancy, see Hirst, op. cit., note 70 above, p. 73, B Velimirovic and H Velimirovic, 'Plague in Vienna', *Rev. infect. Dis.*, 1989, 11: 808–26, and, again, Ell, 'Three days in October', pp. 135–6.

⁷⁴ J-N Biraben, *Les Hommes et la peste en France et dans les pays européens et méditerranéens*, vol. 1, *La Peste dans l'histoire*, Paris, Mouton, 1975, pp. 147–51.

⁷⁵ D J Oddy, 'Urban famine in nineteenth-century Britain: the effect of the Lancashire cotton famine on working-class diet and health', *Econ. Hist. Rev.*, 1983, 37: 68–86, pp. 83–4. Cf. A Hardy, 'Urban famine or urban crisis? Typhus in the Victorian city', *Med. Hist.*, 1988, 32: 401–25, p. 401; *idem*, *The epidemic streets: infectious disease and the rise of preventive medicine, 1856–1900*, Oxford, Clarendon Press, 1993, pp. 191, 282–3.

⁷⁶ H Zinsser, M Ruiz-Castañeda and C V Seastone Jr, 'Studies on typhus fever. VI. Reduction of resistance by diet deficiency', *J. exp. Med.*, 1931, 53: 333–8; F K Fitzpatrick, 'Susceptibility to typhus

of rats on deficient diets', *Am. J. Public Hlth.*, 1948, 38: 676–81; N S Scrimshaw, C E Taylor and J E Gordon, *Interactions of nutrition and infection*, Geneva, World Health Organization, 1968, pp. 81, 93, 104, 110.

⁷⁷ J C Snyder, 'Typhus fever rickettsiae', in F L Horsfall and I Tamm (eds), *Viral and rickettsial infections of man*, 4th ed., Philadelphia, J B Lippincott, 1965, pp. 1059–94, on p. 1076. Later editions do not treat this topic.

⁷⁸ This view was clearly enunciated by Hirsch in the 1880s despite the fact that the transmission mechanism of the disease was then unknown and despite his adherence to miasmatic theories of disease: A Hirsch, *Handbook of geographical and historical pathology*, 3 vols, London, New Sydenham Society, 1883–86, vol. 1, pp. 545–87. As early as 1867, Maclagan had observed a typhus epidemic during a time of economic prosperity in Dundee and drawn the correct conclusion that it was overcrowding brought about by migration to the town and scarce accommodation, not "want and misery", that had caused the epidemic: T J Maclagan, 'Typhus statistics of the Dundee Royal Infirmary with remarks', *Edinb. med. J.*, 1867–8, 13: 140–57, pp. 140–1. A similar case has been documented more recently by Hardy and a similar inference made: Hardy, 'Urban famine', note 75 above, p. 413.

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was absent. Anne Hardy has argued that relapsing fever, not typhus, is the “true famine fever” but she is careful to base this characterization on the ground that case fatality rates show an inverse relationship with social class. However, the research evidence on which this is based is a single paper from the 1940s which employs a methodology too badly flawed by absence of controls for it to be able to bear the weight of Hardy’s conclusion.⁷⁹ The only other evidence for the view that nutritional status has an effect on the case fatality rate in relapsing fever is based on rat models.⁸⁰ Other writers have plausibly explained social class differences in crude mortality in terms of differential standards of hygiene.⁸¹ To summarize, the evidence for the existence of a link between nutritional status and either susceptibility to, or the severity of, both typhus and relapsing fever is weak.

A connection between typhoid fever and nutritional status has been studied relatively little. A series of experiments with mouse-typhoid suggest that protein deficiencies increase the case fatality rate.⁸² The links between undernutrition and acute diarrhoeal diseases, including those formerly referred to as “dysentery”, have been intensively studied and a number of mechanisms by which undernutrition may exacerbate the effect of acute diarrhoeal diseases have been identified.⁸³ Work in modern low income countries suggests that undernutrition, by impairing immunity and other mechanisms, increases the incidence of diarrhoeal diseases and lengthens their duration among children under five years old.⁸⁴ Studies of adults are extremely rare.

This survey of modern medical history makes it plain that, in the circumstances of early modern Europe, the distinction between famine mortality and epidemic disease mortality, commonly found in contemporary documents, is sustainable. Starving civilians were no more susceptible to bubonic plague and suffered the disease no less severely than the well fed. Although medical science has little to say on the matter, the historical evidence suggests strongly that typhus epidemics are a result of overcrowding in cold conditions, not low nutritional status. There is no adequate basis for the view that epidemics of relapsing fever are substantially different. With regard to typhoid fever, we have only experimental evidence to support the supposition of a synergy between undernutrition and disease severity. Only in the case of acute diarrhoeal diseases is there a well-established link between low nutritional status and susceptibility to, and severity of, infection. The history of epidemic disease mortality during the Thirty Years’ War is

⁷⁹ A Hardy, ‘Relapsing fever’, in K F Kiple (ed.), *The Cambridge world history of human disease*, Cambridge University Press, 1993, pp. 967–70, on p. 968; M Gaud, and M T Morgan, ‘Epidemiological study of relapsing fever in north Africa (1943–1945)’, *Bull. Wld. Hlth. Org.*, 1947/48, 1: 69–92.

⁸⁰ K Guggenheim, E Buechler-Czaczkes and S Halevy, ‘The effect of protein deficiency on the resistance of rats to infection with spirochetes of relapsing fever’, *J. infect. Dis.*, 1951, 88: 105–8.

⁸¹ Hirsch, op. cit., note 78 above, vol. 1, pp. 611–12; W P MacArthur, ‘Medical history of the

famine’, in R D Edwards and T D Williams (eds), *The great famine: studies in Irish history 1845–52*, Dublin, Browne and Nolan, 1956, pp. 263–315, on p. 278.

⁸² Scrimshaw *et al.*, op. cit., note 76 above, p. 80.

⁸³ H L DuPont, ‘Diarrheal diseases (acute)’, in Kiple, op. cit., note 79 above, pp. 677–80, on pp. 678–9.

⁸⁴ A Briend, ‘Is diarrhoea a major cause of malnutrition among the under-fives in developing countries? A review of available evidence’, *Eur. J. clin. Nutr.*, 1990, 44: 611–28, on pp. 612–13.

dominated by plague and, to a much lesser extent, diseases usually identified as typhus but which may have been relapsing fever or typhoid. The diarrhoeal diseases known to be synergistic with undernutrition are precisely those most rarely encountered. I conclude that the “synergy” model is largely inapplicable to the Thirty Years’ War.

The “Hunger” Model

The corollary of this conclusion is that mortality crises due to hunger and starvation will have frequently appeared as such, not as epidemics of infectious diseases. This is indeed what the contemporary accounts suggest: Crowne always refers to the “poor wretches” they encountered in Germany as “starved” or “dying of hunger”, not as suffering from disease; from plague victims they were careful to keep their distance. I posit therefore a third model of military mortality crises: the “hunger model”. This section reviews the military and economic mechanisms that make up this model and their operation in the Thirty Years’ War.

Hunger was produced as a direct, designed consequence of military operations of siege, devastation, and manoeuvre. In the Thirty Years’ War sieges were frequent but historians’ highlighting of the most appalling instances (Breda, 1625, Alte Veste (Nuremberg), 1632, Augsburg, 1634–5, Breisach (Baden), 1638) obscures the fact that sieges were often ended quickly by surrender or storm, or were relieved, or abandoned by armies that found themselves incapable of sustaining them or that were withdrawn to fight elsewhere. The instances where a siege was carried *à la outrance*, such as those listed above, were comparatively rare.⁸⁵ Certainly, the mortality attributable to siege operations cannot account for any significant part of the demographic losses of the War: perhaps 8,000 died at Breda; it is reputed that 100 a day were buried during the three month siege of Alte Veste (Nuremberg); nearly 11,000 burials were recorded during 1634–5 in Augsburg, besieged for six months of these two years.⁸⁶ Devastation, in the strict military sense of the destruction of the assets and infrastructure of an area in order to render it incapable of supplying troops or war materiel to an enemy, was again comparatively rare; the prime example among the few that have been suggested being the attempt by Gustavus Adolphus to lay waste Bavaria in 1632.⁸⁷ It is unclear how effective this was. Commanders who were able to confine their enemies to, or compel them to retreat through, areas incapable of sustaining them purposely brought hunger and starvation to the enemy troops. The

⁸⁵ See, for example, the detailed narrative given in A W Ward, ‘The Protestant collapse (1620–30)’, *idem*, ‘Gustavus Adolphus (1630–2)’, *idem*, ‘Wallenstein and Bernard of Weimar (1632–5)’, *idem*, ‘The later years of the Thirty Years’ War (1635–48)’, in A W Ward, G W Prothero and S Leathes (eds), *The Cambridge modern history*, vol. 4, *The Thirty Years’ War*, Cambridge University Press, 1906, pp. 64–117, 190–222, 223–55, 364–94.

⁸⁶ Prinzing, *op. cit.*, note 32 above, p. 72; Wedgwood, *op. cit.*, note 36 above, p. 330; Schreiber, *op. cit.*, note 16 above, p. 111.

⁸⁷ M Roberts, *Gustavus Adolphus: a history of Sweden 1611–1632*, 2 vols, London, Longmans, Green, 1953–58, vol. 2, p. 703; Langer, *op. cit.*, note 24 above, p. 107.

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outstanding example is the retreat of the Imperialists from Holstein to Bohemia in 1644: according to a hostile but near contemporary chronicler only 1,000 of the 18,000 strong army completed the retreat.⁸⁸ However, while food was undoubtedly used as a weapon of war, the ability of early modern military commanders to starve enemy troops into submission was limited by the defensive and offensive actions of their enemies, and there is no evidence that civilians were starved frequently or on a large scale by these operations.

The economic mechanisms linking early modern warfare with hunger and starvation were activated by military demands for food, fodder, shelter and supplies of other war materiel from the German economy. The poor transportation systems of early modern Europe precluded the delivery of significant quantities of supplies from a foreign base. The bulk of an army's supplies therefore had to be obtained locally. Satisfying the military's demands involved military personnel and local civilians in extensive economic, political and social relationships. The character of these relationships had a major impact on the rural and urban economies of Germany and on the ability of civilians simultaneously to preserve their physical security and their nutritional status. At first sight, the sheer scale of military demands on the civilian economy seems sufficient to explain civilian hardship and hunger. Military historians have emphasized the huge size of the armies involved in the Thirty Years' War by the standards of the time: armies of 20,000 combatants were regarded as large at the start of the War but, as early as 1627, Wallenstein, the commander of the imperial army, had 100,000 men under arms; by 1631 Gustavus Adolphus deployed about 130,000.⁸⁹ The estimated 210,000 soldiers in the field at the end of the War was a number without precedent.⁹⁰ These huge bodies of men were attended by a vast crowd of civilian "camp followers": women, children, servants and sutlers.⁹¹ According to C V Wedgwood, as the War progressed the "tail" of camp followers increased to two, three, four or even five times the number of soldiers.⁹² To move their belongings and equipment required a scarcely less impressive number of horses: perhaps two to four for each wagon, perhaps one wagon for every fifteen men: perhaps 6,000 horses for an army of 30,000 men.⁹³ Cavalry horses are in addition to this number. In former times, armies had campaigned in the summer and disbanded in the winter but in the seventeenth century this was no longer the case. While campaigning might cease in the autumn, the armies continued in being at winter stations and therefore required provisioning for twelve months of the year.⁹⁴ Supplying

⁸⁸ Parker, *op. cit.*, note 5 above, p. 156.

⁸⁹ Roberts, *op. cit.*, note 87 above, vol. 2, p. 203; M van Creveld, *Supplying war: logistics from Wallenstein to Patton*, Cambridge University Press, 1977, p. 5; P Limm, *The Thirty Years War*, London, Longman, 1984, pp. 83–4; R G Asch, 'Warfare in the age of the Thirty Years War 1598–1648', in J Black (ed.), *European warfare 1453–1815*, Basingstoke, Macmillan, 1999, pp. 45–68, on pp. 56–9; cf. Parker, *op. cit.*, note 21 above, pp. 45–6.

⁹⁰ Parker, *op. cit.*, note 21 above, p. 191, cf. p. 208.

⁹¹ Van Creveld, *op. cit.*, note 89 above, p. 6; Parker, *op. cit.*, note 21 above, p. 199; *idem*, *op. cit.* note 5 above, pp. 77–8.

⁹² Wedgwood, *op. cit.*, note 36 above, p. 385.

⁹³ Van Creveld, *op. cit.*, note 89 above, p. 6; Parker, *op. cit.*, note 21 above, p. 199.

⁹⁴ Gutmann, *op. cit.*, note 13 above, p. 16.

such a body with food and fodder was the major problem of military finance and supply of its time.

However, although the armies were large in comparison with the past, they remained small in relation to the civilian population and to agricultural output; military demands for supplies did not therefore necessarily spell famine for civilians. The 210,000 men under arms at the end of the War represents less than 2 per cent of the estimated pre-War German population. Martin van Creveld puts forward plausible calculations to show that in the relatively well developed agricultural areas of Europe feeding and foddering an army of 60,000 men on the march would have required relatively small proportions of the agricultural output of the area through which they moved.⁹⁵ Moreover, while the total number of men under arms was very large, by the end of the 1620s they were often dispersed to separate areas and theatres; many of the battles and sieges of the War involved fewer than 20,000 combatants on each side.⁹⁶ Military pressures on food supplies certainly became more difficult to sustain if an army came to a halt, for instance to besiege a town or fortress, or if an army were moving through an area which had already been plundered. Stralsund and Peenemünde on the Baltic coast where Gustavus Adolphus's forces landed in July 1630 give one example of such circumstances. The area had been fought over in both the previous two years: Stralsund had been besieged by Wallenstein in 1628; not far away, he had fought the Danes at Wolgast in 1629. Wallenstein was by this time at the head of an army of perhaps 125,000, though its detachments were quartered over a wide area, in Holstein, Saxony, Brandenburg and Pomerania.⁹⁷ Pomerania was reduced to "utter destitution" by January 1629, Wallenstein reporting that on the nearby island of Rügen "the troops readily eat dogs and cats, whereas the peasants simply drown themselves in the sea out of hunger and desperation".⁹⁸

However, calculations of military demands and civilian supplies such as those offered by van Creveld fail to take into account the impact of military supply operations on civil-military relations; in many instances it appears that the unruly, hostile and violent nature of these relations played a major part in the descent of civilians into hunger and starvation. Broadly speaking, the military could obtain their supplies from civilians in ways which were orderly, peaceful and preserved civilians' physical security (market purchases, taxation, systematic requisition, *ad hoc* agreements) or their methods could be disorderly and violent and attended by serious threats to life as well as property. Orderly and peaceful, though hardly very pleasant, methods were certainly employed, especially in the earlier years of the War. Sometimes a payment in cash or kind (*Brandschatzung* or "fire-money") was extracted from local communities by threatening to fire the village or sack the town unless it was paid. Somewhat similar were payments made by cities in order to avoid becoming muster places or garrisons. The *Brandschatzung* system developed into the

⁹⁵ Van Creveld, *op. cit.*, note 89 above, p. 34.

⁹⁶ Bodart, *op. cit.*, note 24 above, pp. 22–3, 85; Asch, *op. cit.*, note 89 above, p. 57.

⁹⁷ Wedgwood, *op. cit.*, note 36 above, pp. 222–3, 236–9, 253.

⁹⁸ Roberts, *op. cit.*, note 87 above, vol. 2, p. 445. Wallenstein's report is in van Creveld's translation, *op. cit.*, note 89 above, p. 251, note 19, where it is mistakenly attributed to Gustavus Adolphus.

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“contribution system” early in the War, becoming the “mainstay of war finance”.⁹⁹ A “tax” assessment, payable in cash or goods, was made by army commanders of communities in the vicinity of their troops. Gathering the “tax” was left to local community leaders: they might pay from local authority treasuries or gather contributions from members of the community, or, more likely, both. The sums involved were very large: Fritz Redlich gives instances of monthly payments of tens of thousands of florins or thalers continuing over periods of several months or even a few years.¹⁰⁰ The contributions were typically delivered to the army cashier and thence to the soldiers as pay in cash or kind; cash was used by the soldiers to purchase supplies from the army’s sutlers, themselves purchasing from local civilian suppliers, or from the householders on whom they were billeted.¹⁰¹ The system, at least in principle, allowed local communities some control over the distribution of the burden and, although often regarded by historians as only a step away from plunder, it provided a basis for the orderly and non-violent supply of the military by civilians.

However, if they were to work, such systems of supply required the military to establish an appropriately staffed and resourced administration. This could be put in place only by military forces in stable occupation of a territory: in many parts of Germany this condition did not obtain. For example, it took Gustavus Adolphus two years to establish his financial administration of Swedish-occupied Germany.¹⁰² Only two years later, after the major defeat of Swedish forces at Nördlingen in 1634, the Swedes began their long withdrawal towards the Baltic coast. In practice, therefore, formal systems of taxation and assessment imposed by armies of occupation were not characteristic of the War. Instead taxes and contributions were imposed on a more or less *ad hoc* basis.

But even these *ad hoc* mechanisms often failed to supply sufficient resources to the troops. When this happened, the traditional practice was to “forage” for food and fodder in the immediate vicinity of wherever the army found itself. In the absence of sufficient cash to finance market purchases, “foraging” meant requisition, seizure and theft. It was disorderly at best, at worst associated with violence and atrocity. The result was that, by the early 1630s and even earlier in some areas, relations between troops and local civilians were markedly hostile and punctuated by atrocities and reprisals committed by both sides. Reviewing the War up to 1630, Wedgwood writes of the “virulent hatred between soldiers and peasants, rising almost to a frenzy”.¹⁰³ Parker supplies an incident from Bavaria in 1632 in which the mutilation of plundering soldiers by peasants was revenged by firing villages and murdering their inhabitants.¹⁰⁴ Theibault’s history of the impact of the War in Hesse-Kassel gives a detailed account of the deteriorating civil-military relations in that

⁹⁹ F Redlich, ‘Contributions in the Thirty Years’ War’, *Econ. Hist. Rev.*, 1959–60, 12: 247–54, pp. 251–2; G Benecke, *Germany in the Thirty Years War*, London, Edward Arnold, 1978, pp. 25–6.

¹⁰⁰ Redlich, *op. cit.*, note 99 above, p. 254.

¹⁰¹ Gutmann, *op. cit.*, note 13 above, pp. 38–9.

¹⁰² Roberts, *op. cit.*, note 87 above, vol. 2, p. 621.

¹⁰³ Wedgwood, *op. cit.*, note 36 above, p. 257.

¹⁰⁴ Parker, *op. cit.*, note 21 above, p. 200; Benecke, *op. cit.*, note 99 above, pp. 68–69 gives details of a similar incident in Swabia in 1632; see also Friedrichs, *op. cit.*, note 5 above, pp. 186–7.

area, descending ultimately into unremitting hostility.¹⁰⁵ Crowne's diary, as we have seen, frequently notes the dangers posed by the bands of marauding soldiers and ex-soldiers whom he referred to generically as "Croats".

The relevant consequences of these bitter relations were twofold. First, plunder became destructive rather than simply redistributive. Instead of merely carrying off the goods and impressing the services required to aid their operations, plundering troops destroyed food, livestock and other goods they could not carry away, and destroyed growing and standing crops and village buildings, as exemplified by the reprisal firing noted above. Second, as we shall see in more detail below, these antagonistic civil-military relations precipitated frequent flights of civilians to places of refuge, separating peasants from their fields, and adversely affecting agricultural production. The impact of military methods of supply on civilian food stocks during the Thirty Years' War thus became much more serious than a simple comparison of the number of troops and Germany's population and agricultural output would indicate. This would lead us to expect no more than localized civilian nutritional emergencies caused by exceptional circumstances, but a consideration of the socio-economic relations of warfare shows how such problems could become serious and widespread.

The "Transmission" Model

The transmission model depends on the impact of war on the rate at which disease spreads. Despite some controversy, the way in which bubonic plague is transmitted is fairly well known and a detailed exposition of the transmission from rat to flea to human would be otiose.¹⁰⁶ The mechanics of the geographical spread of plague are not always so well understood, however.¹⁰⁷ Geographical diffusion of a bubonic plague epidemic requires the geographical spread of infection amongst rats, and the dispersal of the infected rats themselves or of infected fleas. Since the infection appears to spread slowly through the rat population and since neither the species of rat nor the fleas involved travel far or rapidly by themselves, the geographical spread of plague is largely accomplished by an outside agency and that outside agency is human. The classic method for long distance spread is the transport of infected rats from port to port by infested ships. Short distance spread may occur similarly by rats transported in barges or, conceivably, in carts but much more typically by fleas in bundles of merchandise, especially bedding and clothing, in consignments of cereals, and on the persons or in the baggage of travellers.¹⁰⁸

The probable ways in which plague was disseminated during the War are as

Wedgwood returns to the theme when reviewing the War up to 1637, *op. cit.*, note 36 above, pp. 410–14.

¹⁰⁵ Theibault, *op. cit.*, note 8 above, pp. 141–53.

¹⁰⁶ The epidemiology of pneumonic plague is quite different but there is no evidence that it was

present on any substantial scale in Europe during this period: Bradley, *op. cit.*, note 33 above, pp. 12–13; Slack, *op. cit.*, note 33 above, p. 9.

¹⁰⁷ For example, Friedrichs, *op. cit.*, note 5 above, p. 189.

¹⁰⁸ Hirst, *op. cit.*, note 70 above, ch. XI; Pollitzer, *op. cit.*, note 70 above, p. 300.

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follows. As troops moved from one billet to another they would have carried infected fleas with them—on their persons, in their clothes and bedding—and civilian houses billeting troops are the most likely sites of military-civilian transmissions of the disease. Refugees, fleeing to the towns in the face of advancing troops and returning home later, would similarly have carried fleas to and from places of refuge. Hence flea transport by troops and civilian refugees would have spread the disease faster and more thoroughly than in times of peace. Only the reduction in ordinary commercial traffic and, conceivably, the possible quarantining of plague-infected populations by siege may have ameliorated the situation. That the spread of the disease by troop movements was not merely a theoretical possibility but was also quantitatively important is suggested by Werner Sombart's estimate of the scale of inland road transport in Germany before the railways: he supposed that perhaps 40,000 horses were involved in such activities, the same number that military historians have suggested were required to move the more than 200,000 troops and their baggage deployed towards the end of the Thirty Years' War.¹⁰⁹

Detailed studies of the 1632–7 epidemic in Germany reinforce the relevance of the transmission model of military mortality crises to this episode. First, the spread of the plague was correlated with the major troop movements. Erich Keyser's work, recently confirmed by Eckert, demonstrated that the 1632–7 epidemic began in the south with Bavaria, Württemberg, the Rhine Palatinate, and the lower Rhineland affected in 1632–4, along with the areas of Saxony and Silesia bordering on Bohemia.¹¹⁰ In 1635 the plague spread to previously uninfected localities within these regions (“infilling”). The next year, the plague slowly advanced north-eastwards but moved very rapidly down the Saxony tributaries of the Elbe into Brandenburg. From this year on, the predominant movement was eastwards, reaching the Oder in 1637, with much “infilling” in 1638, and an advance into Pomerania. The epidemic petered out on the Pomeranian coast in 1639. These directions of diffusion are broadly similar to the main military movements of those years.¹¹¹

¹⁰⁹ W Sombart, *Der moderne Kapitalismus: historisch-systematische Darstellung des gesamteuropäischen Wirtschaftslebens von seinen Anfängen bis zur Gegenwart*, 2nd ed., 2 vols in 4, Munich and Leipzig, Duncker & Humblot, 1921, vol. 2.1, p. 341; van Creveld, op. cit., note 89 above, p. 6; Parker, op. cit., note 21 above, p. 199. Sombart's estimate is accepted as a reasonable one by F Braudel, *Civilization and capitalism 15th–18th century*, vol. 2, *The wheels of commerce*, London, Fontana Paperbacks, 1985, p. 350. The total number of horses, including not only draught horses but also farm animals, in Germany at the time of which Sombart was writing was several million (H Kellenbenz, ‘Germany’, in C Wilson and G Parker (eds), *An introduction to the sources of European economic history 1500–1800*, vol. 1, *Western Europe*,

London, Weidenfeld and Nicolson, 1977, p. 198.)

¹¹⁰ E Keyser, ‘Die Ausbreitung der Pest in den deutschen Städten’, in H Poser (ed.), *Ergebnisse und Probleme moderner geographische Forschung, Festgabe H. Mortensen*, Bremen-Horn, W Dorn, 1954, pp. 207–15; Eckert, op. cit., note 9 above, pp. 147–54.

¹¹¹ A W Ward, ‘The later years’, note 85 above, pp. 366–84; Wedgwood, op. cit., note 36 above, pp. 368–40; E A Beller, ‘The Thirty Years War’, in J P Cooper (ed.), *The decline of Spain and the Thirty Years War 1609–48/59*, The New Cambridge Modern History, vol. 4, Cambridge University Press, 1970, pp. 345–9; Biraben, op. cit., note 74 above, pp. 141–3; R J Bonney, ‘France’s “war by diversion”’, in Parker (ed.), op. cit., note 5 above, pp. 129–37.

The epidemic was very widely diffused. Eckert states that only 5 of the 800 parish registers in his sample for these years did not record significant mortality crises.¹¹² By way of contrast, John Shrewsbury found evidence that the plague which struck the British Isles in 1665–8, which was more widely diffused than any other he documented, was reported from ninety-three separate places in England.¹¹³ The German epidemic was also extraordinarily lethal: whereas a loss of 10 to 15 per cent of a region's population would have been regarded as a severe crisis in previous epidemics, "in the period, 1632–39, estimated losses of 40% were commonly approached or exceeded".¹¹⁴ Since there is no reason to suspect an increase in case fatality rates during this epidemic, it seems likely that this high mortality was a direct result of the comprehensive diffusion of the disease. Both the route of diffusion of the 1632–7 epidemic and its extent strongly suggest the operation of an uncommon factor, and the presence and the mobility of the armies of the Thirty Years' War suffice to explain the unusual features of the epidemic and support the "transmission" model of military mortality crises.

Study of the spread of typhus and relapsing fever, and typhoid and dysenteric diseases also confirms the applicability of such a model to this War. As is well known, the transmission of typhus and relapsing fever by the human body louse is facilitated when people are huddled together in confined places in cold conditions with inadequate facilities for bathing.¹¹⁵ However, the mechanics of the geographical spread of typhus and relapsing fever have been less intensively studied than those of plague. It is clear that short distance spread among, say, the inhabitants of a single house or barracks or camp can be accomplished by the independent movement of the body louse. Long distance spread appears to be accomplished by the movement of people incubating the disease, suffering from it in a mild form, or convalescing after it, or carrying infective lice on their persons, or in their clothing or bedding. The rate of spread has struck observers of modern epidemics as "rapid" and impressive, even when it has been unaided by modern means of transport.¹¹⁶ Typhoid fever and the most prominent dysenteric diseases, amoebiasis and shigellosis, are transmitted via the faecal-oral route, usually from the ingestion of faecally contaminated food or water. Epidemics therefore signal a breakdown or absence of sanitary arrangements that keep human faeces separate from drinking water and food. Army camps, refugee camps and makeshift shelters are as a result prominent sites. People appear able to acquire considerable resistance to local strains of *Shigella* and some of the most notable twentieth-century epidemics of shigellosis can be explained by the introduction of unfamiliar strains by, for example, troop movements.¹¹⁷

¹¹² Eckert, *op. cit.*, note 9 above, p. 150.

¹¹³ J F D Shrewsbury, *A history of bubonic plague in the British Isles*, Cambridge University Press, 1970, pp. 445–537.

¹¹⁴ Eckert, *op. cit.*, note 9 above, p. 150.

¹¹⁵ Snyder, *op. cit.*, note 77 above; Hardy, 'Urban famine', note 75 above, p. 413, *idem*, *Epidemic streets*, note 75 above, pp. 191–3; V A Harden, 'Typhus, epidemic', in Kiple, *op. cit.*, note 79 above, pp. 1080–4.

¹¹⁶ MacArthur, *op. cit.*, note 81 above, pp. 271–2; K D Patterson, 'Typhus and its control in Russia, 1870–1940', *Med. Hist.*, 1993, 37: 361–81, on p. 374.

¹¹⁷ C W LeBaron and D W Taylor, 'Typhoid fever', in Kiple, *op. cit.*, note 79 above, pp. 1071–7; K D Patterson, 'Amebic dysentery', *ibid.*, pp. 568–71; *idem*, 'Bacillary dysentery', *ibid.*, pp. 604–6.

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Although the transmission modalities of typhus and relapsing fever on the one hand and typhoid and dysenteric diseases on the other exhibit major differences, all may be precipitated by troop movements and civilian distress migration in the conditions of northern Europe. That such movements occurred on a large scale in the Thirty Years' War is a constant of the literature. The War not only involved armies of an unprecedented size but those armies marched over distances unprecedented since the Crusades. Swedish soldiers marched from the Baltic to Munich; Spanish troops marched from Genoa to Brussels via Munich and Frankfurt am Main. But, once again, purely military activity is insufficient to explain the diffusion of plague: an understanding of the politico-confessional character of the War and of the character of civil-military relationships that emerged during it is crucial for an understanding of the very large-scale civilian movements which took place.

Civilian movements were of various types. Some forms of migration may have been relatively unhurried and may consequently have led to relatively few health problems in reception areas. Many German civilians moved in response to the changing confessional identity of their territory. While these migrations can be described legitimately as "forced", they did not, for the most part, occur at the point of a cutlass or in fear of immediate physical violence. It is often appropriate to refer to the people who migrated in these circumstances as "exiles" rather than "refugees".¹¹⁸ However, "distress migrations", unplanned, precipitate, and often resulting in severe problems of disease and undernutrition in the reception area, also took place. Some civilians were forced to move in search of shelter when their homes were demolished to make way for urban fortifications or destroyed by bombardment and arson.¹¹⁹ Particularly in the later stages of the War, civilians often fled at the approach of soldiers, fearful for their safety.

Studies of Mulhouse and Strasbourg in the Alsace indicate the scale of these problems and how refugees and city authorities attempted to cope with them. Mulhouse became a *ville de refuge* for the rural populations of the area.¹²⁰ It also received Protestant exiles from Colmar and other Protestant regions of Germany, including Saxony, Brandenburg, Württemberg, and Hesse. In October 1632, the inhabitants of the commune of Illzach fled to Mulhouse and the city authorities felt obliged to give refuge to them since they were its subjects. These refugees remained in the town until the arrival of Swedish forces in February 1633. The entire commune fled back to Mulhouse at the advance of Spanish troops later that year and stayed some years. In 1638 it was claimed that the number of refugees exceeded the number of burgesses by 700, indicating they numbered between 1500 and 1800. Although

¹¹⁸ The most well known example is the Protestant migration from Bohemia to Saxony subsequent to the Bohemian counter-Reformation of 1623–4 (Blaschke, *op. cit.*, note 8 above, pp. 113–15). P G Wallace, *Communities and conflict in early modern Colmar: 1575–1730*, Atlantic Highlands, NJ, Humanities Press, 1995, pp. 16–17, 85, provides another example.

¹¹⁹ For examples, see B Stier and W von Hippel, 'War, economy and society', in S Ogilvie

(ed.), *Germany: a new social and economic history*, vol. 2, 1630–1800, London, Arnold, 1996, pp. 233–62, on p. 240.

¹²⁰ R Oberlé, *La République de Mulhouse pendant la guerre de trente ans*, Publications de la Faculté des Lettres de Strasbourg, Paris, Les Belles Lettres, 1965, pp. 257–62.

Raymond Oberlé states that they often found shelter with Mulhousian families and that in calmer moments they were able to venture outside the town walls to cultivate their fields, it is clear from the correspondence of the town's Magistrate that many were destitute. Some attempted to stave off destitution by selling their livestock and personal possessions and by selling or mortgaging land. Nevertheless, a local chronicler described many of the refugees as chronically sick and without work, living in stables, "dirty places" or sleeping in the street, and dying of famine. As the cemeteries filled, the Magistrate resorted to burying the dead in mass graves. The alms provided by the town had been insufficient to sustain the refugees in the face of high food prices.

Strasbourg was another *ville de refuge*.¹²¹ The first influx was precipitated by the Protestant Ernest von Mansfeld's invasion of Alsace at the end of 1621. Some 9,812 adult refugees were enumerated by the city authorities in mid-January 1622 and there were children besides. Lammert states that a fifth of the refugees died in the next few months.¹²² According to some contemporary estimates, nearly 100,000 refugees had passed through the town. It was much worse later. In March 1636, the authorities estimated there were 30,000 in the city. This is an extraordinary number: not far short of the population of some of the major German cities of the era. While difficult to credit, the estimate at least serves to show that the city authorities felt overwhelmed by the influx. Famine took hold. The Magistrate ordered the expulsion of the refugees and forbade the export of grain. Forced into the countryside, the famine progressed, according to one chronicle, to the point of cannibalism.

Theibault's thoughtful and subtle account of the impact of the War in Hesse-Kassel gives an illuminating insight into the causes of flight.¹²³ Soldiers first arrived in Hesse-Kassel in 1623. They were serving in the Imperial forces under the command of Count Tilly. They were supplied with cash by the civil administration of the area and directly with cash, food and other goods by village authorities and the individual households on which the troops were billeted. These arrangements, although highly burdensome, were at first administered in a largely orderly way through a provisions ordinance negotiated between Tilly and the Landgrave of Hesse-Kassel. This does not mean there was no plundering; there was. But the plunder of this period appears to have been instrumental, clearly focused on the military requirements for food, fodder and other materiel, not wantonly destructive or motivated by a desire for booty and, although accompanied by dire threats, not associated with mortal violence. Villagers responded with passive acceptance on the ground while supplicating the Landgrave for relief. Nevertheless, by 1626 even Tilly acknowledged the "distress and poverty of the currently exhausted and worn down lands". In that year, the parish of Grandeborn, which had not seen more than 25 burials a year since the mortality

¹²¹ J-P Kintz, *La Société strasbourgeoise du milieu du XVI^e siècle à la fin de la guerre de trente ans 1560–1650: essai d'histoire démographique, économique et sociale*, Paris, Ophrys, [1984], pp. 110–11, 140–1.

¹²² Lammert, *op. cit.*, note 31 above, p. 57.

¹²³ Theibault, *op. cit.*, note 8 above, pp. 141–53.

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crisis of 1598, carried out 187. The previous orderliness of civil-military relations began to break down; in 1626 four civilians were killed by Tilly's soldiers, the first time this had been recorded. The civil administration was bankrupt and collapsed; the Landgrave abdicated. After 1626 "villagers began to resort to flight as their first response to news that troops were coming". Troops were frequently in the area and flight became constant. By the mid 1630s, but especially after the arrival of Croatian troops in 1637, the practices of plunder had undergone substantial changes for the worse. Regulation, however imperfect, under a negotiated provisions ordinance was superseded by wanton ransacking, arson and violence: "[b]eing caught by soldiers in the open was tantamount to a death sentence".

Once again, we see here the importance of the socio-economic relations of warfare. There were then, as later, sound military reasons for army commanders to maintain good relations with the local civilian population: civilians provided some services that would be performed adequately only by willing collaborators: labour, intelligence and guidance, the latter especially important in an age in which militarily adequate maps were very rare.¹²⁴ Stable, predictable, sustainable and peaceful tax and assessment procedures held out advantages for the military, as well as for civilians. Commanders therefore had reason to enforce a disciplined treatment of the civilian population by their troops. But peaceful methods of regulating civil-military relations broke down. In understanding this, the socio-economics of recruiting and maintaining an armed force in early modern Europe are crucial. The most interesting case to consider is the army of Gustavus Adolphus, not only because the Swedish phase of the War coincided with the peak of the mortality crises but also because Gustavus's intentions, as evidenced by his Articles of War, were to prevent the abuse of civilians at the hands of his troops. Yet, as early as March 1631, Gustavus's General Teuffel admitted that his troops were committing "unheard of excesses". Such incidents became the routine of the Swedish intervention.¹²⁵ They happened because Gustavus's ability to control and discipline his soldiers, as was the case with other commanders, was limited and undermined by the recruitment of mercenary regiments through promises, express or implied, of booty and plunder. Commanders could hardly discipline their troops for extracting their promised rewards. To do so would have been to court disaffection, mutiny and most importantly, desertion: the "more usual reaction of the troops to low pay or poor conditions".¹²⁶ The absence of significant bonds of kinship, language, nationality or, often, ethnicity between civilians and the soldiers in their midst also lessened the restraints on violent expropriation. These absent bonds were not only a consequence of the wide range of European powers involved in the War: Spain, Holland, Denmark, England, France and Sweden. Mercenary recruitment practices meant that even German armies contained significant numbers of foreigners. One Bavarian regiment

¹²⁴ Gutmann, *op. cit.*, note 13 above, pp. 39–41; M van Creveld, *Technology and war: from 2000 B.C. to the present*, New York, The Free Press, 1989, pp. 116–18.

¹²⁵ Roberts, *op. cit.*, note 87 above, vol. 2, pp. 243–5.

¹²⁶ Parker, *op. cit.*, note 21 above, p. 201.

for which details have survived included Italians, Poles, Slovenes, Croats, Hungarians, Greeks, Dalmatians, Lorrainers, Burgundians, French, Czechs, Spaniards, Scots and Irish.¹²⁷ The result was the emergence of socio-economic relations between civilians and military forces dominated by fears of violence and atrocity and to which the predominant civilian response was flight. Flight to crowded and insanitary places of refuge brought with it enhanced rates of transmission of plague, typhus, typhoid and dysenteric diseases.

The “Socio-Economic Relations of Warfare”

I have argued that the explanation of Germany’s demographic catastrophe during the Thirty Years’ War must be sought in the impact of the War on mortality, and have showed that plausible estimates of battle mortality were insufficient to explain any substantial part of the demographic loss. An analysis of contemporary records, as catalogued by Lammert, indicated that the leading cause of death in the civilian mortality crises of the War were plague and hunger, the leading causes of crisis mortality in peacetime as well as wartime early modern Europe. Germany suffered a number of poor harvests caused by meteorological not military factors during the 1618–48 period and mortality from plague ran at high levels in the northern Italian cities of the time. I reviewed simulation studies which suggested that substantial demographic losses could be explained as a consequence of a regime of such mortality but argued that a credible account of the demographic loss of the Thirty Years’ War must explain how the War intensified, multiplied and/or lengthened the usual mortality crises of early modern Europe.

I distinguished three models explaining the impact of warfare on civilian mortality, the “synergy” model in which undernutrition drives disease mortality, the “hunger” model in which undernutrition leads directly to excess mortality, and the “transmission” model in which the exposure of civilians to fatal infectious diseases increases. I argued that nutrition-infection synergies explain little of the excess mortality seen during the Thirty Years’ War, and that there was considerably more support for the “hunger” and “transmission” models. Both these models required an understanding of the socio-economic relations of warfare if they were to explain the excess mortality observed in the War. The primary socio-economic relation between civilians and military forces was in principle an economic one: military resources had to be obtained from civilian owners and producers. The character of this relationship was influenced by the ability of military commanders and socio-political elites to negotiate relations that permitted the military to obtain supplies and civilian producers to sustain their safety, livelihoods and health. Military commanders were handicapped by their frequent inability to control the mercenary troops under their command. The resulting collapse of orderly, regulated, instrumental supply procedures and their supersession by disorderly, unregulated and wanton plunder introduced widespread

¹²⁷ F Redlich, *The German military enterpriser and his work force*, 2 vols, Wiesbaden, F Steiner, 1964–65, vol. 1, p. 456, cited by G Parker, ‘The

universal soldier’, in Parker, op. cit., note 5 above, pp. 171–86, on p. 172.

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violence into civil-military relations. The “universal soldiers” of the War were rarely inhibited in their relations with civilians by ties of kinship, ethnicity or nationality. Civilians, fearful of violence and atrocity at the hands of troops, sometimes responded to violence in kind but often reacted by fleeing to places of refuge. It is the wanton destruction of the peasants’ means of livelihood and their frequent flight from their fields that explain how the 15 million people of Germany were unable to support armies of perhaps 210,000 (less than 2 per cent of their number) without repeated episodes of starvation. It is the flight from violence and atrocity and the conditions they endured in their places of refuge that explain the exceptionally high mortality from epidemic disease.

Recent research on mortality within historical demography has moved away from the brute biological factors of hunger and disease to the beliefs and the actions, both public and private, of the people subjected to nutritional and microbiological threats to their well-being. Of hunger in the early modern period, John Walter and Roger Schofield have suggested that “in so far as mortality was related to famine, the critical link was not a biological one through nutritional status, but rather a social structural one which determined how the impact of food shortage would be distributed between individuals and the range of actions, including migration, that they might take in response”.¹²⁸ Specialists in nineteenth-century mortality, while continuing to controvert the importance of nutrition and nutrition-infection synergies, have emphasized public action in public health and housing, and changes, possibly accelerated by public interventions, in social values, and in domestic hygiene and health behaviours.¹²⁹ Specialists in twentieth-century famine mortality and the impact of “complex political emergencies” on civilian lives and livelihoods have been impressed by Alexander de Waal’s analysis of the Darfur, Sudan, famine of 1984–5 in which not starvation but social and economic dislocation producing an increased exposure to disease was found to underlie the excess mortality.¹³⁰ My analysis, by bringing to the fore the socio-economic relations of warfare, is consonant with the current concern to elucidate the social determinants of mortality.

Of these streams of research, de Waal’s is most closely related to the topic considered here. While his 1989 book is increasingly cited by demographic historians,¹³¹ it is his less well-known 1990 paper that attempts a general model

¹²⁸ Walter and Schofield, *op. cit.*, note 68 above, pp. 53–4.

¹²⁹ S Guha, ‘The importance of social intervention in England’s mortality decline: the evidence reviewed’, *Soc. Hist. Med.*, 1994, 7: 89–113; S Szreter, ‘The importance of social intervention in Britain’s mortality decline c. 1850–1914: a re-interpretation of the role of public health’, *Soc. Hist. Med.*, 1988, 1: 5–37; R I Woods, P A Watterson and J H Woodward, ‘The causes of rapid infant mortality decline in England and Wales, 1861–1921 Part I’, *Popul. Stud.*, 1988, 42: 343–66; D C Ewbank and S H Preston, ‘Personal health behaviour and the decline in infant and child mortality: the United

States, 1900–1930’, in J Caldwell, S Findley, P Caldwell, G Santow, W Cosford, J Braid and D Broers-Freeman (eds), *What we know about health transition: the cultural, social and behavioural determinants of health*, Health Transition Series 2, 2 vols, Canberra, Health Transition Centre, Australian National University, 1990, vol. 1, pp. 116–49; E van de Walle and F van de Walle, ‘The private and the public child’, in *ibid.*, pp. 150–64; Hardy, *Epidemic streets*, note 75 above.

¹³⁰ A de Waal, *Famine that kills: Darfur, Sudan, 1984–1985*, Oxford, Clarendon Press, 1989.

¹³¹ For example, Hardy, *Epidemic streets*, note 75 above, p. 282.

of famine mortality.¹³² The model has two variants, applicable to times of peace and to times of war. In the peacetime version, famine precipitates “social disruption” and distress migration producing a “health crisis” and excess mortality from fatal epidemic diseases. In the wartime model, however, the violence limits people’s ability to cope with food shortages and this leads not to the “impoverishment” seen in peace but to “destitution”. Destitution brings death to some from frank starvation. Instead of the “social disruption” seen in peacetime famines, “social collapse” ensues, but, although there is a change in terminology, the “social collapse” of wartime famine brings about a health crisis and excess mortality due to disease, as before.¹³³ Death from frank starvation therefore occurs only in famines attended by war.¹³⁴

While de Waal’s model is consistent with the experience of the Thirty Years’ War, it fails to explain why some wars are attended by starvation and not others and, more generally, why the demographic impact of warfare shows the marked variations evident in the historical and modern record. De Waal’s account as well as the existing historiography therefore, fail to explain what was “special” about the Thirty Years’ War. The explanations of the military mortality crises of the period given by general and demographic historians are all general explanations of the demographic impact of warfare in early modern Europe. Flinn’s account is explicitly applied to the whole of early modern Europe; other historians, once they move away from the myriad specificities of their local studies, are no different in the broad contours of the accounts they offer. This leaves us unable to explain why the Thirty Years’ War produced such an awesome demographic catastrophe when other wars of the period did not. The outstanding counter-example is provided by the Civil Wars in England. The estimated demographic impact of which was approximately nil.¹³⁵

¹³² A de Waal, ‘A reassessment of entitlement theory in the light of recent famines in Africa’, *Develop. Change*, 1990, 21: 469–90.

¹³³ *Ibid.*, pp. 486–8.

¹³⁴ My brief review of those few famines for which reasonably reliable cause of death data are available shows that this empirical generalization has no obvious exceptions. For the Soviet famine of the early 1920s, a study of Saratov Gubernia found that 10 per cent of the excess mortality in 1921 and 16 per cent in 1922 was recorded as due to “starvation and scurvy” (Russian Civil War) (S G Wheatcroft, ‘Famine and epidemic crises in Russia, 1918–22’, *Ann. Demogr. Hist. (Fr.)*, 1983, 19: 329–52); studies of famines in Athens in 1942, the Warsaw Ghetto and the western Netherlands in 1945 found that “hunger”, “frank starvation” or “malnutrition” were the causes of death in a significant proportion of cases (Second World War) (V G Valaoras, ‘Some effects of famine on the population of Greece’, *Milbank meml. Fund q. Bull.*, 1946, 24: 215–34, p. 222; A van der Lem, ‘Food entitlements and coping strategies in the Warsaw Ghetto famine’, BA Dissertation,

University of Leeds, 1995; [Government of the Netherlands], *Malnutrition and starvation in western Netherlands: September 1944–July 1945*, 2 vols., The Hague, General State Printing Office, 1948, vol. 1, p. 25). A study of Kampuchean refugees encamped on the Thai-Cambodia border in 1979 found that “malnutrition” accounted for 21 per cent of the deaths recorded in the first fortnight of the camp’s operations (Khmer Rouge insurgency) (J Adler *et al.*, ‘Medical mission to a refugee camp in Thailand’, *Disasters*, 1981, 5: 23–31). A study conducted during the 1980 famine in Karamoja district, Uganda, gave “starvation” as the cause of death in 78 per cent of cases (civil unrest following the Tanzanian invasion of Uganda) (R J Beillick, and P L Henderson, ‘Mortality, nutritional status and diet during the famine in Karamoja, Uganda’, *Lancet*, 1980, ii: 1330–3).

¹³⁵ Wrigley and Schofield, *op. cit.*, note 46 above, table A3.3, estimate a population increase in England of 3.5 per cent over the 1639–51 Civil War period as a whole. Population falls of 17,000 and 8,000 are estimated for 1643–44 and 1649–50,

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My study of those wars in comparison with the Thirty Years' War suggests that while the shorter duration of the wars in England and the greater prosperity of the English economy played a role in reducing the demographic impact of the English Civil Wars, what I have termed the socio-economic relations of warfare were paramount.¹³⁶ I argue there that the limited level of atrocity in England, the presence of enduring social bonds, the absence of hostile "inter-ethnic" relationships and of mercenaries, reduced the level of abuse and atrocity suffered by civilians, resulting in levels of distress migration which were low in comparison with those seen in Germany. This, in turn, limited the rate of transmission of epidemic disease and kept the number of local mortality crises low. Mortality from frank starvation was practically absent: the last famine in England appears to have been in 1623, with the dearth of 1647–9 failing to produce a mortality crisis of significant scale even in the localities most severely affected.¹³⁷

Outside the confines of early modern Europe one sees additional determinants of the socio-economic relations of warfare; specifically, the importance of the objectives and the structure of the warring parties becomes apparent. That genocidally motivated wars have dire impacts on civilian mortality needs no emphasis. Less obviously, wars motivated or prolonged by economic predation, as in Sudan since 1983, lead to specific forms of socio-economic relationship between military forces and the civilian population under its control typically leading to substantially diminished civilian life chances.¹³⁸ Warlordism, defined by the military and economic competition of a number of independent armed forces, as seen classically in China between 1916 and 1928 and more recently in Somalia from 1991 and in Liberia, West Africa, after about 1993, again leads to specific forms of civil-military relationships with clear and highly adverse consequences for civilian life chances.¹³⁹

It thus appears that the new approach to understanding the historical and modern development of mortality in which social structures, social and personal behaviour, public and private action form an essential part of any explanation pretending to sufficiency and completeness is no less essential in the study of military mortality crises. In particular, the "socio-economic relations of warfare", the matrix of civil-military transactions, structured by the nature of the war, the objectives of the

respectively. Wrigley and Schofield, *ibid.*, pp. 31–2, warn that defective registration during the Civil War renders estimates for these years relatively imprecise.

¹³⁶ Q Outram, 'The demographic impact of early modern warfare', *Soc. Sci. Hist.*, forthcoming.

¹³⁷ A B Appleby, *Famine in Tudor and Stuart England*, Liverpool University Press, 1978, pp. 126, 147–56. These conclusions are endorsed by Walter and Schofield, *op. cit.*, note 68 above, p. 34.

¹³⁸ M Duffield, 'The political economy of internal war: asset transfer, complex emergencies

and international aid', in J Macrae and A Zwi (eds), *War and hunger: rethinking international responses to complex emergencies*, London, Zed Books in association with Save the Children Fund (UK), 1994, pp. 50–69; D Keen, *The benefits of famine: a political economy of famine and relief in Southwestern Sudan, 1983–1989*, Princeton University Press, 1994.

¹³⁹ D Lary, 'Warlord studies', *Mod. China*, 1980, 6: 439–70; Q Outram, "'It's terminal either way": an analysis of armed conflict in Liberia, 1989–1996', *Rev. Afr. Polit. Econ.*, 1997, 73: 355–71.

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warring parties, civil and military law, regulation, custom and practice, informed by ideologies of ethnic, religious or national antagonism or affinity, are crucial to an understanding of how the brute biological facts of disease and nutrition affect a civilian population in the midst of war.