SEASONS OF DEATH: ASPECTS OF MORTALITY IN IMPERIAL ROME*

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nec mala me ambitio perdit nec plumbeus Auster
autumnusque gravis, Libitinae quaestus acerbae.

Within the last decade significant advances have been made towards a better understanding of the fundamental demographic regimes that characterized the Mediterranean world of Graeco-Roman Antiquity.[1] Coincident with this improvement in our knowledge has come a renewed interest in the rituals and cultural practices associated with death and burial in the societies that were part of the Roman Empire.[2] These divergent interests are reflected in two distinct approaches to the analysis of death in Roman society. The cultural method, which finds significance in reading the quality of a given death and burial, has tended to concentrate on eliciting connections between the archaeological remains of burial, the ritualistic celebration of death, and the social values of the living. The other approach to the phenomenon of death is more directly concerned with the crude biological facts of life and death: the historical demography of human mortality that has emphasized the analysis of quantitative data. In almost any consideration of death, however, the two approaches are pragmatically inseparable. This interdependence of the evaluative and quantitative aspects of death is apparent from the fact that it was a dramatic shift in cultural values that produced the consciousness and the recording of the temporal 'quantity' that made the writing of this study possible. What I propose to do is to track the seasonal variations of mortality in Roman society. Pronounced seasonal fluctuations in the demographics of any given human population are one of the most fundamental and enduring aspects of its characteristic profile. This applies not only to crudely biological processes such as birth and death, but also to practices, like marriage, that are apparently culturally driven. These annual oscillations rarely alter very much over the long term; they are one of the 'deep structures' that identify the main environmental and cultural factors that form a given population. As such, they mirror the interplay between the bare biological forces and the human decisions that give any population its peculiar shape. The delineation of a central diagnostic feature of a given population, in this case that of a vanished population of one and a half millennia ago, is something that will enable us better to understand its basic demographic structure.

Defined as a peculiar social and historical phenomenon, the Roman Empire was a world of cities, of which the largest and most important was the imperial metropolis itself. Apart from the problems of the disposal of bodies implied by the sheer size of its population, there were changing cultural significances attached to the dead that affected modes and means of burial. Although these symbolic interpretations of death have been recognized as facts of considerable historical significance, the study of them is only just beginning to be undertaken for the Christians of the City of Rome.[3] These cultural

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[1] T. G. Parkin, *Demography and Roman Society* (1992), offers both a good résumé and a critique of the existing studies. For a specific high-quality study that incorporates current conceptions and methods, see R. Bagnall and B. Frier, *The Demography of Roman Egypt* (1994).

[2] I. Morris, *Death-Ritual and Social Structure in Classical Antiquity* (1992).

[3] J. Bodel, *Graveyards and Groves: A Study of the Lex Lucerina* = *AJAH* 11 (1986 [1994]), now offers a standard point of departure; see also K. Hopkins, in collaboration with M. Letts, 'Death in Rome', ch. 4 in *Death and Renewal: Sociological Studies in Roman History* 2 (1983), 201–56.

aspects of death have basic biological constraints. But for all the towns and cities of the Roman Empire, including Rome itself, very little can be ascertained within tolerable limits about the principal variables in their population structure.[4] The determination of general quantities, such as that of total population figures for any given town or city, remains a difficult task that has provoked continual, and usually unresolved, debate. Finer demographic perspectives seem to be beyond possible reach. The principal problem is that the determination of more detailed demographic facts requires data in significant quantities, but mere bulk is often not sufficient, since the data must also be of the specific quality or type needed to resolve a question of demography. Fortunately, the Christian burials of the City of Rome are particularly rich in the aspect of quantity that is necessary for the inquiry that I propose to pursue here: to establish the seasonal variations in the annual cycles of mortality for populations in the Western Roman Empire. I shall attempt to do this first for the urban metropolis of Rome, where the requisite data are most prolific. I shall then proceed to apply the same sort of analysis to the larger geographic region of the Italian peninsula outside Rome, and to three selected provincial regions of the Western Empire.

The mass burials of Christians in the City of Rome are of particular use to the historical demographer precisely because they are so numerous. The extent of this evidence is probably easiest to measure, and illustrate, for the first major phase of Christian burial in the city. In the period extending approximately to the mid-fourth century, the Christian deceased were buried in the so-called catacombs — a disparate network of well over sixty different burial grounds constituted by underground tunnels and chambers radiating outwards from the periphery of the city. It has been estimated that these subterranean corridors extend for a combined length of about a thousand kilometres beneath the surface of the suburban regions of Rome. The tunnels of the single largest complex, the catacombs of Domitilla, extend for more than fifteen kilometres underground.[5] The known catacombs may well have provided burial places for up to six million persons.[6] Though underground, the catacombs were still located outside the city walls of Rome. Early Christians and, later, the Christian emperors in their imperial constitutions carefully observed 'pagan' injunctions against burial within the city itself. In the catacombs themselves, burial places (*loci/loculi*) consisted of individual longitudinal box-shaped burial chambers hollowed into the walls (*pila*) of the underground corridors. Usually, these were rectangular spaces about six feet long, two feet wide, and a foot to a foot-and-a-half in height. Depth and size could be increased in order to accommodate more bodies, in which case the place was designated a two-body chamber (*bisomus*) or, more rarely, a three- or a four-body place (*trisomus*, *quadrisomus*).[7]

Following the Constantinian recognition of the Church, there was a gradual but constant shift from these forms of subterranean burial to the use of open-air cemeteries (*areae*) located at ground level. The numbers of burials in the *areae* must have been on a scale similar to the burials in the catacombs, but the quantities are not as easily measured. It has been estimated that between about A.D. 340 and 360 a third of all burials were in above-ground cemeteries, and that such burials became an even proportion of all burials in the decade ending in the 360s. In the decades after 370 until the 'sack' of Rome in 410, the proportion of above-ground burials rose to a level of more than two-thirds of the total.[8] In the *areae* or above-ground cemeteries, the deceased were buried in simple trenches (*formae*) excavated in the soil or tufa, and were

[4] G. R. Storey, *Preindustrial Urban Demography: the Ancient Roman Evidence* (2 vols), PhD thesis, The Pennsylvania State University (1992), recapitulates the earlier arguments, evidence, and bibliography.

[5] P. Pergola, 'Le catacombe romane: miti e realtà (a proposito del cimitero di Domitilla)', ch. 7 in A. Giardina (ed.), *Società romana e impero tardoantico, 2: Roma: politica, economia, paesaggio urbano* (1986), 333–50, 489–90, at 337.

[6] N. Müller, 'Koimeterien, die altchristlichen Begräbnisstätten', *Realencyclopädie für protestantische Theologie und Kirche*[3] 10 (1901), 794–877, at § 5, based on the estimates of de Rossi and Marchi — estimates as low as about 500 kilometres have been proffered by some, but seem to be based on older and incomplete evidence.

[7] See the description in E. Josi, 'Cimiteri Cristiani Antichi', *Enciclopedia Cattolica* 3 (1950), 1617–37, at 1626.

[8] Müller, op. cit. (n. 6), § 4.3; and H. Leclercq, 'Catacombes', *DACL* 2.2 (1910), 2432–5, noting that de Rossi places the final abandonment of the catacombs in the mid-fifth century.

sometimes stacked one above the other in step-like fashion with stone plaques or marble benches separating the various levels. In the case of these layered burials one spoke of a 'two-stepper' (*biscandens*) or a 'three-stepper' (*triscandens*) — or even one meant to contain many bodies (*poliandron*).[9] Concomitant with the legal recognition of the Church and the physical change in the location of burials, there was a corresponding power struggle for control of the burial grounds themselves. The control of burial grounds seems originally to have resided with the six deacons who were in charge of the six ecclesiastical 'regions' of the city (districts formed by pairing the twelve Augustan *regiones* within the city walls). In the open-air cemeteries, however, the power to assign burial plots (usually by sale) increasingly fell into the control of corporations of grave-diggers (*fossores*).[10]

Although both forms of individual burial, whether in the subterranean niches of the catacombs or in the above-ground trenches of the *areae*, were used by persons far down the social order, they still did not encompass deceased persons from the lowest orders of society. Nor did they cope with the sudden need to bury large numbers of corpses *en masse*. There still remained mass burials of anonymous dead, such as the series of pits (*pozzi*) found in the cemetery of Commodilla, where each pit could contain at least fifty corpses.[11] Such collective burials were probably the final resting-places of large numbers of persons who perished in the periodic onslaughts of epidemic disease that struck the city. For the purposes of our analysis, however, such incidents of mortality are not measurable, since the mass burials remained resolutely anonymous in nature. The deceased were not provided with individual burial places closed with an appropriately inscribed funerary plaque. The analysis of death that follows is, therefore, probably limited to periods of normal or 'non-crisis' mortality in the city.

It has long been recognized that the detailed information provided by the Christian epigraphy of the city presents us with unusual opportunities for demographic inquiry.[12] The particular usefulness of Christian inscriptions for the present study is determined not just by their sheer bulk, but also by the fact that they provide specific types of information not found on other tombstone memorials. These peculiar data are produced because of a special concern of the Christians — an interest deeply embedded in their ideology and self-perception that separated them as a group from the previous non-Christian populations of the city. This new perspective was reflected in a dramatic change in the Christian evaluation of quotidian existence. Part of the new ideology is reflected in the very name of their place of burial, *coemeterium*: derived from the Greek κοιμητήριον or κυμητήριον, it meant 'a place of sleep'.[13] This image of life-after-death was one shared with some 'pagan' beliefs and, perhaps, more directly with certain Jewish conceptions. But Christians went much further in developing a clear and concrete vision of an actual life-in-the-body to be lived in a vital after-life. For Christians, this strongly embodied sense of a life-after-death became a pervasive and

[9] Josi, op. cit. (n. 7), 1621.

[10] J. Guyon, 'La vente des tombes à travers l'épigraphie de la Rome chrétienne (III^{e}–VII^{e} siècles): le rôle des *fossores*, *mansionarii*, *praepositii* et prêtres', *MEFRA* 86 (1974), 549–96; for the practices in the Jewish catacombs see H. J. Leon, 'The Sepulchral Formulas and Epithets', ch. 6 in *The Jews of Ancient Rome* (1960), 122–34, with important criticisms and corrections by M. H. Williams, 'The organisation of Jewish burials in ancient Rome in the light of evidence from Palestine and the Diaspora', *ZPE* 101 (1994), 165–82 ('a plurality of consortia, each offering a range of facilities, from unmarked *loculi* at one end of the scale to spacious, *arcosolia*-filled *cubicula* at the other').

[11] Josi, op. cit. (n. 7), 1626, guessing at 'una epidemia' — perhaps, but not necessarily: see Hopkins and Bodel above on mass burials at Rome in the pre-Christian period.

[12] H. Nordberg, *Biometrical Notes: The Information on Ancient Christian Inscriptions from Rome concerning the Duration of Life and the Dates of Birth and Death*, Acta Instituti Romani Finlandiae II.2 (1963), who cumulated evidence from *IC* 1–2; *ICUR* 1–3; and *SICV*; see, more recently, A. Ferrua, 'Saggio biometrico sulle iscrizioni cristiane della Nomentana e della Salaria', *RAC* 64 (1988), 43–63. Since my study was submitted for publication, W. Scheidel, 'Libitina's bitter gains: seasonal mortality and endemic disease in the ancient City of Rome', *Anc. Soc.* 25 (1994), 151–75, appeared. This study, which highlights the evidence for what Scheidel regards as the main disease vector that caused the high autumnal mortality in the City of Rome (malaria), is based on the figures in Nordberg, with additional samples drawn from *IC* and *ICUR*, vols 3–5.

[13] E. Rebillard, 'Κοιμητήριον et *coemeterium*: tombe, tombe sainte, nécropole', *MEFRA* 105 (1993), 975–1001, has demonstrated how the term never had the significance of graveyard or 'necropolis' (itself a term not commonly attested in Antiquity) but rather that of individual grave and, by extension, *the* grave — i.e., that of a martyr — or the sacred edifices adjacent to the burial place of a martyr.

deeply rooted belief that was distinctively theirs, and which provoked a rather sharply divided evaluation of two periods of life. The temporal life of the present came to be looked upon as something akin to death. It was subject to corruption and decay. It was transitory. By contrast, life on the other side of death was eternal, pure, and perfect. Biological birth into the temporary existence of the flesh was therefore likened to a form of dying, whereas one's biological death was now considered to be one's real birth — the birthday on which one was born (again) into a true life. What was a rather sombre and sad occasion for non-Christians came to be placed in a more hopeful mental and behavioural framework.

The anniversary of one's biological birthday had been celebrated by 'pagans' with great festivity. The Christians reversed this perspective. They tended to denigrate, devalue, and even ignore secular birthday celebrations; now it was the precise time of one's death that became the centre of a new sense of celebration. The point of transition from the deathly pall of this existence to the eternal reward of perfect life was the time that was important and deserving of memory. Christians, therefore, placed particular emphasis on the precise date when a person died. Christian rhetoric was marked by an ironic reversal (typical of many rebellious ideologies) which asserted that death was actually the point of birth into life. Hence Christians frequently refer to the day of one's death as the day of one's birth (*natus*) or birthday (*dies natalis*).[14] The actual number of years one had traversed in this life — a shadowy and evil thing configured by sin and by demonic forces that had systematically to be exorcized at baptism — was of less concern. The first transition in this time towards one's new life was marked by the liminal ritual of baptism. It was then that one began the process of being born again. Hence the frequent identification of a Christian in our inscriptions as either a *neophytus* or a *neophyta* — a person who was a 'new growth'.[15] What was much more worth remarking upon and recording on one's burial-marker, therefore, was the temporal point of the transition into one's genuine life, a reality that required no measurement since it would be eternal.[16] The place of burial became significant for this reason. It was a temporary place of repose, or sleep, where the true relatives, the 'brothers' and 'sisters' of the deceased's Christian family, would come once a year to celebrate his or her birthday. As Tertullian phrased it, 'on the anniversary of their death we make ritual offerings to the dead in celebration of their birth' ('oblationes pro defunctis pro nataliciis annua die facimus').[17]

Unlike non-Christians who were, if anything, wont to record the quantitative extent of one's life in this world (in so many years, months, days and even, sometimes, hours), Christians were more concerned to mark the exact time of death. Usually they noted the day of the month, but sometimes precision even to the hour of decease was carefully recorded. It is not that Christians abstained from declaring the length of one's secular lifetime (that practice persisted); rather it is the addition of this new fact, specifying the time-of-death, that makes the Christian epigraphy of the city of Rome so interesting, and useful, for our purposes.[18] This general concern with 'time when' is surely part of the general exactness in computation of time which includes the fact that the Christians of Rome were more exact in recording ages-at-death in their funerary epitaphs than were the preceding non-Christians.[19]

[14] Consider: 'natus in pace': *ICUR* 9046 (for death); 'natus': 9060 (death); 'natale suo': 9228 (day of death); 'quo et natus est cuius anima cum sanctus in pace': 15634; 'natus in pace': 24060 (day of death); 'qui natus': 24180 (death).

[15] J. Janssens, *Vita e morte del cristiano negli epitaffi di Roma anteriori al sec. VII* (1981), 1.1.5, 'I neofiti', 26–32, notes how often Christians took care to emphasize the ritual of baptism, even when performed shortly before death itself.

[16] On the new ideology see A. C. Rush, *Death and Burial in Christian Antiquity*, The Catholic University of America Studies in Christian Antiquity 1 (1941), esp. pt. 1, ch. 3, 'Death as Birth. The Day of Death as *Dies Natalis*', 72–87. See also A. Stuiber, 'Geburtstag', *RAC* 9 (1976), 217–43, esp. 220–33, on the ways in which Roman practices were redefined and designated by Christians in connection with the absolute value that they placed on life-after-death, especially as exemplified by the deaths of the martyrs.

[17] Tertullian, *De Corona* 3; cf. *De Exhortatione Castitatis* 11; and *De Monogamia* 10.

[18] Not that they did not care to know how long a person lived or to record that number if possible; otherwise the plaintiff cry of 'que quod vixit annis nescio quando' of *ICUR* 24564 would make no sense.

[19] Nordberg, op. cit. (n. 12), 35, and his table 5.

The peculiar significance of time in the context of death also might shed light on another aspect of Christian funerary epigraphy which has so far gone unexplained. Unlike the preceding 'pagan' funerary epitaphs, Christian funerary inscriptions frequently add a proviso to the duration of the person's life, noting that the person had lived so many years 'more or less' (*plus minus*; μικρῷ πλείῳ or πλέον ἔλαττον in Greek).[20] Whatever explanation is proffered for the practice, it must address two problems. First, the behaviour is peculiarly Christian. The qualification 'more or less' does not appear in pre-Christian funerary epigraphy. It appears only in post-Constantinian Christian funerary epigraphy, becoming common in the course of the fourth century. Second, the explanation must also deal with the fact that the use of the phrase 'more or less' has no particular connection with degrees of ignorance concerning the deceased's age-at-death. Whereas it is true that the qualification appears with 'rounded' ages-at-death (ages ending in fives or tens), the critical objection is that the phrase is also normally found attached to ages at death given to the precise year and month, or even with ages that are specified to the very hour of death. I would suggest, therefore, that the practice is yet another aspect of the significantly altered Christian attitude to death in which it was necessary to fix the quantities of time involved when the person passed from one life to the other. Whereas it was quite easy to be very specific about the 'time when' (the year, month, and day) the person died, in many cases there must have been greater uncertainty about the precise age of the deceased. Hence the recourse to a piece of operative legalese: the person who died was 'x' years old (months, days, or even hours) — the caveat 'more or less' being added to cover any area of doubt.

There are, however, occasional double-notices found on the tombstone epitaphs concerning time and death that might cause problems for our proposed use of them to determine demographic facts. When two entries are found concerning time and death, it is usually to distinguish between the precise date-of-death as opposed to the later date-of-burial. Whereas it is true that some inscriptions make the distinction between the exact day of death and the later day when the person was buried (the *depositus*), the noting of a single date on almost all stones clearly works on the assumption that they were the same. Moreover, in almost all cases where a distinction is noted, the time lapse between death and burial does not usually exceed one or two days. The simple numbers justify the conclusion that it seems 'probable that the day of death and the day of deposition usually coincided'. Only if there was a significant difference between the two was the number of days between death and burial noted.[21] This conclusion agrees with an investigation of the precise days of the week on which burials took place. These turn out to be rather evenly distributed through every available day in the week; the consistent patterns underwrite the obvious conclusion that 'the climate made a speedy deposition necessary'.[22] Since the analysis in this paper only concerns *monthly* variations in mortality, however, the difference of a day or two on some of the funerary inscriptions will not affect the statistical analysis.

The careful annotation of the precise point in time when one passed to a new life was a practice that stemmed directly out of a new Christian ideology of death. Thus in every regional and local collection of Latin funerary inscriptions, the transition from one sort of enumeration (duration of life only) to the addition of this particular one (time of decease) marks the watershed between Christian and non-Christian epigraphy. An equally significant observation is that the new practice does not seem to have contemporary Jewish parallels, or indeed to have been influenced by Jewish practices. The main tenets in the 'life beyond death' ideology in Christianity did have origins in various strands in late Hellenistic 'Judaism'. On the form in which such sentiments are expressed in Christian burial practices and rituals recorded for this investigation, however, it is striking that there is no evocation of this new sense of time in the

[20] F. Grossi Gondi, *Trattato di epigrafia cristiana latina e greca del mondo romano occidentale* (1920; reprint 1968), 96–7, who rightly rejected the explanations of Le Blant.

[21] Nordberg, op. cit. (n. 12), 52–3 already saw this (N = 14, where only two were in excess: three and four days difference respectively). In our sample, where the number of cases rose to N = 27, there were four cases of four-day delays, three of three-days, and the rest were only one- or two-day delays between death and burial.

[22] Nordberg, op. cit. (n. 12), 61.

contemporary Jewish funerary epigraphy, whether from the City of Rome or from the provincial communities of the Western Empire.[23] Jewish funerary inscriptions in the Western Empire are not oriented towards some new embodied life to come, but rather to the one just lived, and so express (in addition to the amount of time that has been lived) sentiments such as that the person lived a 'blameless' life (*ammonos*) or that they had lived well or had lived a 'good life' (*kalôs biôsas/biôsasa*). The hope is expressed that they might sleep in peace (*en eirêne hê koimêsis autou*) or that they might sleep 'with the just' (*meta tôn dikaiôn*).[24] It may well be that if one could have had a more detailed explication of the Jewish conceptions of the afterlife in the texts on their funerary stones, there would be a stronger overlap with Christian conceptions — as, for example, in the famous epitaph of the woman named Regina from the City of Rome. The problem is that it seems unclear whether or not Regina was Jewish — the singular phrase concerning her *observantia legis* reflects a virtue to which even a Christian of the time might give assent.[25] The most that can be said is that we might be witnessing a complex background of shared perceptions, but that in the case of the Christians this attitude to the moral balance between life and life-after-death was in the final instance different in kind, and that this critical difference is made explicit in the transcendent dimensions of their epitaphs.

The final observation that is significant for our analysis is that a very large number of Christian grave-markers record the precise time of death of the deceased. The existence of these data in bulk permits us to do something rather unusual, if not unique, for a human population of this degree of antiquity: to establish graphically a 'seasonal curve' for the variability in the cycles of mortality for a large urban centre in the Roman world.

I. THE DATA

The contextual history of the Christian epigraphy of Rome is relatively well known.[26] The sample used for the analysis that follows is drawn from the data recorded in the ten volumes of the Christian inscriptions from the City of Rome, the *Inscriptiones Christianae Urbis Romae*, published between 1922 and 1992, from the three precursor volumes of this same series (1857–1915), and from supplementary data on new inscriptions from the City of Rome reported in the *Rivista di Archeologia Cristiana* and in other epigraphical publications.[27] The approximately 35,000 inscriptions collated in these corpora from the Christian burial places around the City of Rome have been recorded and analysed for the purpose of determining the annual cadence of death. Only a portion (N = 3,943) of all these inscriptions were either sufficiently detailed or have

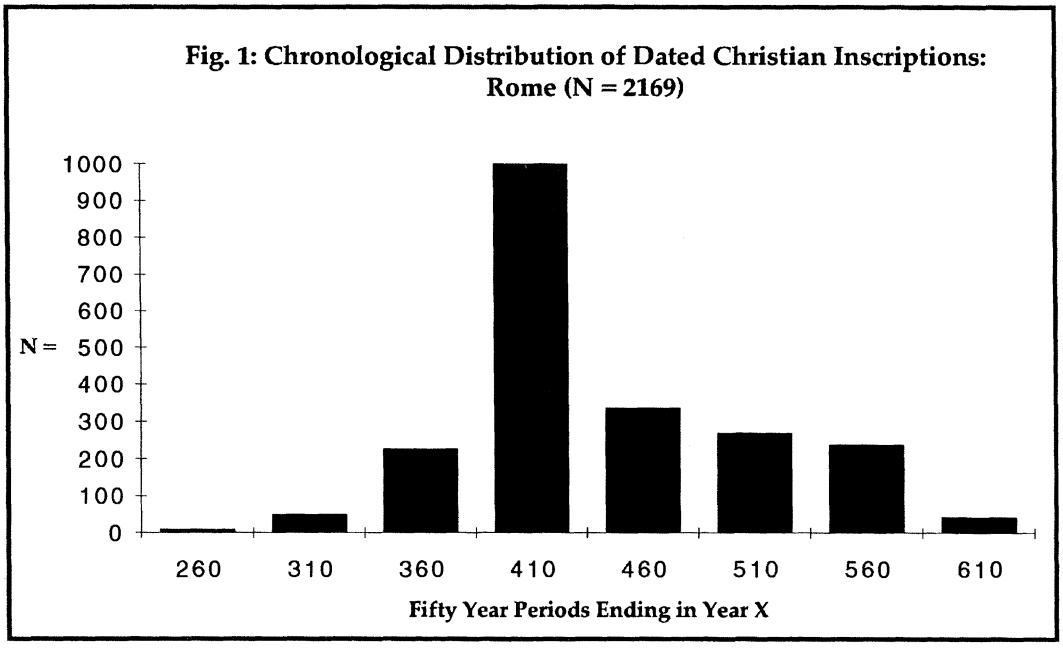
[23] J. B. Frey, *Corpus of Jewish Inscriptions: Jewish Inscriptions from the Third Century B.C. to the Seventh Century A.D.: Europe* (1936; reprint 1975). There are a few exceptions to this rule, but they are few indeed (e.g. Nos 68, 242, 268, 271, 457, 476, 482, and 527 in Frey's collection — of which most seem to me to be dubious or even probably non-Jewish, despite being included in Frey).

[24] H. J. Leon, 'The Sepulchral Formulas and Epithets', ch. 6 in *The Jews of Ancient Rome* (1960), 122–34.

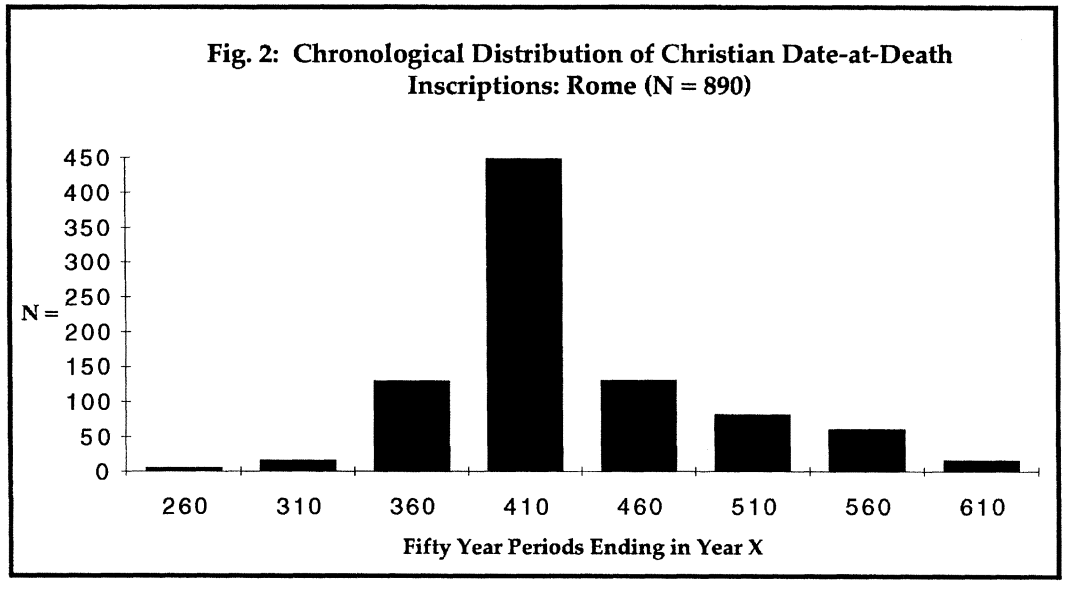
[25] Frey, op. cit. (n. 23), No. 476 = *ILCV* 4933; cf. Leon, op. cit. (n. 24), 248 f.; the rest of the sentiments in the inscription: 'rursum victura, reditura ad lumina rursum', that 'hoc tibi praestiterit pietas, hoc vita pudica', etc., are not necessarily specifically Jewish.

[26] P. Testini, *Archeologia cristiana*[2] (1980); C. Carletti, *Iscrizioni cristiane di Roma: testimonianze di vita cristiana, secoli III–VIII* (1986); and his 'Epigrafia cristiana, epigrafia dei cristiani: alle origini della terza età dell'epigrafia', in A. Donati (ed.), *La terza età dell'epigrafia* (1988), 115–36. C. R. Galvao-Sabrinho, 'Funerary epigraphy and the spread of Christianity in the West', *Athenaeum* 83 (1995), 431–66, argues that the Christian revival of the 'epigraphic habit' was provoked by new concerns with 'self identity' that were centred on the problems of the body, resurrection, and on new senses of time and place.

[27] See Table 1 ('Primary Sources'). The re-edition of the Christian epigraphy of the City of Rome begun by de Rossi, Silvagni, and Ferrua, was meant to supercede and replace the earlier project begun by de Rossi himself, of which the first two volumes and a supplement were produced (1857–1915). In collating the inscriptions, one had to be careful to eliminate possible repetitions from one corpus to another. To avoid these, care was taken to use the standard cross-reference guides: J. Moreau and H. I. Marrou, '*Concordantiarum Tabulae*', in *ILCV* vol. 4: *Supplementum* (1967), 63–165; A. Ferrua and D. Feissel, 'C. Wessel et *ICVR* Concordati', *RAC* 67 (1991), 37–68; K. A. Worp, 'Konkordanzen zu C. Wessel, *Inscriptiones Graecae Christianae Veteres Occidentis*', *ZPE* 87 (1991), 275–90.



Data source: Table 1 primary sources: Rome: all dated inscriptions.



Data source: Table 1: primary sources: Rome: all dated date-at-death inscriptions.

survived in a sufficiently readable form to provide the data useful for our study. It must further be noted that only a proportion of all of these inscriptions are dated (N = 890; about 23 per cent of the total) — but the sample is sufficiently representative of the whole. The temporal rhythm of production of the inscriptions that contain this specific date-of-death information must then be measured against the general chronology of all dated Christian inscriptions from the City of Rome (Figs 1 and 2). The result of the comparison reveals that the chronological distribution of the inscriptions in our sample is the same as the general chronological distribution of the whole set of Christian inscriptions from Rome. Most of the date-of-death inscriptions are dated to the fourth

century, with a massive concentration in the half century before the first 'sack' of the city in A.D. 410. Well over half of all the dated inscriptions are concentrated in this single period. The convergence in the chronological distribution of the two sets assures us that we are not dealing with some aberrant pattern that would affect the interpretation of the data. The rather intense chronological concentration in distribution, which might have negative implications for other sorts of historical investigation, is actually advantageous for our analysis. It means that a very significant proportion of all the data was produced by a generation or two of persons who lived and died in the metropolis. This peculiar chronological distribution of the data makes our conclusions on the patterns in seasonality of death somewhat more dependable than they might otherwise be.

From a careful reading of approximately 35,000 Christian inscriptions from the City of Rome, only those were selected that had at least the minimum information of date-of-death (day/month) plus one other specific variable. This process of sorting yielded a grand total of 3,943 data sets, which makes this collection one of the larger banks of data available for demographic study in the Roman world.[28] Wherever possible the following items of data were tabulated in connection with the date-of-death of the deceased: (i) the location of the burial and inscription, usually the precise cemetery or catacomb, where known; (ii) the name of the deceased, including praenomen and nomen, though in almost all cases only the cognomen was known (N = 3,392; about 86 per cent of all cases); (iii) the names of the dedicator(s) and his/her/their relationship to the deceased (N = 1,467; about 37 per cent of all cases);[29] (iv) the gender of the deceased (male/female); and (v) the age-at-death (month, day). Where known, the year of death, which gives the precise date of the inscription, was also recorded (N = 890; about 23 per cent of all cases). The main point of collating such a large number of data, however, was to acquire a large enough sample to permit not just the production of a seasonal distribution for all deaths, but also to enable this whole to be further analysed by correlating the factor of seasonal mortality to other variables, principally those of age and gender, and hence to try to see if there were any significant variations in the seasonal distributions of mortality related to these other factors. There was also the hope (alas, largely disappointed) that the variable of social status might be able to be correlated with seasonal variations in mortality rates.

The gender of the deceased can be specified in a high percentage of cases of the whole data set (N = 3,733; about 94 per cent of all). With respect to the factor of gender, moreover, we are particularly fortunate since the proportion of males and females celebrated within the date-at-death inscriptions is almost equal (males, N = 1,918; about 51 per cent; females, N = 1,815; about 49 per cent of the whole).[30] The tendency to attain near equality in the commemoration of males and females is something that is peculiar to Christians, and sets them apart from the earlier non-Christian populations of the city.[31] This virtual equality of gender in commemoration is characteristic of almost every age decile through the whole population as reflected in our sample — a fact which is not only significant in itself, but one which also permits an easy and systematic checking of the correlation of gender with other factors in the sample.

[28] It can be compared, for example, with the approximately 300 data sets provided by the Egyptian census returns, on which see Bagnall and Frier, op. cit. (n. 1). In this study, we are able to analyse a sample of the order of ten times that scale — a considerable improvement in quantity.

[29] This represents a significant decline in the percentage of stones that record relationships as found in the epigraphy of the inhabitants of the city in the pre-Christian period — about 62–63 per cent of all: see R. P. Saller and B. D. Shaw, 'Tombstones and Roman family relations in the Principate: civilians, soldiers and slaves', *JRS* 74 (1984), 124–56, at 147, col. 4; and B. D. Shaw, 'Latin funerary epigraphy and family life in the later Roman Empire', *Historia* 33 (1984), 457–97, at 467 f.

[30] These proportions remained relatively constant as new data were added to the sample. As a footnote to the historical study of epigraphy, however, it might be noted that the editors of *ICUR* had a disconcerting tendency to resolve fragmentary inscriptions as masculine in cases where either gender would be possible (and in a set where there is no great overall male gender preference): see, e.g., 14253 and 18096.

[31] B. D. Shaw, 'The Cultural Meaning of Death: Age and Gender in the Roman Family', ch. 4 in D. I. Kertzer and R. P. Saller (eds), *The Family in Italy from Antiquity to the Present* (1991), 66–90, at 80 f. and table 4.5, pp. 81–2.

II. PERSONS AND PLACES

The inscriptions come from the great Christian burial grounds of Rome, development and regulation of which have been the subject of intense study and analysis.[32] The precise details derived from our sample of the whole only tend to confirm the general conclusions reached in these studies about the range of social ranks of the persons involved. The population of the city reflected in our data is representative of what might be called the great mass of common persons of the city. But the sample also includes a representative range of persons from those in the 'aristocracy': a selection of persons marked by the standard titulature signalling high social status, including *viri clarissimi* (N = 12), *perfectissimi* (N = 8), *spectabiles* (N = 7), and *illustres* (N = 1); and *feminae clarissimae* (N = 8), *honestae* (N = 5), and *illustres* (N = 2).[33] Persons from the military and élite imperial 'bureaucracy' are also represented, as are those from the Church hierarchy (bishops, priests, and readers). By nomenclature and type of burial, however, most of the deceased were manifestly 'ordinary persons'. Unfortunately, their daily working professions are rarely specified. With the exception of those noted as holding an ecclesiastical office (N = 71), the total number of occupational statuses recorded is not very large (N = 91). About half of these cases (N = 39), however, are not occupational in the strict sense that they are not persons employed in the private sphere but are employees of the imperial administration (N = 19) or the army (N = 20).[34] Such persons include a clerk in the office of the Urban Prefect (*exceptor Praefectus Urbi*), a messenger (*tabellarius*), a secretary of the Senate (*scriba Senatus*), a chief of secretaries (*primicerius notariorum*), a scribe of the Prefect of the Vigiles (*exceptor Praefectus Vigilium*), along with soldiers and veterans of various ranks.[35]

Of those remaining persons whose working occupations are specified (N = 52), the employments are those of ordinary persons: a pickle-maker (*sagalmarius*), a gardener (*ortolanus*), a maker of tiles (*artifex artis tesselariae lusorie*), an actor (*comicus*), a baker (*pastillarius*), a goldsmith (*aurifex*), a marble worker (*marmorius*), a builder (*faber*), a dyer (*tinctor*), a wet-nurse (*nutritor*), a professional scribe (*olographus*), a charioteer (*auriga*), the manager of a warehouse (*horrearius*), a seller of hay (*fenarius*), a seller of milk (*lactearius*), a money-changer (*argentarius*), a seller of cakes (*lagenaria*), and an innkeeper (*tabernarius*). They are clearly the sort of persons from the labouring classes that made up the vast bulk of the population of the free plebs of the vast late Roman metropolis.[36] So too, when ecclesiastical offices are noted, it is clear that we are in the world of the local parish and its officials: priests (*presbyteri*, N = 30), readers (*lectores*, N = 14), gravediggers (*fossores*, N = 7), deacons (N = 5), subdeacons (N = 2), and exorcists (N = 1). Bishops (*episcopi*) and more senior officials of the Church are present (N = 7), but the officials of the Church most regularly in evidence would seem to indicate that most of the population was centred on the parish-level of organization. In

[32] See the works cited in nn. 6–9 above, and also G. B. de Rossi, *La Roma sotterranea cristiana* (3 vols, 1864–77); M. Armellini, *Gli antichi cimitieri di Roma e d'Italia* (1893); O. Marucchi, *Le catacombe romane secondi gli ultimi studi e le più recenti scoperte* (1903; 2nd edn, 1933); H. Leclerq, 'Coemeteria', *DACL* 2.2 (1910), 2376–486; P. Styger, *Die römische Katakomben: archäologische Forschungen über den Ursprung und die Bedeutung der altchristlichen Grabstätten* (1933); U. Fasola, 'Katakomben', *Lexikon für Theologie und Kirche*[2] 6 (1961), 20–44; P. Testini, *Le catacombe e gli antichi cimitieri cristiani in Roma* (1966); U. Fasola and P. Testini, 'I cimitieri cristiani', in *Atti del IX Congresso internazionale di archeologia cristiana* I (1978), 103–210.

[33] See, e.g., *ICUR* 18503, 23460, 18503, 17629, 221, 752 (a *nummerarius*), 4855, 5043, 5748, 5798, 13487, 13491, 13696, and 13940.

[34] The number of instances is frustratingly small and seems to indicate a further change in Christian values and self-presentation (also somewhat limited by the physical nature of the Christian epitaph itself). About fifty instances is an exiguous proportion of the total (about 1.5 per cent), whereas for pre-Christian Rome, the 'occupational' inscriptions of *CIL* VI (N = 1,470) seem to represent a rather larger proportion of the total (about 5 per cent); see S. Joshel, *Work, Identity, and Legal Status at Rome: A Study of the Occupational Inscriptions* (1992), 16 f.

[35] See, e.g., *ICUR* 17525, 22635, 23064, 1213, 1477, 4928, and 11748.

[36] A study is required that would extend the work of Joshel, op. cit. (n. 34), into the evidence of this later period in the history of the metropolis; for these examples see *ICUR* 13141, 20830, 19041, 3, 529, 1403, 1761, 2223, 4283, 4328, 5027, 34, 5047, 5053, 14583, 15389, and 944.

nomenclature and in designation of origin and profession, the population was a diverse and modulated one, drawn from the wide range of occupational statuses in the city, and with clear indications of a fairly wide range of ethnic and regional backgrounds that indicate a constant immigrant element to the general population of the city. In these specific modes, our sample matches the profile obtained from detailed analysis of individual Christian burial grounds in the city.[37]

It is also possible to evoke some of the personal relationships that centred on commemoration of death. Although Christians were less prone to record secular relationships than their pre-Christian predecessors, from a sorting of those personal relationships that are tabulated (N = 1,467; about 37 per cent of all cases) it is possible to compare this social group with other non-Christian and non-urban ones.[38] The urban populations of the pre-Christian Roman Empire placed heavy emphasis on the 'nuclear' family — the elemental set of relationships between husband and wife, and between parents and children. Although Christian populations (the sample from Rome we are using being no exception in this regard) consistently down-played the noting of secular relationships at death, the patterns that emerge from an analysis of those who did do this is consistent. In fact, in our sample, which is representative of the whole of Christian epigraphy from the city, elementary or 'nuclear' family relationships are wholly dominant (about 97 per cent of all recorded cases). There are, it is true, some relationships noted outside it, drawn from the range of kinship relations that were from the circle of the extended family (some grandparents and grandchildren, a few 'in-laws', uncles and aunts).[39] But they are truly few and peripheral. The same applies to non-kin relatives such as friends, freedpersons, and 'foster children' (*alumni/ae*).[40] Consistent notices of persons outside the elementary family are not only few, but point to special cases such as recent immigrants to the city who maintained their kinship links more strongly, such as the *germani fratres* Remus and Arcantia who, on closer inspection, identify themselves ethnically as from the *natio Gallica*.[41] Or there is the woman who had her epitaph inscribed by all her neighbours (*omnes vicinales*) but who was a solitary — a widow who had lived alone as a 'pure virgin' for eight years following the death of her husband.[42]

Within the nuclear family there are two sets of relationships that absolutely predominate. Firstly, conjugal relationships between husband and wife — that is to say, funerary inscriptions that were set up by a husband to a deceased wife, or by a wife for her husband — are one of the two most dominant types of relationships recorded (about 45 per cent of all).[43] These relationships are complemented by those flowing 'downwards', so to speak, from parents to children (about 43 per cent of all).[44] This is, finally, reflected in the reciprocal celebration of deceased parents by their children — although the percentage of dedications in the category is small by comparison (about 5 per cent of all), it is still the next largest category after the husband-wife, parent-child nexus.[45] Thus the Christian family relationships as recorded in our corpora of inscriptions from Rome were even more bereft of complex familiar patterns than were the earlier pre-Christian population of the city. The general populations of Rome and Ostia who left epigraphical records of this type in the period of the High Empire placed about 75–80 per cent of all recorded relationships within the field of elementary family relationships. This more detailed analysis of personal relationships amongst the Christian inhabitants

[37] For example, the cemetery *ad duas lauros* on the Via Labicana to the south-east of the city studied by J. Guyon, *Le cimetière aux Deux Lauriers: recherches sur les catacombes romaines* (1987), 352–9.

[38] For the type of analysis used here, and for the comparative figures that will be used, see Saller and Shaw, op. cit. (n. 29), with tables; and Shaw, op. cit. (n. 29), with tables.

[39] Janssens, op. cit. (n. 15), 1.5, 'Le relazioni fra altri membri della famiglia', 169–70.

[40] Janssens, op. cit. (n. 15), 2.2, 'I rapporti con i liberti', 179–81; and 2.3, 'I rapporti con gli alunni', 181–90.

[41] *ICUR* 20819.

[42] *ICUR* 10953.

[43] Janssens, op. cit. (n. 15), 1.1, 'Le relazioni fra marito e moglie', 103–32, justifiably placed first in his analysis of intra-family relationships.

[44] Janssens, op. cit. (n. 15), 1.1, 'Le relazioni fra genitori e figli', 132–56.

[45] Janssens, op. cit. (n. 15), 1.1, 'Le relazioni fra figli e genitori', 156–62.

of Rome, therefore, confirms the very high order of estimates gained from an earlier study devoted to this same population.[46]

The impression gained from these data is that attested relationships place greatest emphasis on the conjugal husband–wife relationship (along with strong connected affective links to their own children).[47] This is also confirmed in part by mode of burial. Where the acquisition of burial slots in the walls of the catacombs or plots in the above-ground cemeteries is recorded in the epitaphs, the most frequently specified type is the *bisomus* — a technical funerary term derived from the Greek *bisomos* meaning a space for two bodies. It is very rare that a *trisomus* or a *quadrisomus* is attested.[48] Further, from the sort of purchasers of *bisomi*, and the sorts of initial burials made in them, by far the majority were intended for a husband and a wife.[49] The assumption is that children would tend to be buried separately, later on in their own life-cycle as part of their own conjugal unit. The conclusion is confirmed by expressions of sentiments between husbands and wives which, contrary to some recently expressed modern interpretations, constantly stress the strong affection of love. Characteristic is the epitaph set up by a husband to his wife whom he had married when she was only fourteen years old. They lived as husband and wife for only two years and four months. And of that time, since he was away travelling so much, they were only able to spend some six months together:[50]

> Dominae / innocentissimae et dulcissimae coniugi / quae vixit an. xvi, m. iiii et fuit / imaritata ann. duobus, m. iiii, d. viiii / cum qua non licuit fuisse propter // causas peregrinationis / nisi mensib. vi / quo tempore ut ego sensi et exh(i)bui / amorem meum / nulli su(am) alii si dilixerunt // deposit(a) xv kal. iun.

The same applies to the words *parens* and *parentes*. In moralizing, political, legal, or lexicographical texts, the terms might well be general ones for 'relatives' or 'familials' but in our sample they have only one consistent meaning — basically the same one that they have today. The words designate the biological parents, the father and mother (or surrogates) of the deceased. In every instance whenever the persons who were *parentes* are named, they are none other than the father and mother of the deceased. No other meaning is ever contemplated. In their expression of affection, sentiment, and duties, the Christian inscriptions of Rome impart to us an unmistakable impression of the primary and central significance of husbands and wives, parents and children.[51] Whereas sons are given a slight preference over daughters in terms of celebrations in death by their parents (Table 2), the difference is slight indeed, and points to a strong and relatively egalitarian set of descending elementary family relationships. Christians emphasize the downward links with the children more than their pagan predecessors, and seem to have narrowed the preferential gap between sons and daughters.[52] Indeed, daughters, like the Celerina who died at age one year, four months, and six days on 1 October 382, could be spoken of as 'the hope for the future' of her parents (*spes futura*).[53] A parent such as Graecinia, who lost her child Ianuaria at the age of one year, six months, and twenty-seven days, could lament the loss of her daughter with as much obvious sentiment and grief as for any son.[54]

The sample is therefore a fairly representative population — a cross-cut through the various age, gender, status, and occupational groups of Rome's urban population. The one great caution is that, even though children are commemorated more frequently in this sample than in any non-urban or pre-Christian group, infant deaths are still

[46] Shaw, op. cit. (n. 29), 465 f., and tables 7–14, esp. 8–10.

[47] P. Testini, 'Aspetti di vita matrimoniale in antiche iscrizioni funerarie cristiane', *Lateranum* 42 (1976), 150–64.

[48] H. Leclercq, 'Biscandens, Bisomus', *DACL* 2.1 (1910), 910–15.

[49] Guyon, op. cit. (n. 37), 571: more than 40 per cent of gravesites purchased from *fossores* have their type specified (most frequently a *bisomus*); one-third of all contracts are already made by a family group, most often by a conjugal pair.

[50] *ICUR* 23891.

[51] M. Borda, *Lares. La vita familiare romana nei documenti archeologici e letterari* (1947).

[52] Saller and Shaw, op. cit. (n. 29), esp. tables 1–6.

[53] *ICUR* 1439.

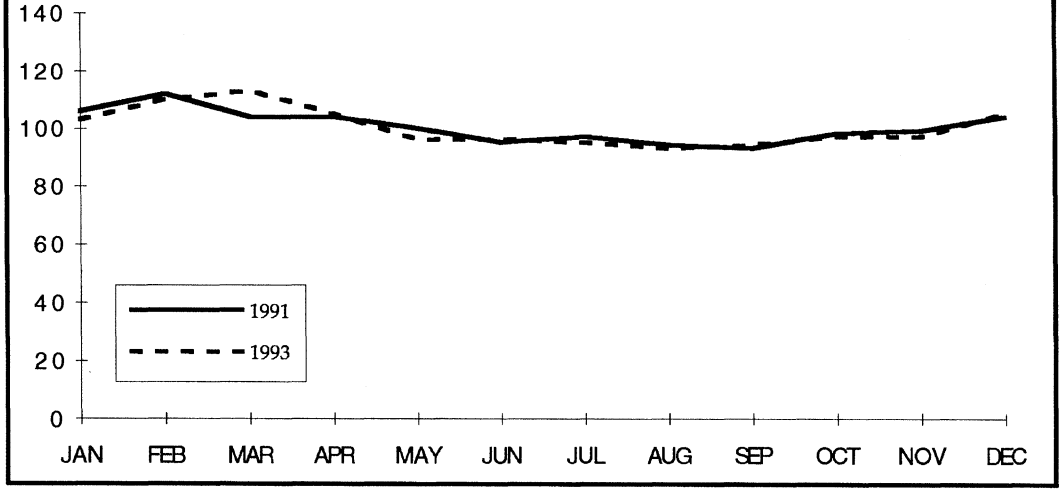
[54] Consider the sentiments of bereavement in *ICUR* 1637; cf. No. 1978, a father for his son Dalmatius (dead at age six): a long poem on his schooling and learning Greek and Latin letters.

greatly under-represented as against what must have been their proportion of the mortality of the whole population.[55]

III. THE PROBLEM OF SEASONALITY

For most periods of premodern history, the rates of mortality in any given human population have not tended to be evenly distributed throughout the year, but rather have been strongly seasonal in nature. Levels of mortality have been markedly higher or lower according to the time of the year. The gradual disappearance of this marked seasonality of death is correlated with the shift from premodern to modern economies and social conditions, especially with the systematic introduction of services, products, and mechanisms that permitted a better control over infectious diseases and over the conditions that aided their spread. Mechanisms that permit human populations better to mediate the relationships between themselves and the climatic and environmental conditions in which disease organisms are favoured are conducive to a more even distribution of deaths through the year. Human populations without such devices, and which are therefore more directly exposed to the climatic and environmental conditions, typically exhibit a pronounced seasonality in their mortality patterns. As the conditions in which a given population modernize, there is an increasing tendency to the flattening of the annual mortality cycles as they are represented graphically. In the case of fully modern populations, like those of the most advanced western European countries, Canada, Australia, the United States, or Japan, seasonal mortality cycles tend towards what demographers call 'aseasonality' or 'deseasonality'. That is to say, the annual distribution of death rates does not display very much overall variation from one month to the next (Fig. 3).[56]

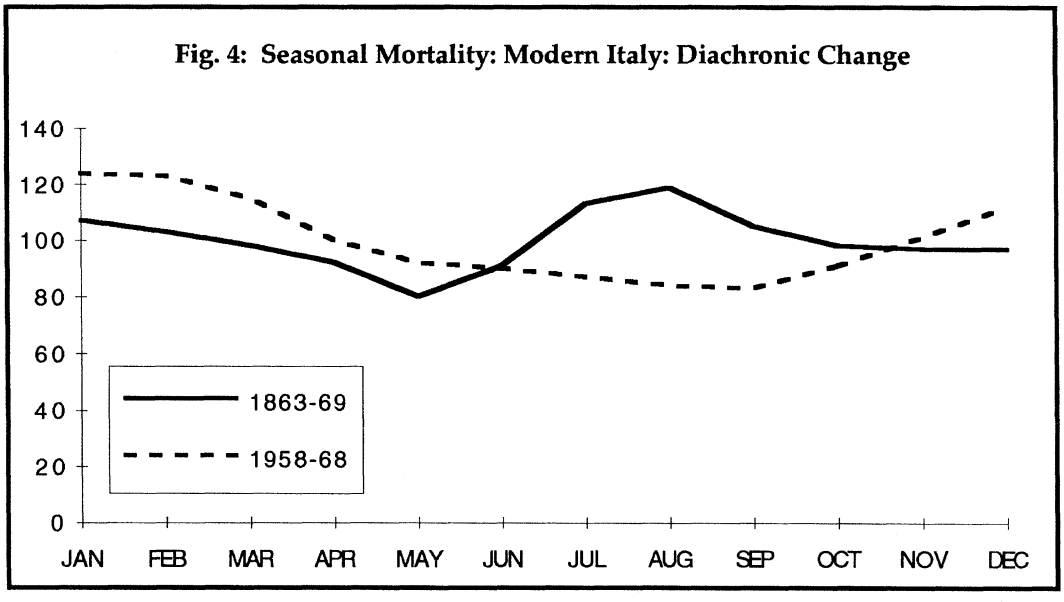
Fig. 3: Seasonal Mortality: Modern United States



Data source: United States Office of Vital Statistics, *Monthly Vital Statistics Report*, vol. 40, no. 12 (15 April 1992), 7; ibid., vol. 42, no. 12 (13 May 1994), 11.

[55] On the tendency of urban and Christian populations to accord greater public recognition to infants and children in funerary commemoration, see Shaw, op. cit. (n. 29), 473 f.; (n. 31), 75 f.

[56] M. Sakamoto-Momiyama, *Seasonality in Human Mortality: A Medico-Geographical Study* (1977), 20–5, 43 f., 49.



Data source: Ferrari and Livi Bacci, op. cit. (n. 59), tab. 4, p. 279.

This is not to say that individual causes of death in a modern state like England, whether by traffic accidents (January–February highs) or by suicide (lows in November–December), do not have their own seasonal peaks.[57] Nor, more relevant to the present study, does it mean to deny the fact that some deaths in modern-day Italy vary seasonally: vehicular accident death rates are much higher in the summer months (especially August and September), homicide rates high in mid-summer (especially June and July), whereas, like England, suicide rates are lower in mid-winter (November to January).[58] It is simply the case that the sum total of mortality in the populations of large modern nation-states tends to be more evenly distributed over the whole year. When populations move from pre-modern to modern conditions, there is usually an initial disappearance of the most intense months of mortality. Thus as seasonal mortality of the Italian population is traced from the 1860s to the 1960s, there is a gradual disappearance of the very high rates of death in the July to September period that were characteristic of the pre-modern population, and a gradual replacement of these highs by slightly muted mid-winter periods of higher mortality — accounted for mainly by the peculiar susceptibilities of an aging population (Fig. 4).[59]

Thus the cumulated statistics for all causes of death when summed for the whole population of modern and post-modern societies tend to produce modest variations through the seasons of a given year.[60] By contrast, the annual mortality cycles of many so-called 'developing' countries are characterized by pronounced swings from one season to the next. The considerable amplitudinal difference in their variable seasonal rates of mortality is almost always attributable to the appalling sanitary and nutritional conditions in which their populations are trapped. The malign effects of these conditions are reinforced by the effects of bad seasons, especially those that are marked by dampness and humidity (e.g., monsoons) and extreme heat. The combination produces

[57] Office of Population Censuses and Surveys, Series DH4 No. 16: *Mortality Statistics: Injury and Poisoning . . . England and Wales, 1990*, HMSO London (1992), table 2, pp. 2–4.

[58] L. di Comite, *La Mortalità in Italia*, Istituto di Demografia (1974), Tavola 93: 'Indici di stagionalità dei decessi per taluni gruppi di cause di morte, 1958–67', p. 195.

[59] Di Comite, op. cit. (n. 58), 187; see table 4 in G. Ferrari and M. Livi Bacci, 'Sulle relazione tra temperatura e mortalità nell' Italia Unita, 1861–1914', in *La popolazione italiana nell' ottocento: continuità e mutamenti* (1985), 273–98, at 279.

[60] Already noted for the so-called 'advanced' countries by the early 1960s: R. Tomlinson, *Population Dynamics: Courses and Consequences of World Demographic Change* (1965), 110–13; on variation for precise disease groups still discernable in these advanced 'aseasonal' or 'deseasonal' populations, see, e.g., P. Cox, *Demography*[5] (1976), 133–5, and table 7.10.

conditions that are especially conducive to the spread of infectious diseases that affect either the pulmonary or gastro-intestinal systems and produce sharp distinctions in seasonal rates of death.[61] Similarly pronounced seasonal variations in mortality can also be traced for the populations of pre-industrial states in early modern Europe, such as England, where they are linked to comparable seasonal cycles in births, marriages, and baptisms. These patterns also seem to be deeply entrenched in the basic demographic structures of such societies and remain remarkably consistent over long periods of time. The consistency of these patterns, which reflects the interplay between a human population and its physical environment, therefore provides an historical 'fingerprint' identification of that population's demographic regime. In the case of pre-modern England, one of the best documented of case studies, the general patterns are relatively fixed over the period of the three centuries for which, accurate measurements are possible.[62]

In the recognition of these 'bad seasons', however, there is nothing that requires the techniques of modern demographic sciences to unearth a hidden fact of population history. Almost all persons within a given population share a folk knowledge about more or less favourable seasons of the year. That various seasons of the year were more or less healthy than others for humans was one that reposed not just on common observation, but was also one that became the object of the analysis of medical writers as early as those in the so-called 'Hippocratic Corpus'. Indeed, the technical term 'constitution' (*katastasis*) widely used amongst those writers referred specifically to a given configuration of atmospheric conditions that tended to favour the prevalence of certain types of diseases.[63] Hippocratic treatises such as the *Airs, Waters, Places* and the *Aphorisms* had already established a series of observed truisms for connections between typical weather systems, disease patterns and seasons of the year — presumably for the cultural area of the north-eastern Mediterranean basin. These 'scientific observations' seem to have become the shared knowledge of other 'researchers' at an early date, since an historian like Herodotus was able to state that it was his considered opinion that shifts in the climatic regime were the main cause of disease in humans.[64] In this nexus of cause, the following connections were usually stressed: (i) that the dry seasons were observed to be the healthiest in general; (ii) that serious diseases were most acute and lethal in the early autumn; (iii) that the spring season was the healthiest and diseases least fatal; and, finally with regard to age-groups (iv) that infants and children, and the young in general, were healthiest in conditions of spring and early summer; whereas (v) the elderly were best off in summer and early autumn; and (vi) persons in the intermediate age ranges were healthiest in the intervening months of the rest of autumn and through the winter.[65]

One can systematically tabulate and correlate the main disease patterns recorded in the *Aphorisms* and in *Epidemics* I and III to produce the following general observations.[66] The effects of lethal diseases for the periods of spring and summer are nugatory. Fatal diseases are consistently associated with the more humid and colder phases of fall and winter. Those of late summer and autumn seem to be severe gastro-intestinal and respiratory infections (like tuberculosis) marked by symptoms such as high fevers. It is important to note, however, that the ancient pathology of these diseases, while tying them to 'climatic regimes' does not thereby make any dynamic account of their spread in terms of the mechanism of infection. Rather, the fact that some humans succumbed to the disease, whereas others did not, was the result of the juxtaposition of the exogenous factors of climate and the peculiar internal disposition of the person concerned that made them, rather than anyone else, susceptible.[67]

[61] T. Dyson and N. Crook, 'Seasonal Patterns in Births and Deaths', ch. 5 in R. Chambers, R. Longhurst and A. Pacey (eds), *Seasonal Dimensions to Rural Poverty* (1981), 135–62.

[62] E. A. Wrigley and R. S. Schofield, 'Short-Term Variations: Some Basic Patterns', ch. 8 in *The Population History of England, 1541–1871: A Reconstruction* (1981), 285–355, at 285.

[63] F. Sargent, *Hippocratic Heritage: A History of Ideas about Weather and Human Health* (1982).

[64] Hdt. II.77.

[65] Sargent, op. cit. (n. 63), 54–5 and table 2.1.

[66] Sargent, op. cit. (n. 63), 56–8, plus Appendix II, tables 3–6.

[67] M. D. Grmek, *Les maladies à l'aube de la civilisation occidentale: recherches sur la réalité pathologique dans le monde grec préhistorique, archaïque et classique* (1983), 279 f.

Likewise, in the Roman world there was a general awareness that the summer season was 'sickly' — by summer or *aestas* was meant the last half of the summer, so principally the three months between the summer solstice (22 June), when the sun entered the sign of Cancer, until the autumnal equinox (22 September, the sun's entrance into Libra).[68] For the City of Rome itself, Horace, the lines of whose second *Satire* are quoted as an epigraph to this paper, and other satirists who wrote about life in the city, were clearly aware of the peculiarly morbid seasons of death in the metropolis — of the 'heaviness' and 'morbidity' of conditions that offered a 'rich profit to Libitina' in the autumn of every year. The Horatian verses fall into the category of 'folk observations' that apply to the City of Rome itself. But to the end of Antiquity, both specialists such as the medical doctors and the more general population, in their aphorisms, verses, and calendars, were well aware that some seasons of the year were more likely to be fatal than others. The problem is that one rarely finds an explicit or conscious statement of the fact in the funerary epigraphy itself. One of the rare examples from our set of epigraphy is found on the funerary inscription on the sarcophagus cover of a young girl who died at age of three years:[69]

> Hic Optata sita est quam / tirtia (= tertia) rapuit aestas
> Lingua, manu nunquam / dulcior ulla fuit / in pace

Even in this most explicit of texts, however, the *aestas* may well be no more than a metonymical expression for 'year'. But the fact that summer is the season chosen to snatch away her life seems particularly telling. The rarity of such notices, however, only serves to underscore the need to seek other means of measuring the seasonal effects of mortality.

The Problem of Infant Mortality

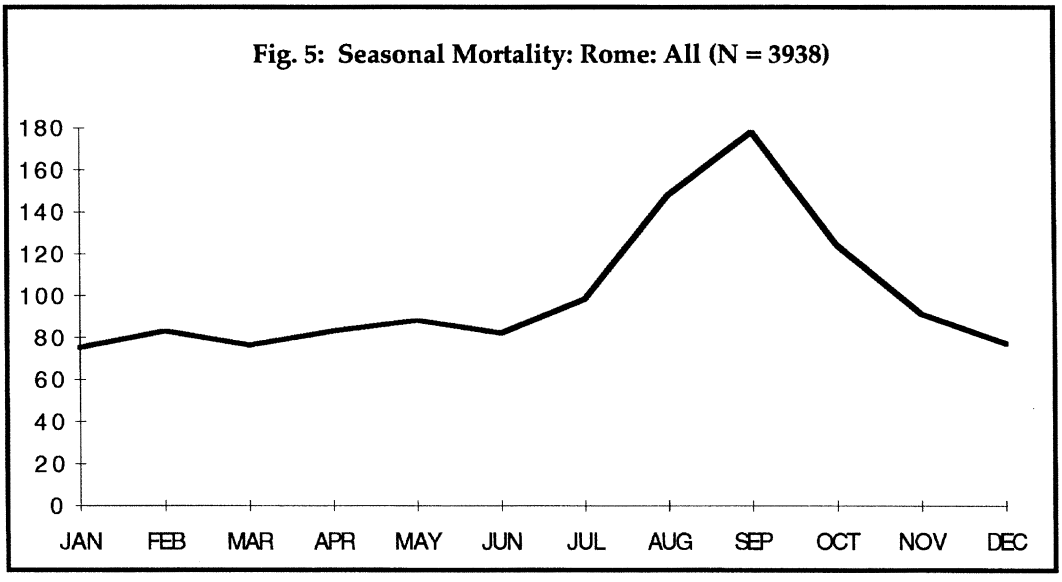
Before advancing to the general analysis of the epigraphical evidence relevant to seasonality of death, a specific problem with the age-distribution of the inscriptions must be considered first. The seasonal distribution of deaths could be consistently linked to the exogenous factors of the environment as long as all human beings faced such external factors in equal numbers throughout the year. For most persons in most human populations this is generally true, but there is one significant group which, especially in a pre-modern population, can skew the overall seasonality of mortality: the annual cohort of newborn infants. The central problem is that infants do not enter any given human population evenly throughout the year. Even in hyper-modern populations infants tend to be born according to quite distinct seasonal patterns that form regular oscillations in the overall reproduction of the population. Since there are very many more infants being born in certain months of the year, and they are especially at risk to exogenous factors in the environment, very many more of them will probably die in or close to the month of their birth. It is, in fact, possible to make a reasonable estimate of this birthing cycle for Roman women (at least for women who lived in the City of Rome and in Italy).[70]

Although this peculiar factor must be borne in mind in the analysis of our data, it is not a significant problem for the data that remain for us to analyse. From the data that remain, it is clear that funerary inscriptions simply do not survive for infant deaths (indeed were probably never produced in the first place). Although it is possible to develop an estimate of what the main months of birthing for Roman women were, since the data concerning infant deaths are not found in our surviving records, the seasonality of mortality for infants simply does not affect the graphic curves for seasonal mortality

[68] Lucretius, *De rerum natura*, VI.1090–137.

[69] *ILCV* 4756 = *NdS* (1916), 126 f.; an image of the sarcophagus, originally found in the cemetery of S. Cyriacus on the Via Ostiense, and now in the Museo delle Terme, can be found in G. Wilpert, *I sarcophagi Cristiani antichi, Volume primo, Tavole* (1929), tav. LIX.4; with discussion in *Volume primo, Testo* (1929), 79–80.

[70] B. D. Shaw, 'The seasonal birthing cycle of Roman women' (forthcoming).



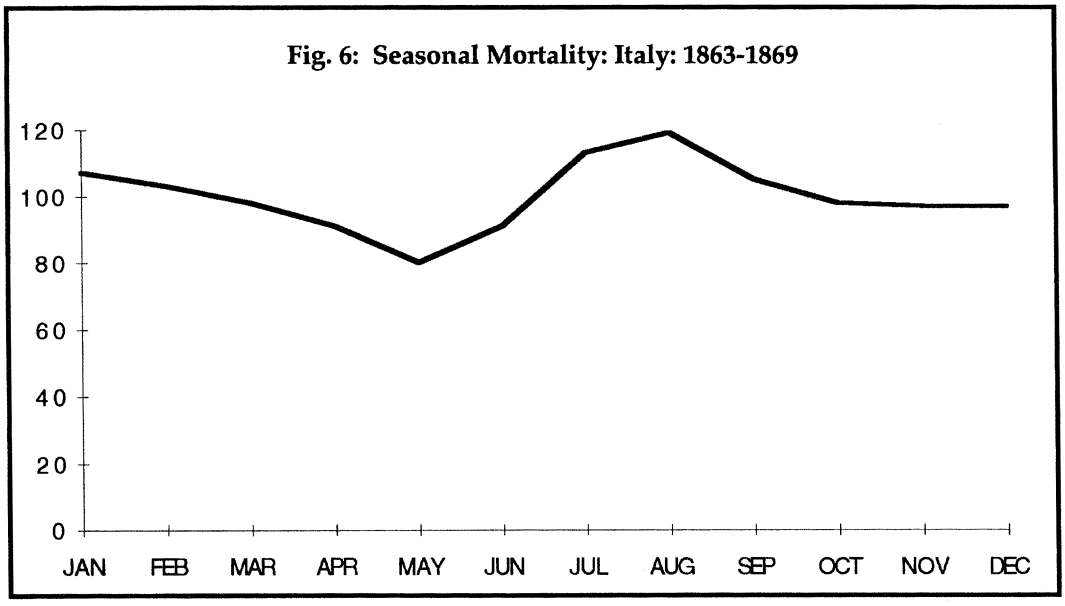
Data source: Table 1: primary sources: Rome.

that are produced by our statistics. The seasonal cycles, as represented on our graphics, are principally for persons who survived the first great onslaught of mortality (affecting those from birth to the age of four years), and are valid for those age-ranges. It is also a simple fact that they tell us little or nothing about the seasonal variation in the massive numbers of infant deaths.

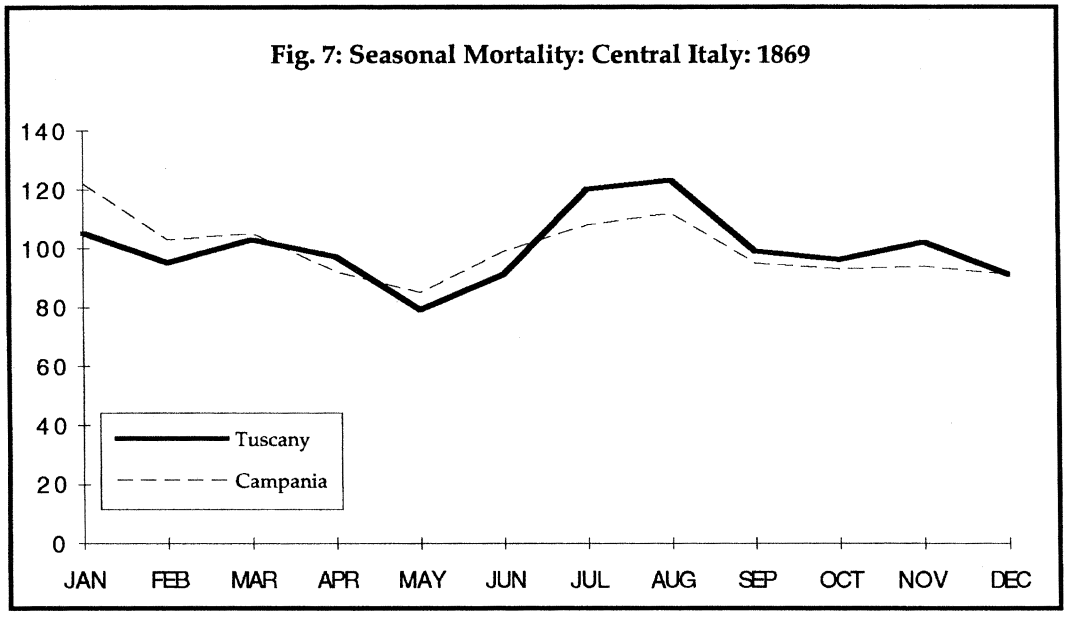
IV. GENERAL SEASONAL MORTALITY

We can now turn to the overall seasonal configurations of death in the City of Rome. Analysis of the seasonal distribution of all deaths in the Christian populations of late imperial Rome produce a consistent general pattern. When reproduced graphically, the annual seasonal pattern of mortality is represented as a single annual oscillation between a high and a low period of mortality (Fig. 5). Characteristic pre-modern Italian populations tend to have a distinct bi-modal pattern of seasonal death (Fig. 6), but it must be remembered that our data are missing one of the most characteristic causes that is responsible in these pre-modern series for the mid-winter highs of mortality — statistics on infant deaths. Without these figures, our statistics produce a single late-summer series of highs of mortality that is true of most of the population that survived the first year of life. Further, without the addition of the infant deaths, it is arguable that the amplitude or degree of seasonal fluctuation for the population as a whole must be somewhat exaggerated. But the pattern that remains is valid for all the persons who constituted the vast majority of the living population of the city. The pattern is also one that is consistent with what is known of Central Italy in the pre-modern period (Fig. 7). This annual regimen of death is also significant when set against pre-modern seasonal patterns of mortality in Italy that are characterized by the periodic intervention of plague, pestilence, and epidemic disease. Such periods of 'crisis' mortality tended to concentrate very high levels of death in the summer months of June, July, and August, as can be seen from the cumulative figures for thirteenth- and fourteenth-century Florence, or late sixteenth-century Mantua.[71] Since epidemic attacks tended to accentuate the already dominant patterns of seasonal mortality during 'normal' times

[71] D. Herlihy and C. Klapisch-Zuber, *Les Toscans et leurs familles. Une étude du catasto florentin de 1427* (1978), 192; L. del Panta, *Le epidemie nella storia demografica italiana: secoli XIV–XIX* (1980), 47–63.



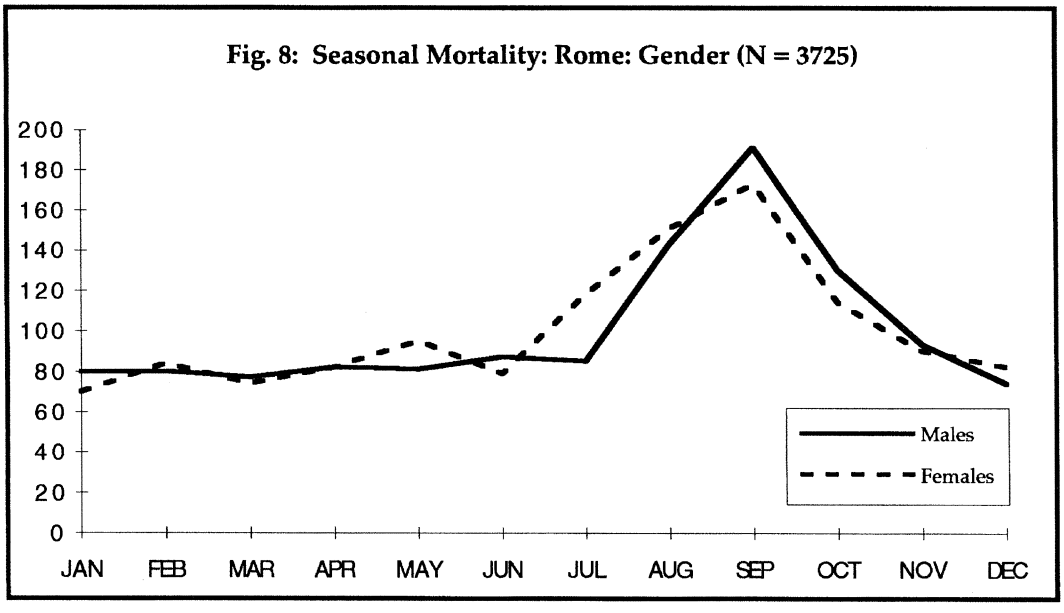
Data source: Ferrari and Livi Bacci, op. cit. (n. 59), tab. 4, p. 279.



Data source: Ferrari and Livi Bacci, op. cit. (n. 59), tab. 3, p. 279.

(for the obvious reason that the population was already more susceptible and more exposed to disease vectors in these same months) one can argue, conversely, that these same months would tend to be most deadly in 'normal' or non-crisis times as well. This is, once again, confirmed by detailed studies for all regions of the Italian peninsula in the pre-modern period.[72]

[72] C. Corsini, 'Problemi di utilizzazione dei dati desunti dai registri di sepolture e morti', in *Problemi di utilizzazione delle fonti di demografia storica: Atti del seminario di demografia storica 1972–73*, 2 (1974), 93–135, at 124–30, 'La stagionalità', with 'Tabella 7: Indici di stagionalità dei decessi per zona, negli anni di crisi et nel resto del periodo preso in esame', and 'Grafico 3: Indici di stagionalità dei decessi nelle zone indicate'.



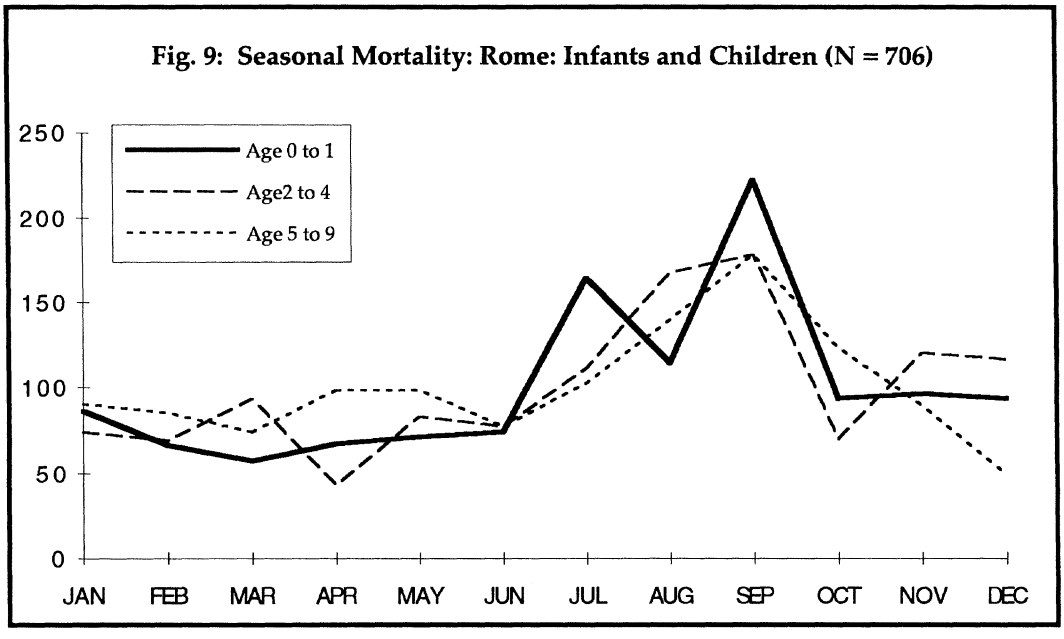
Data source: Table 1: primary sources: Rome.

It is also possible to consider this variable seasonal effect of mortality as related to the factor of gender (Fig. 8). The variability in seasonal death rates, for both sexes, remains fairly stable over the winter months from November, falling to a low through the months of December to February, and rising slightly in May to July. The annual rise in mortality is very high in the August to October period, with a pronounced peak in September. Given the fixed numbers in the sample, there does not seem to be any significant distinction with regard to gender over most of this period. It seems that males might be more susceptible to the conditions creating the very heavy mortality in late mid-summer. Insofar as potential margins of error in the data are tolerable (and the same pattern was sustained with the input of more and more data), it seems that females became susceptible to the main causes of death in this seasonal cycle *earlier* than males. That is to say, they entered the annual seasonal cycle of high mortality before males did, and were only surpassed by males in the later autumn months of September and October.

This pattern is supported by analyses of the mortality patterns in pre-modern Italy. Analysis of general mortality for three specific generation cohorts, one pre-modern and two modern (the generations of 1870, 1910, and 1950) found a consistent pattern of female surmortality in the deciles between ages ten and forty for the pre-modern population.[73] Moreover, during crisis periods of mortality (during plagues or onslaughts of epidemic disease) in pre-modern Italy, females in general have experienced much higher levels of mortality than males. They seem consistently to be more at risk to dangerous exogenous factors, and this seems to be related in turn to the less favourable access they have had to basic life entitlements.[74] This is further supported by the fact that it is younger women (forty and under) who are particularly susceptible. But a general study concludes that it was not the dangers of childbirth which accounted for

[73] M. Natale and A. Bernassola, *La mortalità per causa nelle regioni italiane* (1973), 73 f. and fig. 8, 'Curve di mortalità per sesso delle generazioni del 1870, 1910, 1950'.

[74] G. Delille, 'Un problema di demografia: uomini e donne di fronte alla morte', in E. Sori (ed.), *Demografia storica* (1975), 257–84, at 272 f.: it is especially true that in crises of mortality more women and children die than do men: see p. 273, a table of mortality on the early nineteenth-century South. A month-by-month tally under 'normal' conditions still shows more women than men dying in the early spring and in late summer/early fall (July to October). A second case, that of Casoria, reveals a worse scenario where female mortality consistently outpaced that of males in every month of the year, being particular bad in early spring (May) and then again in the July to October period.



Data source: Table 1: primary sources: Rome.

this female surmortality as much (if, indeed, at all) as did the more pervasive factors of the harder work regimes and the consistent unequal access to alimentary resources. In these circumstances, when dangerous disease conditions afflicted a given pre-modern population in Italy, it was women who led the way in death, and who died in greater numbers and sooner than did the men.[75] In being part of this pattern, the population of late imperial Rome was therefore no different in kind from most pre-modern populations that were characterized by a typical female surmortality which persisted even in modern western European countries like Sweden and England to the 1920s and France until the years just before the Second World War.[76]

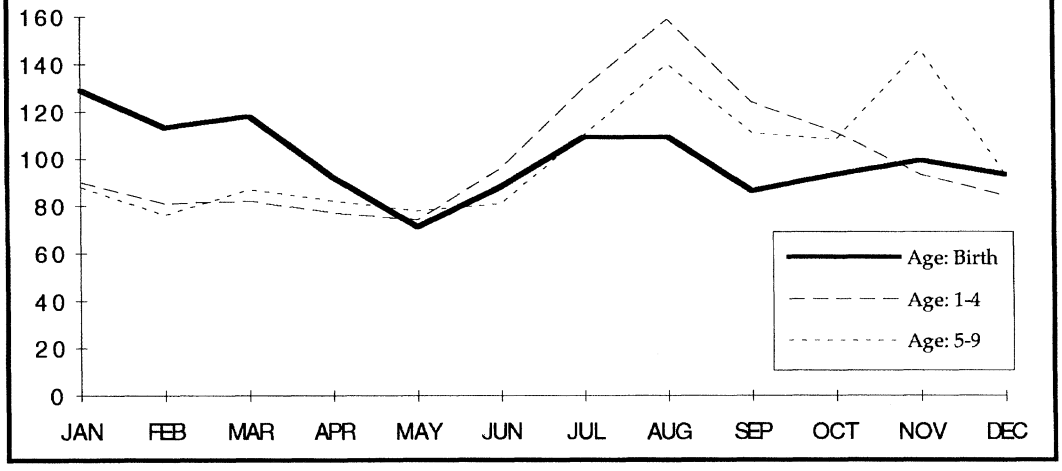
The Young

There are no significant divergences from the above patterns for persons in the age decile 'under ten', and those of four years and under, that is to say infant and child burials (Fig. 9). The numbers of epigraphical data in the latter category, however, are too small and have lead to some skewing in the data (especially for March). For these age-ranges much the same pattern emerges of a fairly even death-rate over most of the months up to June, after which the precipitate rise in the death-rate through July and August began, reaching a pronounced peak in September followed by a rapid adjustment downwards in October. This cycle matches the general patterns for pre-modern Italian

[75] Delille, op. cit. (n. 74), 278–9, and chart on p. 273; thus confirming on a regional basis the global observations made by Amartya Sen, 'More than 100 million women are missing', *NRYB* (20 December, 1990), 61–6, and S. R. Johansson, 'Welfare, mortality, and gender: continuity and change in explanations of male/female mortality differences over three centuries', *Continuity and Change* 6 (1991), 135–77.

[76] D. Tabutin, 'La surmortalité féminine en Europe avant 1940', *Population* 33 (1978), 121–48. The pattern has been reversed only since the Second World War in more developed countries so that it is now generally true that women have a consistently higher life expectancy than men, even in most so-called 'developing' countries, see: 'Patterns of Sex Differentials in Mortality in Less Developed Countries', in A. D. Lopez and L. T. Ruzicka (eds), *Sex Differentials in Mortality: Trends, Determinants and Consequences* (1983), 7–32. Differences in mortality rates are most apparent in the fifteen to forty-four age range.

Fig. 10: Seasonal Mortality: Modern Italy: Infants and Children (1869)



Data source: Ferrari and Livi Bacci, op. cit. (n. 59), tab. 5, p. 280.

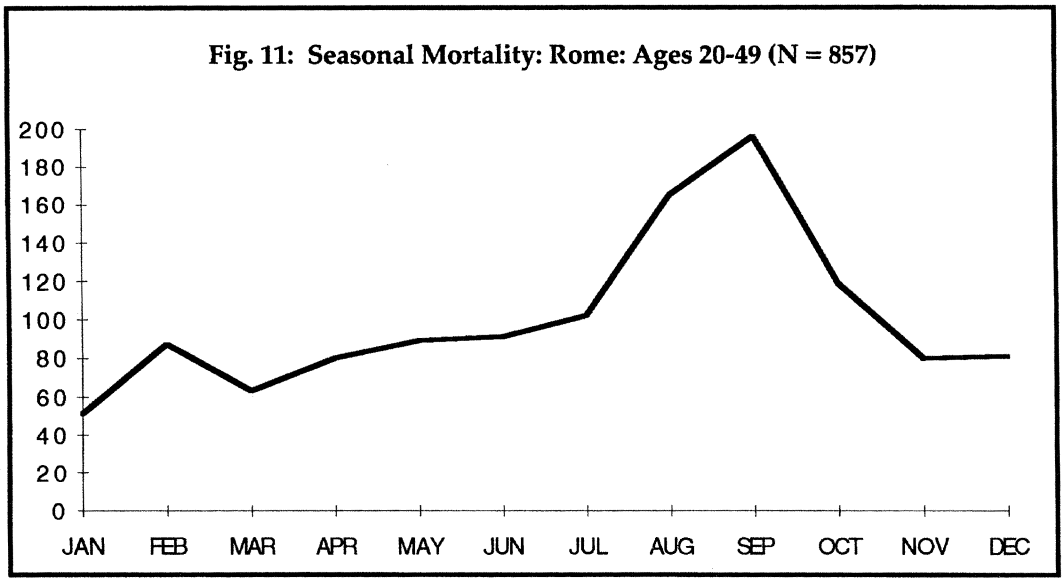
populations (Fig. 10) where the children in the age-range one to four years of age experienced very high levels of mortality in the July to September period — a high which in the case of the five to nine age-range still remains higher than any other decile of the population.[77] The critical group which the modern data preserve, but which are clearly absent from the ancient tombstone data are early infant deaths (i.e., those who die at under one year of age) and especially infant mortality at birth itself. This is a significant missing piece in the whole picture since the modern data for comparable Italian populations clearly indicate that the highest seasonal mortality rates for infants at or near birth were experienced in the winter months of January–February (much higher even than the mid-summer months of July–August) — precisely because this is when most infants were born in the pre-modern birth-cycle of Italy and when they were most at risk.

The Middle-Aged and the Elderly

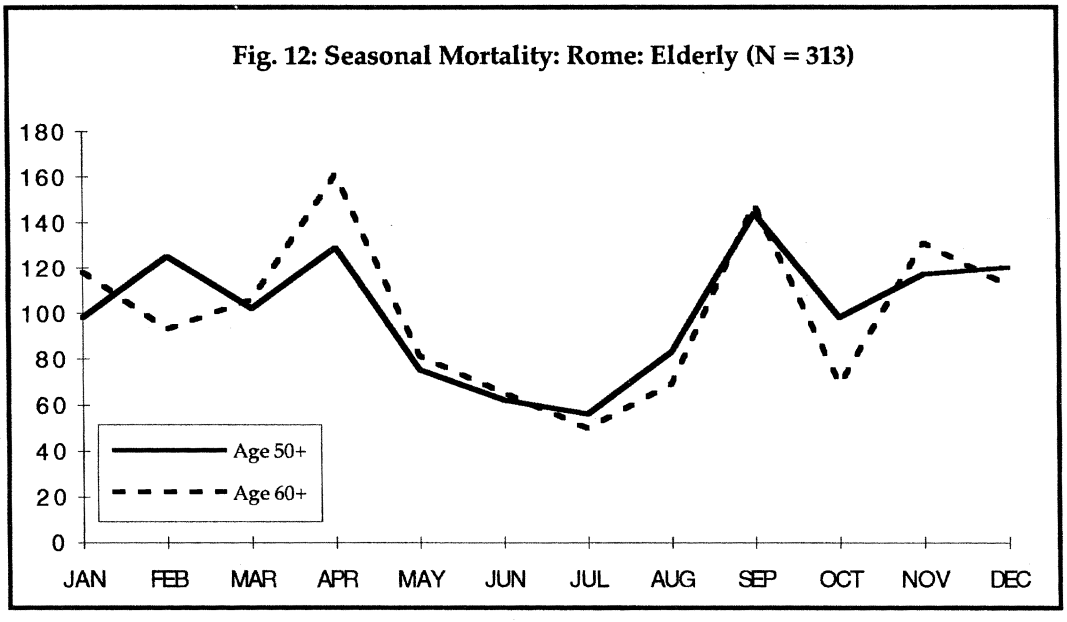
When the data from late imperial Rome relating to the mid-decades of life (the twenties, thirties, and forties) are analysed for seasonality, the annual cycles that emerge are fairly similar to the general pattern for the whole population (Fig. 11). This is the result that would tend to be expected, since these are the age-ranges in which most populations are most stable in terms of mortality. For those who lived to ages above the fifties and sixties, however, the seasonal patterns of death change noticeably (Fig. 12). The summer months, beginning in August marked another precipitate rise cresting in September. But October brought only temporary relief and another ascent culminating in mid-winter in December, and that was followed by another brief trough before there was another period of steep mortality in the spring culminating in the March to May period. Comparative evidence from pre-modern Italy indicates that the elderly constitute a population group that is especially susceptible to respiratory and other diseases that take an unusually high toll of deaths during the winter months (Fig. 13).[78]

[77] Evidence drawn from Ferrari and Livi Bacci, op. cit. (n. 59), 280: 'Tabella 5: Indici di stagionalità dei decessi per classi di età, Italia 1869'.

[78] Di Comite, op. cit. (n. 58), 190 f.; table 91, p. 190 and fig. 21, p. 191.



Data source: Table 1: primary sources: Rome.



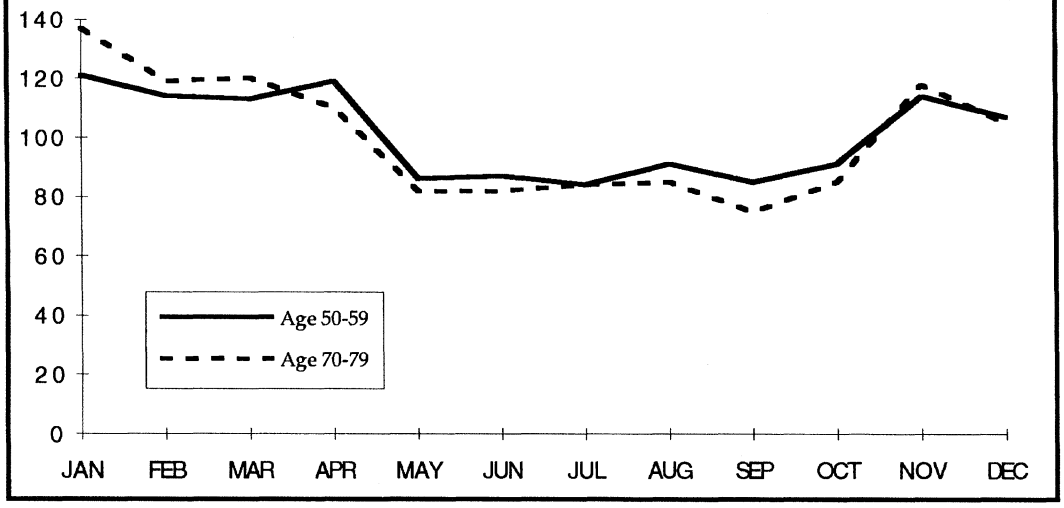
Data source: Table 1: primary sources: Rome.

The same evidence shows that the winter months represent an ever-increasing share of all deaths with each succeeding aging cohort. The turning point seems to occur with the age-cohort of fifty to fifty-nine when the high summer monthly death-rates slump below the annual average and the winter months begin a dramatic increase in the proportion of all deaths.[79] Although the deaths of the elderly take place according to a different seasonal fluctuation, unlike infant deaths their peculiar seasonal distribution of mortality does not greatly affect the general annual cycle of mortality for the whole population.

[79] Ferrari and Livi Bacci, op. cit. (n. 59), 280: 'Tabella 5: Indici di stagionalità dei decessi per classi di età, Italia 1869'.

The simple reason is that the total numbers of persons in advanced age ranges are an ever more exiguous proportion of the whole population in the pre-modern period. It is unlikely, therefore, that the different seasonal mortality of the elderly affects the overall amplitude of variation in seasonal mortality that has been produced for the City of Rome in our analysis in this paper.

Fig. 13: Seasonal Mortality: Modern Italy: Elderly (1869)



Data source: Ferrari and Livi Bacci, op. cit. (n. 59), tab. 5, p. 280.

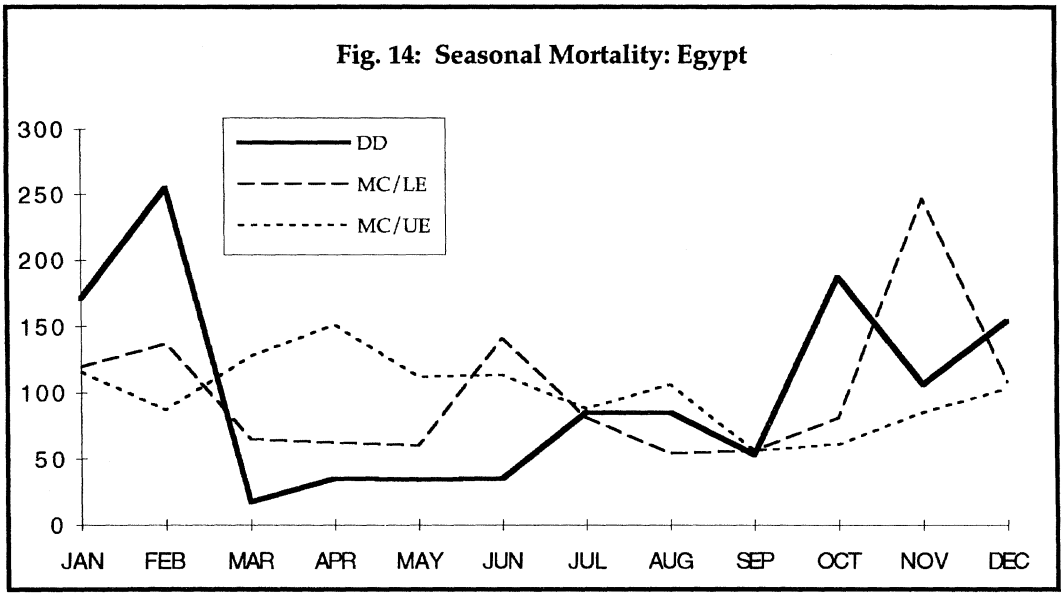
V. SEASONAL MORTALITY OUTSIDE ROME

There have been some attempts made to resolve the problem of seasonal mortality for local regions of the Empire. For example, in her social history of Byzantium, Patlagean noted evidence to suggest rising mortality rates in the autumn-winter period (September to October) with a period of maximum mortality in the spring and summer (March to July).[80] The evidence for her suggested patterns is provided by three groups of funerary inscriptions: one from the district of Moab in the Transjordan, another series from cemeteries in southern Palestine (around Jericho), and, finally, a similar group from Egypt. In no case is her sample more than between sixty and two-hundred cases in total. Her data are exiguous, bedevilled by problems of interpretation, and are taken from such disparate geographic and cultural contexts that they are, at best, only indicative of possibilities. Her study is typical, and most evidence relating to seasonality of death in the Empire outside the City of Rome is limited to quantities of about this order.

The Egyptian Evidence

For the Nile Valley riverine environment there exists a detailed study by Boyaval based on 'mummy certificates'. He claims that these labels, fastened to mummy casings,

[80] E. Patlagean, *Pauvreté économique et pauvreté sociale à Byzance 4e–7e siècles* (1977), 92–4.



Data source: Boyaval, op. cit. (n. 81); Casarico, op. cit. (n. 82), with up-dates.

functioned much like tombstone inscriptions in the Latin West, recording the name of the deceased and, in some cases, the actual date of death and/or deposition. He was able to collate 217 cases for the ecological zone of Upper Egypt (the Fayyûm, Middle and Upper Egypt, Nubia) and 389 for the zone of Lower Egypt (the Delta).[81] Not used by Boyaval are the data (alas even more exiguous) provided by 'death declarations' made to Roman officials of the provincial administration of Egypt.[82] These were made for fiscal purposes and therefore have almost the same evidentiary profile (concentrations of provenance, chronological distribution) as do the well-studied census declarations.[83] It is important to note that the death-declarations, being a fiscal instrument, were made predominantly by and for males.[84] These too have their problems, but they at least specify the exact month in which the person died.[85] It is possible to reduce these three sets of data to graphic form, and thereby to test their implications for seasonal mortality (Fig. 14).

[81] B. Boyaval, 'La mortalité saisonnière dans l'Egypte gréco-romaine', in J. Vercoutter (ed.), *Livre de centenaire, 1880–1980, de l'Institut français d'archéologie orientale du Caire* (1981), 281–6; the use of the 'mummy labels' as evidence is discussed by the same author in his, 'Remarques à propos des indications d'âges des étiquettes des momies', *ZPE* 18 (1975), 49–74; for their chronological distribution see his, 'La date sur les etiquettes de momies', *BASP* 18 (1981), 101–18, at 116 (before the second century: 3; A.D. 100–150: 4; A.D. 150–211: 15; third-century: 54).

[82] There were forty of these known at the time Montevecchi made the first comprehensive study of them: O. Montevecchi, 'Ricerche di sociologia nei documenti dell'Egitto greco-romano, V: Le denunce di morte', *Aegyptus* 25 (1946), 111–29; the number has now more than doubled: L. Casarico, *Il controllo della popolazione nell'Egitto romano, 1: Le denunce di morte*, Corpora Papyrorum Graecarum 2 (1985); supplemented by U. Molyviati-Toptsi, 'A death certificate from the Berkeley collection', *ZPE* 77 (1989), 281–2, and the new finds listed by her.

[83] Compare Montevecchi, op. cit. (n. 82), 112–13, and Casarico, op. cit. (n. 82), 25–33, with Bagnall and Frier, op. cit. (n. 1), 6–9, and their table 1.2 and fig. 1.1.

[84] Not solely by males, as Montevecchi, op. cit. (n. 82), 121, thought; Ulrich Wilken was right (*Griechische Ostraka aus Aegypten und Nubien* 1 (Leipzig, 1899; reprint, New York, 1979), 454) — women were included, though perhaps only in default of other declarants. There are now fifteen female cases: see Casarico, op. cit. (n. 82), 12.

[85] The dates on which they were *filed* (which is sometimes different than the month of death), however, are sometimes much later in the year, but always, it seems, within six months of the month of Mecheir (late January/February) — with a tendency to 'bunch' in the months immediately before and including Mecheir — a pattern that prompted the hypothesis that the filing had to be made by that month for fiscal purposes: Montevecchi, op. cit. (n. 82), 117–19, and Casarico, op. cit. (n. 82), 17; an hypothesis first proposed by Wilcken: L. Mitteis and U. Wilcken, *Grundzüge und Chrestomathie für Papyruskunde* (1912), 1, 196 (though, as Montevecchi cautions, there is nothing in the form of the documents themselves that states as much).

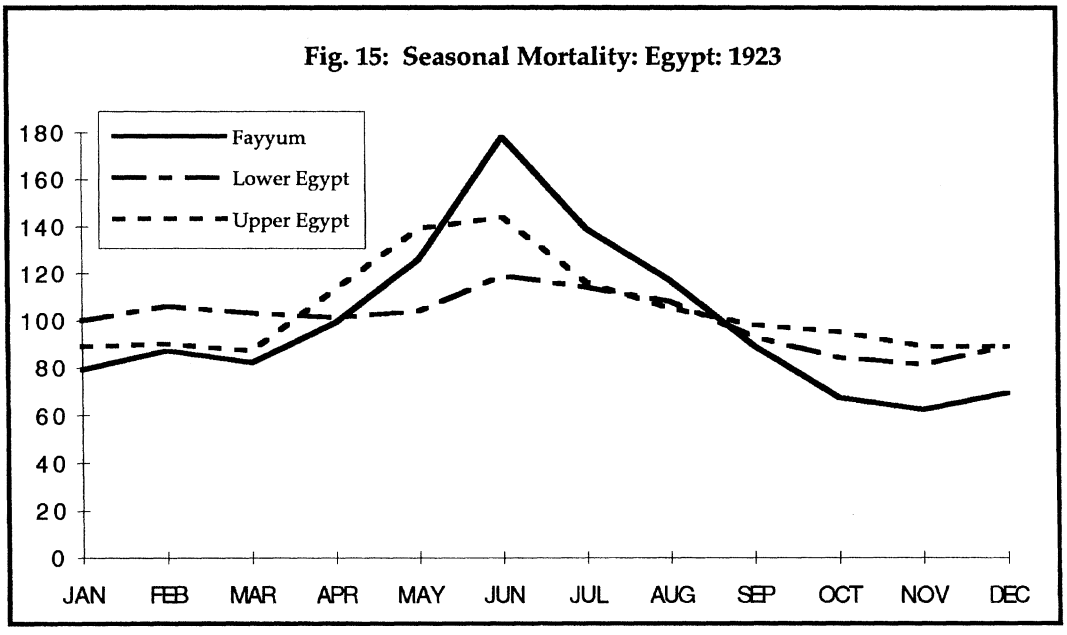
There are several objections to accepting either Boyaval's data or those of the death certificates as reliable indicators of seasonal mortality. First, the graphic curves produced by these data are oddly erratic in a fashion not characteristic of most known seasonal mortality distributions. Secondly, the data are mutually contradictory. For example, the death declarations which come from Upper Egypt (mainly from the Fayyûm) clearly indicate high months of mortality in mid-winter (January–February) with a steep *decline* in mortality in spring. The 'mummy certificates' from the same region, however, indicate precisely the opposite (i.e., a winter plateau then leading to *rising* death-rates in the early spring). But even more disturbing is the fact that none of these sets of data have any coherence with the known seasonality of mortality in Egypt (Figs 15 and 16). We can analyse reliable statistics produced for the decade immediately after the First World War when the Egyptian population was still firmly pre-modern in type. When processed for the factor of seasonality, these data reveal a fairly typical pattern in which the populations of Upper Egypt have marked summer highs of mortality (mainly in the months of May–June), and where the district of Fayyûm (from which most of the ancient papyrological evidence derives) is not only no different from this general pattern, but actually demonstrates a more pronounced mid-summer high of mortality.[86] It is difficult to specify what environmental and demographic conditions in Egypt would have changed so radically so as to produce the erratic and contradictory patterns produced by the papyrological data and the evidence of the mummy certificates. The possibility that the death declarations and the certificates were governed primarily by factors other than the immediate decease has been canvassed. It seems probable that there might be some indirect connection between the propensity to file the death notices with fiscal authorities, and the relative frequency with which certain seasonal deaths were noted. The distorting factor in the case of the mummy labels is less certain.[87] As enticing as the Egyptian data are, therefore, a course of caution seems best advised. Whatever they do indicate, they probably cannot contribute to our knowledge concerning seasonal mortality.

The Western Mediterranean

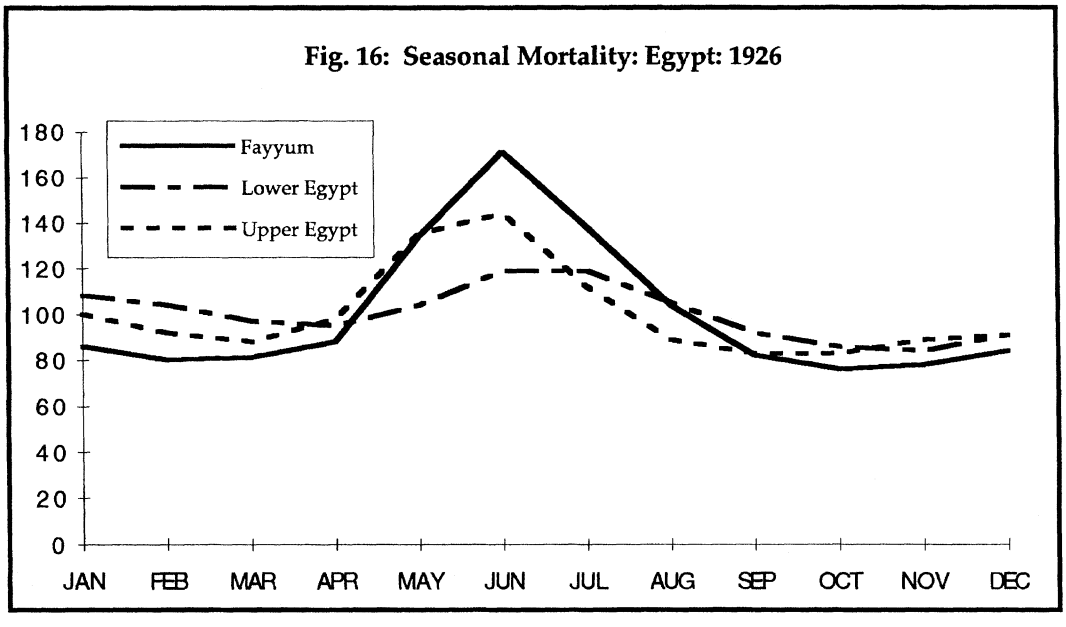
The data pertaining to seasonal mortality for places and times outside those of the Christian populations of the urban metropolis do not exist in the profusion produced by the City of Rome (hence the importance of the Rome study). Although the data are not as plentiful as for the urban metropolis, they do exist in significant numbers and the indications about seasonality they produce, however tentative, must be pursued for critical reasons of context. That is to say, these regional samples can provide us with some idea of how typical the Rome data are within the wider context of the western Mediterranean. Given the apparent weakness of existing studies of seasonal mortality for the eastern Mediterranean, I have, therefore, collated new data on five regions of the western Mediterranean for which the Latin funerary epigraphy (provided, once again, by Christian funerary stones) can furnish evidence concerning precise time of death. Regional samples were assembled for: Italy outside Rome, which I have provisionally divided into two zones: (i) Northern Italy, and (ii) Southern Italy and Sicily; (iii) the

[86] I surveyed the decades of the 1920s and 1930s in the statistical charts furnished by the *Annuaire statistique de l'Egypte* under the section entitled 'Distribution mensuelle des naissances et des décès par gouvernats et provinces'; the years 1923 (*Annuaire statistique de l'Egypte, 1923–1924*, Cairo, 1925, tableau iv, pp. 50–1) and 1926 (*Annuaire statistique de l'Egypte, 1926–1927*, Cairo, 1928, tableau iv, pp. 60–1) were chosen as exemplary of the general pattern. It should be noted that the seasonal mortality for Lower Egypt (the Delta) has been rather more erratic and unpredictable than that of Upper Egypt. Since the figures were given for provinces, it was also possible to track the specific figures for the 'Fayoum', from whence most of the papyrological evidence derives, to see if there was a seasonal régime of death that was peculiar to its environment.

[87] See n. 85 above; the problem is that such an interpretation must hypothesize an indirect linkage between the 'filing dates' of the death notices and the affixing of labels to mummy caskets and a propensity to record certain seasonal death patterns.



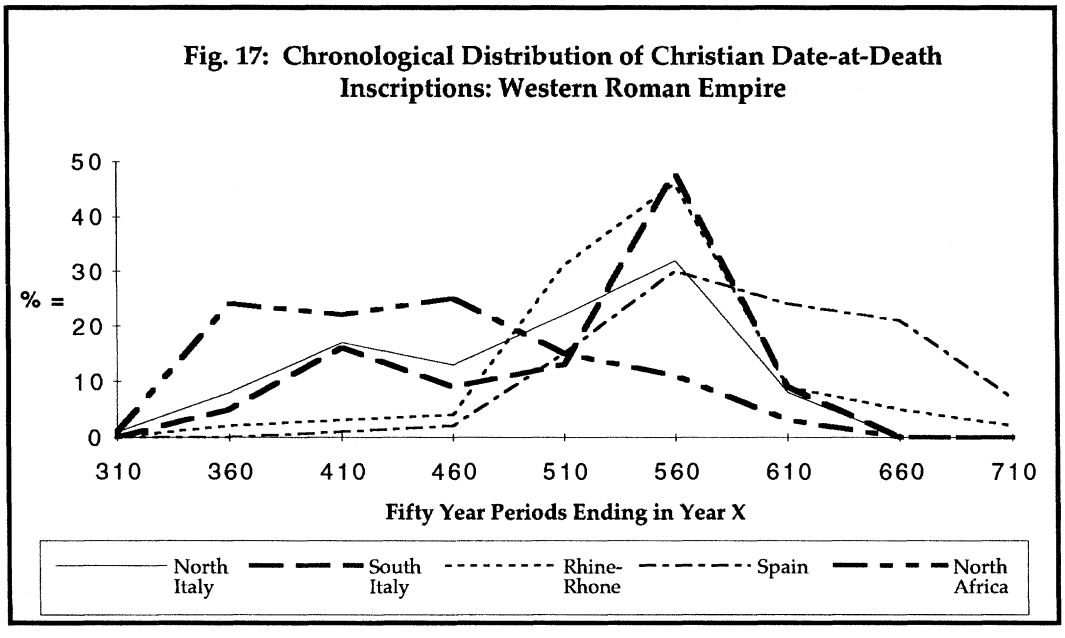
Data source: *Annuaire Statistique de l'Egypte, 1923–1924* (Cairo, 1925), tab. IV, pp. 50–1.



Data source: *Annuaire Statistique de l'Egypte, 1926–1927* (Cairo, 1928), tab. IV, pp. 60–1.

more northerly regions of the Rhine-Rhône corridor of Gaul and Germany; (iv) Spain, principally its northern and western zones; and (v) the provincial regions of North Africa.

I have applied the same method of analysis to these regional collations of funerary inscriptions as described above for the Christian inscriptions from the City of Rome. Peculiarities that might skew the evidence from each regional sample are discussed under each respective heading below, but a few preliminary remarks might be made here on a general matter that concerns the samples as a group: their comparative chronological distribution. As can be seen from a sorting of all dated inscriptions from our various regional samples, the Christian inscriptions are distributed according to



Data source: Table 1: primary sources: all dated date-at-death inscriptions exclusive of Rome and Italy.

rather different temporal cycles (Fig. 17). Unlike the sample from the City of Rome, all the regional samples save that from North Africa find their greatest concentration of all inscriptions in the fifty-year period between A.D. 510–560 (between 30–48 per cent of all dated inscriptions in these samples). The high points of chronological distribution of the North African inscriptions, on the other hand, are fairly evenly distributed across three different fifty-year periods: 311–360, 361–410, 411–460 (22–25 per cent in each). Those cases where the Christian funerary texts are intensely located within a set fifty-year period are advantageous for our purposes. This would tend to suggest that the samples drawn from North and South Italy, and from the Rhine-Rhône region in the Gauls and Germanies, were produced by a few generations of dedicators. This is much less likely to be true of the North African sample, and adds to the general unreliability of this particular regional set of evidence for our purposes. The same caveat applies to the evidence from Spain since in what is already a rather sparse sample, the dated Christian epitaphs are evenly distributed over several fifty-year periods between A.D. 510 and 660. The figures from North Africa and from Spain relating to seasonal mortality must therefore be viewed as problematic; those from the other regions, however, have a rather higher order of dependability.

Italy

Fortunately for our type of analysis, Christian populations outside the City of Rome in Italy also shared the cultural practice of noting the precise time of death on their tombstones. The problem here, however, is one that bedevils the field of Italian epigraphy in general — the numeric paucity of the epigraphy compared to the urban metropolis. By using the collected volumes of *CIL*, *ICI*, with the addition of unrepeated materials from *ICUR* 1, and other epigraphical publications, however, a reasonably large sample was culled for Christian populations in Italy outside the City of Rome (N = 1,008).[88] In the process of collating the data for this sample, the data were

[88] See Table 1 'Sources', for the corpora of inscriptions used in the collection of the primary data.

collected for three sub-regions: Northern Italy (*Regiones* 6–11; N = 533), Southern Italy (*Regiones* 1–5; N = 244), and Sicily-Sardinia (N = 244).[89] What emerges from an initial sorting of these data is a palpable difference between a 'Northern' and a 'Southern' Italian regime. Both have summer highs of mortality in the August to October months. But there are significant differences. The North has a single high in August with a general decline which then sets in (Fig. 18). In the South the August peak leads to even higher death-rates that culminate in October (Fig. 19). Even within the summer highs, the indexes of amplitude of death in the South are much higher for those same months. The other major distinction is that whereas the South has a single massive peak of mortality in late summer, the North has a second and more pronounced high extending over the winter months of December–January, a time which is actually a significant 'down' period in mortality in the South.

These distinctive patterns are paralleled by a series of studies of the pre-modern populations of the Mezzogiorno. Detailed study of the problem of seasonality for the Bitonto region of Bari province over the period from the mid-seventeenth to the end of the eighteenth century (1661–1800) reveals patterns that are similar to those of the Roman period.[90] Similar studies of seasonal mortality patterns in the provinces of Bari and Foggia for the early nineteenth century reveals typically pronounced summer highs of mortality (Fig. 20).[91] Analyses of data from the pre-modern cities of Sicily (during the seventeenth century) show in almost all cases that there was a single great season of death extending over the late summer and early autumn months of August to October (with high seasonal indexes of 150 to 170).[92] These cycles match the general patterns for the City of Rome in Late Antiquity, with the exception of the continuation of high death rates beyond the autumn months into winter.

This is where the subdivision of the data into smaller regional sets helps explain the divergent patterns. If the samples for Southern Italy and Sicily of the Roman period are separated from those for Northern Italy, it is apparent that the months of highest mortality in the South were in the months of August to October, whereas the high rates in the North were concentrated later, in the months of October to December (Fig. 21). By contrast, similarly detailed studies of pre-modern demographic regimes for Northern Italy, such as that done for the region centred on Bologna for the early nineteenth century, show a more consistent pattern of a high season of death concentrated in the November to February period of mid-winter. Although there is a second rise in death rates in mid-summer (August) from deep lows in the spring (indexes in the low 80s), the summer period of death tends to attain only the average rates of mortality for the whole year (index of 100).[93] The simple hypothesis follows that as one shifted to more northerly environments it was the winter months that were the periods of higher mortality. In this respect, the pre-modern and ancient populations are palpably reacting in the same fashion to broadly similar environmental conditions and constraints.

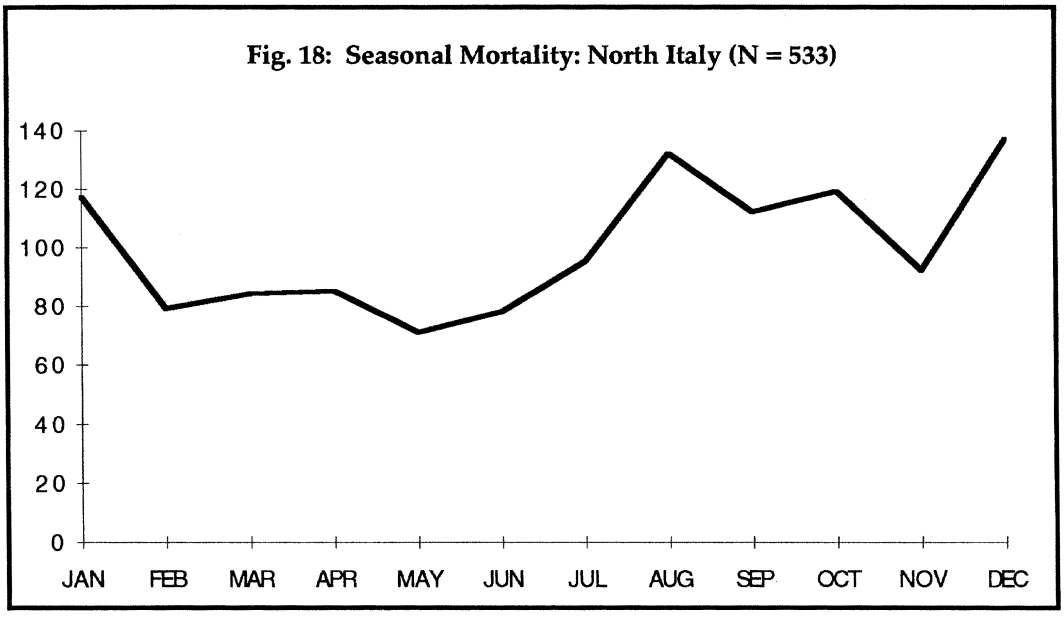
[89] Part of the reason for keeping the 'Sicily' sample separate from that of Southern Italy was the fact that most of the epigraphy was in Greek; these data were therefore initially kept separate to see if there might be any cultural differences between them and the Southern Italian set. There were, however, no significant differences that were relevant to seasonal mortality.

[90] A. F. Cardamone, 'Il ciclo stagionale dei matrimoni, delle nascite e dei decessi a Bitonto dal 1661 al 1800', in E. Sori (ed.), *Demografia storica* (1975), 227–36, esp. 'Tab. 7: Indici di stagionalità dei decessi, Bitonto, 1661–1800', p. 235.

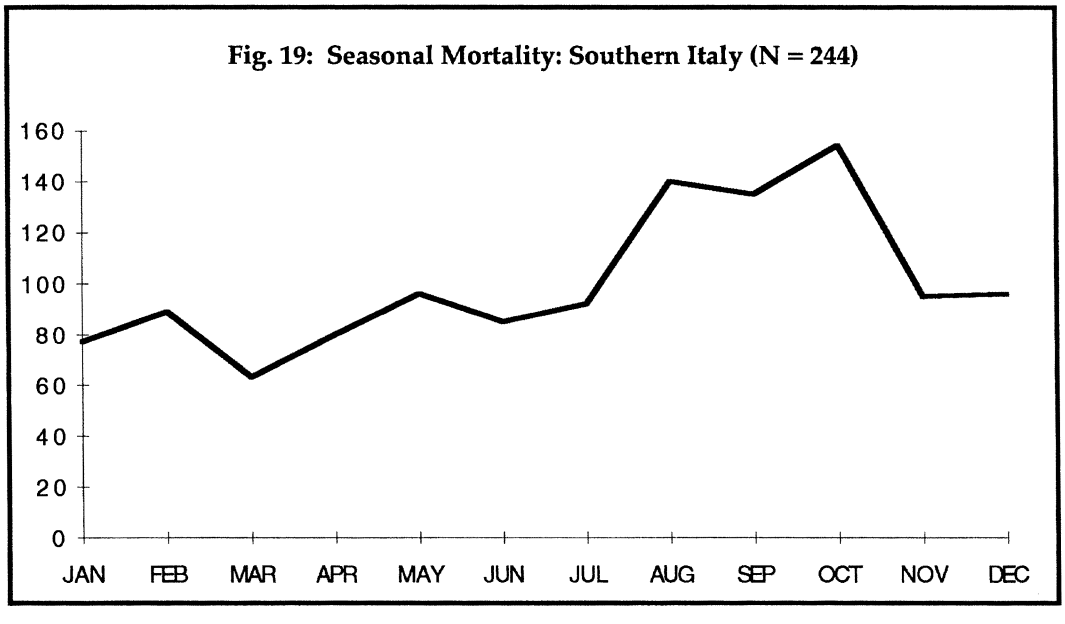
[91] F. Assante, *Città e campagne nella Puglia del secolo XIX: l'evoluzione demografica* (1974), 124–8; the figures are replicated from 'Grafico 10: Indici di stagionalità in provincia di Bari (1816–1820)', and 'Grafico 11: Indici di stagionalità di Foggia (1816–1820)', p. 126.

[92] D. Ligresti, *Sicilia moderna: le città e gli uomini* (1984), 155 and 'Tabella 24: Indici di stagionalità delle sepolture'.

[93] A. Bellettini, *La popolazione del Dipartimento del Reno* (1965), 188 f. and 'Figura 22: Ciclo stagionale delle morte (1811–12)', facing p. 190; cf. G. Marcuzzi and M. Tasso, 'Seasonality of death in the period 1889–1988 in the Val di Scalve (Bergamo, Pre-Alps, Lombardia, Italy)', *Human Biology* 64 (1992), 215–22.



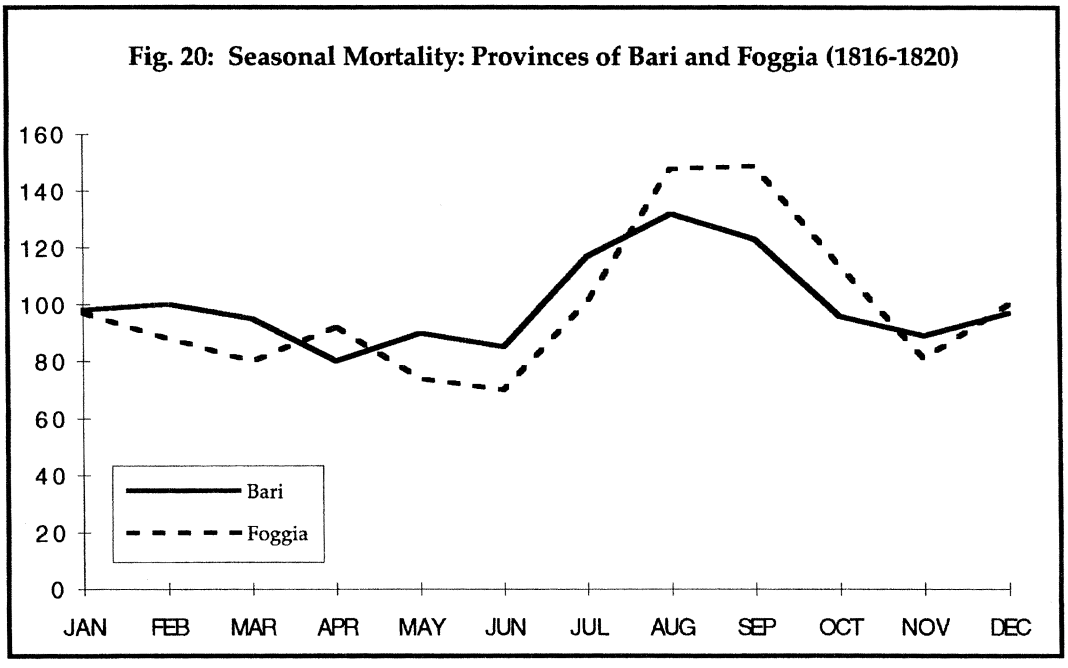
Data source: Table 1: primary sources: Italy.



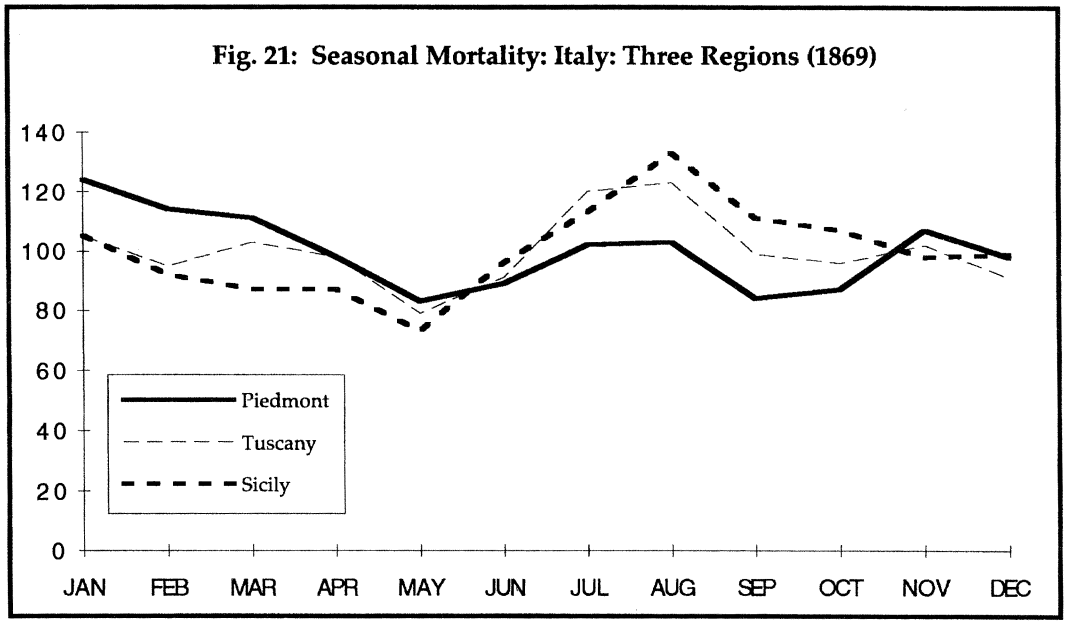
Data source: Table 1: primary sources: Italy.

Gaul-Germany and Spain

The probable effects of more northerly environments can be seen in the samples taken from Spanish provinces (Fig. 22) and the provinces of Gaul and Germany (Fig. 23). The statistics provided by Spain come from the more non-Mediterranean environments of the North-West and the West. Those from Gaul tend to come overwhelmingly from what might be called the Rhine–Rhône corridor: from the late imperial provinces of Viennensis, Lugdunensis Prima, Belgica Prima, Germania Prima,

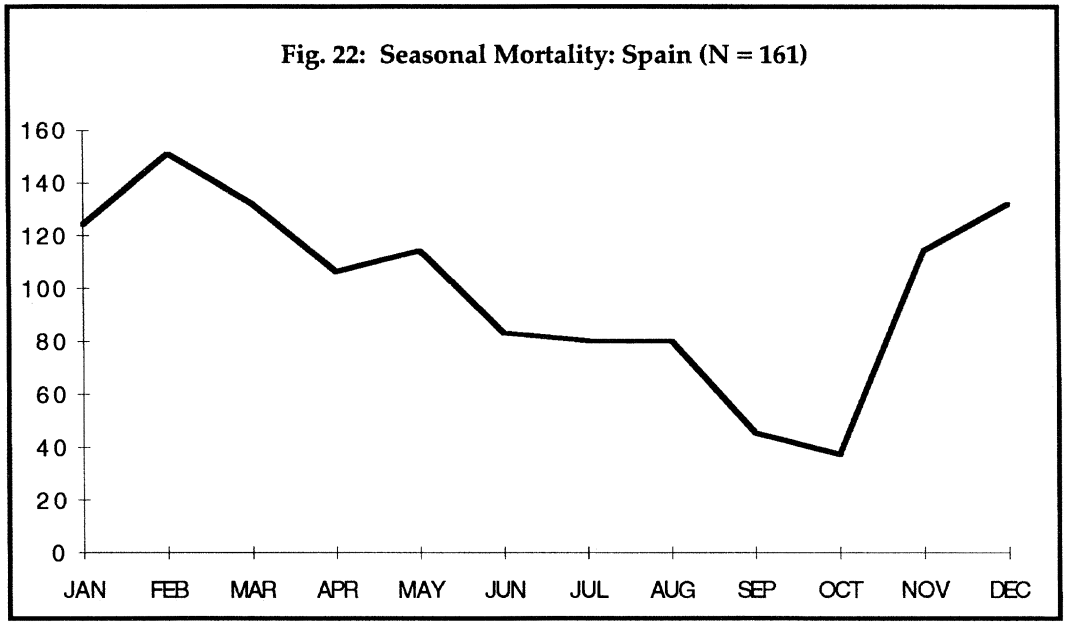


Data source: Assante, op. cit. (n. 91), grafici 10–11, p. 126.

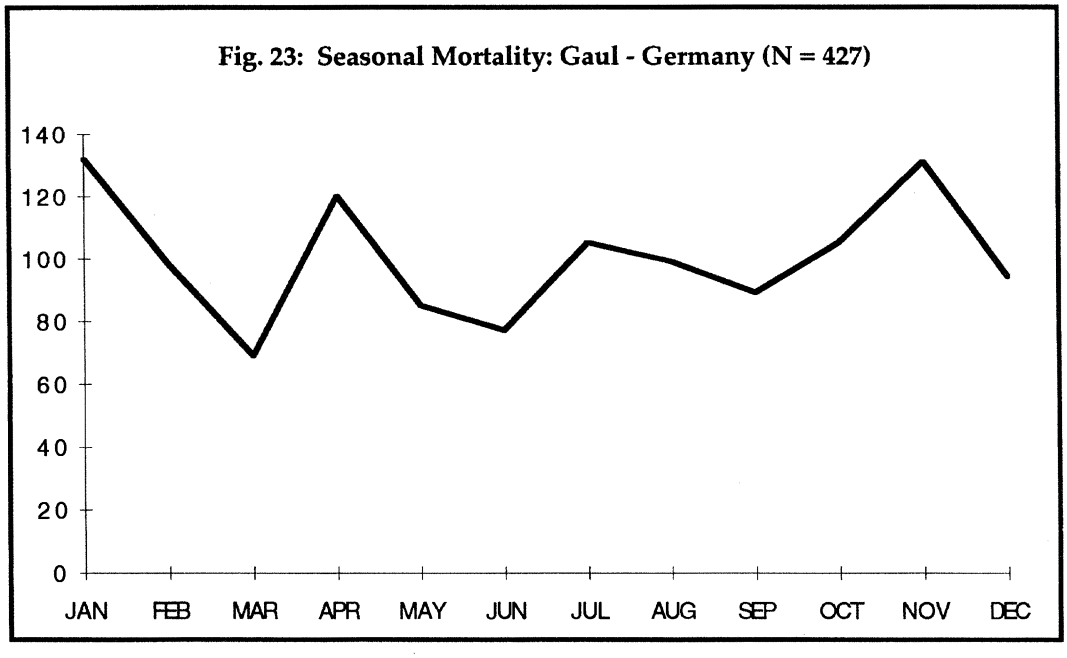


Data source: Ferrari and Livi Bacci, op. cit. (n. 59), tab. 3, p. 279.

and the eastern parts of Narbonensis Prima. In both samples the high season of death is concentrated in the winter months between November and February. This accentuates the patterns that distinguished Northern from Southern Italy. It should be noted, however, that the sample taken from the Rhine-Rhône zone of Gaul and Germany is far more dependable than the one adduced for Spain. There are three reasons for the different reliability. First, the absolute number of data for Spain are exiguous. Secondly, the data collected from the late Gallic and German provinces are concentrated in a

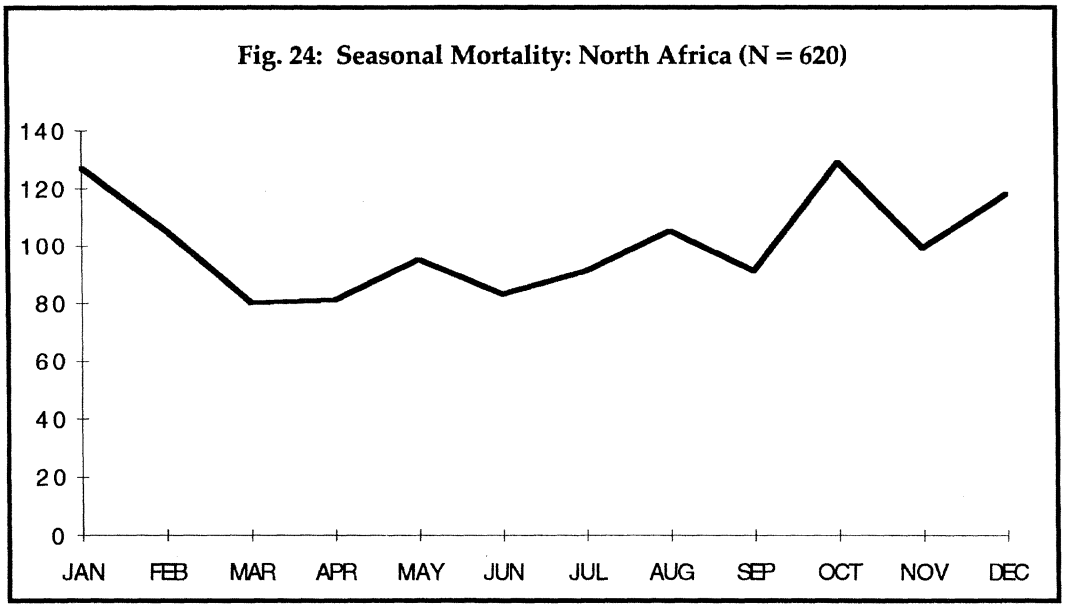


Data source: Table 1: primary sources: Spain.



Data source: Table 1: primary sources: Gaul.

single-time period, whereas the more exiguous data from Spain are scattered across a much broader time span (Fig. 16). Finally, the age-distribution of the deceased for Gaul-Germany is much closer to a 'model' population (discounting infant and child mortality) than is that from Spain. In sum, the graphic cycle produced for Spain is probably best discounted as unreliable, whereas the larger, more consistent and chronologically condensed sample from the North is reasonably informative. The latter sample would argue, as in North Italy, for a seasonal regime of mortality characterized by high death-rates in the mid-winter months.



Data source: Table 1: primary sources: Africa.

North Africa

For North Africa, a region renowned for the quantity of its surviving epigraphy, the quality of its Christian epigraphy is surprisingly disappointing. Much of it is fragmentary and difficult to restore and to read. The final numbers concerning seasons of death that have been collected by existing investigations of the subject have been rather sparse and isolated. A very small sample of fifteen absolute dates collated by Père Delattre from the Christian epigraphy of Carthage has peaks in December-January and another summer high in the May to September period.[94] For rural regions outside Carthage, and further to the west, an important source of data is provided from the small cemetery in the southern region of Cirtan Numidia, at Jabal Nif en-Nsir, north of Batna in the 'Great Lakes' region of the high Constantine plains. The cemetery, dated by Leschi to the fourth and fifth centuries A.D., yielded about fifty tombstones that gave the precise date of decease.[95] Most of the deaths were in the winter months, with another peak in the autumn months of September and October. Finally, there is the corpus of Late Roman inscriptions from the Roman city of Altava located in western Algeria (Hadjar Rûm, former Lamoricière) that provides 169 cases of precisely dated time of decease. Most persons died in the winter months with a secondary peak in the preceding months of autumn, in September and October.[96]

The recent publication of the funerary epigraphy of Carthage and of Haïdra (ancient Sbeïtla) enables greater numbers to be accumulated, but the patterns that emerge are rather confusing (Fig. 24). They would seem to indicate a bimodal periodization of death with a lower mid-summer high in the July to September period, and much higher levels of death in the months of December to January. Collation of all the North African data suggests that the winter months, especially the period between November and January, were the most lethal. That betokens a rather odd distribution

[94] J. M. Lassère, *Ubique Populus: peuplement et mouvements de population dans l'Afrique romaine de la chute de Carthage à la fin de la dynastie des Sévères: 146 a.C.–235 p.C.* (1977), 553–4.

[95] F. Logeart, 'Les inscriptions funéraires chrétiennes du Djebel Nif en-Nser (commune mixte d'Aïn M'lila)', *Revue africaine* 84 (1940), 5–29; Lassère, op. cit. (n. 94), 554–5; location of the cemetery: S. Gsell, *Atlas archéologique*, f. 17 (Constantine), no. 441.

[96] J. Marcillet-Jaubert, *Les inscriptions d'Altava*, Publications des Annales de la Faculté des Lettres, Aix-en-Provence, 65 (1968); Lassère, op. cit. (n. 94), 555; fig. 56 (N = 169, dated between A.D. 301 and 599).

of death. One would expect the North African environment to be much more like that of Southern Italy and Sicily, and therefore to be marked by a mid-summer high of mortality.

The explanation for the peculiar seasonal cycles of mortality indicated by the North African funerary epigraphy is to be found in the broader social context in which the data themselves were produced. Once that context is understood, it requires us to make the appropriate adjustments to the interpretation of the evidence. The great and relevant caution here is that North African epigraphy exhibits a striking emphasis on celebration of deaths of the elderly (especially those over fifty years of age). What we are witnessing in the graphic patterns of seasonal mortality is a pattern that applies especially to those age-ranges. We are, therefore, commensurably less well-informed about the middle and lower age-ranges.[97] Indeed, if the age-range of those recorded in the African inscriptions recording the date of death is investigated it is precisely this very pronounced skewing of the data towards the celebration of the elderly and very elderly in death that re-appears, and it is those elderly persons who seem to be especially prone to disease vectors borne during the winter months of the year.

The impression left by the North African literary sources, on the other hand, is that it was the summer period that was considered especially dangerous and difficult to bear — the season that was full of potential sickness and disease for most persons. Augustine refers to the 'sickly airs' (*aer morbidus*) of the low lying seashore zones near the port city of Hippo Regius in summer.[98] Writing from Carthage at the beginning of the summer of A.D. 250, Cyprian noted that 'the summer has already begun, a season that is disturbed by continual and serious illnesses'. It is important to note that he was considering normal conditions in the city, and not ones peculiarly connected with the onslaught of plague that struck the city in the summer of 252.[99] Given the different environmental conditions on which they were reporting, their emphasis on summer as the high season of morbidity might indicate that the atmospheric and ecological conditions of the shoreline were particularly hard on health in these months, whereas in the drier highlands of the interior, although the heat was intense, general conditions were not as severe or deleterious to health as the cold, frost, and brutal cold winds that marked the winter seasons — which seem to have taken a toll on the elderly, as at Jabal Nif en-Nsir and Altava. It is this peculiar and disproportionate influence of the commemoration of the elderly that skews our epigraphical sample on seasonality. Despite the relatively high absolute numbers of data that can be culled from the North African epigraphy, therefore, one must note the other caution (Fig. 16) that the Christian inscriptions from North Africa are distributed rather evenly over a long period of time, a distribution which impairs their statistical significance.

VI. CONCLUDING REMARKS

It is probably premature to designate specific causes (e.g. specific disease vectors) for the patterns of seasonal mortality evident in our analysis of the Roman data. Even in well-documented studies of comparable early modern situations (for example, eighteenth- and early nineteenth-century London) the linkage of specific causes of mortality to seasonal cycles of death remains a rather speculative enterprise. There can be no reasonable doubt, however, that the main disease causes must have been the 'big killers' of the time. These are, as yet, unknown to us by direct measurement and so the most reasonable guide remains comparative data from the same physical environments. The most appropriate comparative contextual evidence is provided by demographic

[97] See the cautions in Shaw, op. cit. (n. 29), 476 f., and (n. 31), 78 f. with table 4.4.

[98] Augustine, *Ep.* 126.4.

[99] Cyprian, *Ep.* XVIII.1.2; see G. W. Clarke, *The Letters of St. Cyprian of Carthage, Letters 1–27* (1984), 297–8, who notes that there is no reason to see in these words reference to early stages of the 'plague of Gallus' or to specific epidemics of malaria: 'Cyprian is merely making a deduction from general observation about a notoriously unhealthy season'. On the plague, see the description in Cypr., *de Mort.* and Pontius, *Vita Cypr.* 9.

studies of early modern Italy. Until the decades before the Second World War, the demographic regimes of many regions of Italy, especially the rural districts and the South, remained pre-modern in their profile (very high levels of infant mortality, for example, being one sure indicator of the population's type). Given the population interests of the modern state, reasonably good statistics are available for the period from the Risorgimento onwards. For periods before this, however, there are occasional regional surveys which are available and which are dependable.[100] A detailed study of the region around Bologna (Dipartimento del Reno) in the early nineteenth century (1811–12), for example, shows a typical bimodal pattern of death with one high in the December–January period, and another more pronounced season of death in June–August.[101]

The principal environmental factor that affected both human organisms and disease vectors in such an 'unprotected' pre-modern environment was that of temperature.[102] This single variable seems decisive in affecting the other environmental factors that hinder or aid disease organisms (e.g. atmospheric humidity, condition of the water-supply). If one considers pre-modern European populations in general, where the effects can be measured, it seems clear that it is the factor of temperature variability that marks the main separation between 'northern' and 'southern' regimes of seasonal mortality (Figs 18–23).[103] In all regions this single factor exacerbated the seasonal impact of the fatal infectious diseases that were the principal causes of mortality in the pre-modern period. The main causes of epidemic death were typhus and cholera, but 'normal morbidity' was mainly caused by 'normal' diseases. These were, in order of significance as causes of death: diseases of the respiratory system (mainly bronchitis, pleurisy, tuberculosis), infections of the digestive system (gastroenteritis, colitis), and related diseases.[104] Keeping these general parameters in mind, the following general aspects of our analysis of seasonal mortality for the City of Rome, Italy, and selected regions of the Western Empire are worth noting:

(i) The first is the relationship between the birthing cycle and the seasonality of mortality. Since in pre-modern populations the highest levels of mortality are to be found amongst newborn infants, high incidence of births concentrated in a given part of the annual cycle will invariably affect the measurement of seasonal mortality. Although infant mortality might explain some of this pattern, there are two arguments against it constituting an important explanation for the pattern discernible in the Christian epigraphy of Rome. Firstly, the degree of seasonal change in the birthing cycle, as it has been reconstructed: although there is a slight peak in the birthing cycle in August, it is not of sufficient amplitude to affect the enormous peak of seasonal mortality in September. Secondly, the figures for infant and child mortality are, in fact, largely missing. The principal factors causing the high late-summer mortality amongst the non-infant/adult population must therefore be largely exogenous — that is to say, they must be found in environmental conditions.

(ii) Another matter deserving comment is the amplitude of the mortality of seasonal mortality cycles. As populations are more and more 'modern' the distribution of deaths tends to become evenly distributed over all the months of the year, and the degree of variation between one part of the year and other becomes less and less pronounced. The degree of amplitude of seasonal mortality in the City of Rome, however, is very pronounced, the difference between the lowest months (February, June) and the highest (August, September) being measured by a factor of two or more. Degrees of amplitude are very difficult to correlate with other factors, especially when we are clearly missing one of the great sets of mortality figures (those for infants) that would probably produce

[100] A. Bellettini, *La popolazione italiana: un profilo storico* (1987), 162 f.; until the turn of the century, of all countries in Western Europe, Italy and Spain had the lowest life expectancy at birth, and some of the highest general and infant mortality rates; see Ferrari and Livi Bacci, op. cit. (n. 59), 276 f., for whom the half century following Unification 'è un periodo durante il quale la mortalità è ancora fortemente caratterizzata da condizioni di *ancien régime*'.

[101] Bellettini, op. cit. (n. 93), 163 f.

[102] Ferrari and Livi Bacci, op. cit. (n. 59).

[103] Ferrari and Livi Bacci, op. cit. (n. 59), table 2, p. 278.

[104] Bellettini, op. cit. (n. 100), 166–75, with tables 7, 8, and 9, provides a convenient summary.

another season of death in the mid-winter months, and which in turn would probably reduce the great amplitude of the mid-summer highs in the City of Rome. Despite these caveats, a few basic observations can legitimately be made. However much the figures for Rome might be modified, it is clear that the annual amplitude between seasonal 'highs' and 'lows' of mortality would remain considerable. An amplitude (+200 to -75, a 'swing' of about 275 points) is a huge difference for a normal non-crisis population. Even with the addition of seasonal infant and child mortality in different months that might somewhat temper the differential amplitude, this is still a pre-modern population that was very susceptible to disease vectors — as bad in this respect as most of the worst cases found in so-called 'developing' countries. None of the reliable provincial or regional samples, including those from Northern or Southern Italy (the latter being the most detrimental of the surveys from outside Rome) have the same degree of amplitudinal variation in seasonal mortality. This observation would seem to indicate that, although environmental conditions were still very unfavourable to human survival in provincial contexts, they were markedly more favourable than those that prevailed in the urban metropolis.

(iii) The seasonality of mortality should be correlated with the principal 'great killer' diseases of pre-modern western Europe and the Mediterranean: tuberculosis and related pulmonary infections.[105] Infectious diseases that infect the respiratory system are particularly significant in accounting for the high mortality rates in the mid-summer months.[106] Because of its prominent place in contemporary infectious disease elimination programmes, modern-day historians of Antiquity have tended to accord much attention to malaria. The less virulent and destructive form (*vivax malaria*) is most pervasive in conditions of mid-summer heat and humidity, but the most lethal form (*falciparum malaria*) 'which has a longer incubation period in addition to its higher temperature requirements for development, does not reach its peak frequency until the autumn'.[107] The problem is that the mortality and seasonal mortality effects of malaria are quite variable around the Mediterranean. While malaria seems to have been a significant cause of death in pre-modern Greece, the same has not been true of Italy, where no history of the pre-modern demography of the peninsula counts it as one of the major factors in mortality for the general population.[108] Comparative studies tend to account for such seasonal imbalances in mortality by emphasizing the greater effect that normal gastric and respiratory diseases have in hotter or colder conditions, diseases such as smallpox and typhus — or afflictions variously categorized as 'fevers' and 'gripes' in records of the time. But the salutary caution has been made, and bears repeating, that 'the logical and empirical difficulties involved in . . . moving from observed patterns of seasonality to imputed patterns of disease are considerable'.[109]

(iv) Substantial variations in seasonal amplitude of mortality are usually characteristic of pre-modern populations that are living in very unhygienic environmental conditions. For all that, it is *not* possible to correlate the degrees of amplitude with the other demographic characteristics such as expectation of life at birth. It will probably remain

[105] M. D. Grmek, *Les maladies à l'aube de la civilisation occidentale: recherches sur la réalité pathologique dans le monde grec préhistorique, archaïque et classique* (1983), ch. 7, 'Une grande tueuse: la tuberculose', 261–90; and ch. 10, 'L'hyperostose poreuse du crâne, les anémies héréditaires et l'évolution du paludisme', 355–407 (Eng. trans., *Diseases in the Ancient Greek World* (1989)).

[106] R. Sallares, *The Ecology of the Ancient Greek World* (1991), 237 f.; Scheidel, op. cit. (n. 12), 155–64, argues forcefully that the temporal convergence of the period of highest seasonal mortality in the City of Rome with the period when falciparian malaria is most virulent (both in autumn) permits one to deduce that malaria was probably the principal lethal disease vector. While this *might* be true, it is difficult *on this basis alone* to specify malaria as the main cause of the high autumnal mortality in the city, or indeed to separate its effects from those of the other great 'killer' diseases of the time, including typhoid, tuberculosis, and severe gastero-intestinal infections.

[107] Di Comite, op. cit. (n. 58), 194 f. and fig. 22, p. 196, cf. Sallares, op. cit. (n. 106), 271 f., selects this as the main disease factor that made autumn 'the most dangerous season of the year in ancient Greece'.

[108] Bellettini, op. cit. (n. 100), 170 ff. and 'Tabella 7: Mortalità per gruppi di cause', 171; and 'Tabella 9: Morti per gruppi di cause e di età, 1887–89', 174: the leading causes of death in the period were pulmonary and bronchial infections, gastro-enteritis and colitis, tuberculosis, scarlet fever (and related illnesses), infections peculiar to newborn infants. Malaria accounted for only 2.2 per cent of all mortality during the years surveyed.

[109] J. Landers and A. Mouzas, 'Burial seasonality and causes of death in London, 1670–1819', *Population Studies* 42 (1988), 59–83, at 62–3.

impossible to do so, if only for the reason that two of the main population groups whose deaths *potentially* most affect the amplitude of seasonal variation of a whole population — infants and the elderly — are poorly represented in the Christian funerary epigraphy (the former, indeed, hardly at all). Moreover, in the case of Rome, one is dealing with a very large pre-modern city and the amplitudes of seasonal mortality that characterized its population were probably not true of those of smaller Italian cities (e.g. Pompeii) or of those in the Italian countryside in general. Without doubt, many of the factors producing the considerable seasonal variations were peculiar to the City of Rome itself, which, as a massive concentrated urban conglomeration, suffered from many of the typical detrimental conditions of health and sanitation that made pre-modern mega-cities 'net consumers' of their own populations.[110] Nevertheless, comparative studies would caution against there being any special 'urban' disease vectors. The people in large pre-modern cities were more susceptible to infectious diseases, but still tended to perish from the same diseases that characterized the rural regions around the cities themselves.[111]

(v) For all the caveats and problems with this large-scale project in sorting and counting one aspect of death in the Roman world, it is perhaps the positive results that should be emphasized. It is difficult, sometimes very difficult, for modern historical demographers to elucidate seasonality of mortality for populations of even three and four centuries ago.[112] To have been able to track the seasonal mortality of the population of a large urban centre over one and half-thousand years ago, even if for that portion of the population exclusive of infants, is still an achievement of sorts and a real contribution to the demographic history of the period. Although the testing of some of the rural and provincial regions served only to highlight the distinct problems that bedevil them (e.g. the data from Spain and North Africa), for others it can be argued that reliable indications of seasonal mortality have been uncovered. The distinctive patterns of seasonal death found in the Christian funerary data from the Northern and Southern parts of peninsular Italy, and from the Rhine–Rhône regions of the Gallic and German provinces of the North-Western frontier of the Empire, are reasonably reliable, and agree with the seasonal distributions of mortality typical of populations in these same lands in the pre-modern era. These regional patterns allow us to place the seasonal mortality cycles for the metropolis of the Empire in a regional and temporal context. The epigraphical evidence of the Christian burial places from the City of Rome, from Italy, and from selected provincial areas of the Western Empire has thus contributed to a better knowledge of some of the basic facts of life, and death, in the Roman world.

APPENDIX I : INDEXES OF SEASONALITY

The absolute quantitative data concerning any specific demographic factor for any given population group (e.g. regional, temporal, or ethnic) will usually be very different from those for any other such group. One of the primary desiderata of historical demographers in tracking the seasonality of a specific demographic phenomenon (e.g. birth, marriage, death) in a given population, however, is to be able to compare the

[110] A. Scobie, 'Slums, sanitation, and mortality in the Roman world', *Klio* 68 (1986), 399–433. For some comparative studies, see E. A. Wrigley, 'A simple model of London's importance in changing English society and economy', *Past & Present* 37 (1967), 44–70, and the riposte by A. Sharlin, 'Natural decrease in early modern cities: a reconsideration', *Past & Present* 79 (1978), 126–38.

[111] J. Landers, 'Seasonality of Mortality', ch. 6 in *Death and the Metropolis: Studies in the Demographic History of London, 1670–1830* (1993), 203–41, at 239–41; the analysis of mortality data for the city of Bologna and three adjacent rural districts (plains, hills, mountains) in the early nineteenth century reveals much the same cycles of death in all of them; in terms of the factors affecting their demographic make-up, it seems that pre-modern cities were not as dramatically separated from their rural environments as modern ones: Bellettini, op. cit. (n. 93), fig. 22, facing p. 190.

[112] J. Landers, 'Mortality and metropolis: the case of London 1670–1830', *Population Studies* 41 (1987), 59–76; Landers and Mouzas, op. cit. (n. 109); and Wrigley and Schofield, op. cit. (n. 62), give some of the problems with the English case where burial records and the London 'Bills of Mortality' have been used to reconstruct seasonal mortality.

results with the seasonal cycles typical of other populations. To be able to effect such comparisons directly, historical demographers reduce the fixed and absolute numbers for any given data sample to so-called 'indexes' of seasonality. The concept is relatively simple. It reduces the aggregate demographic statistics for any given group to their annual average which is then equated to the index number of '100'. The extent to which those figures (e.g. mortality statistics) for any given month exceed this average, they have an index that is above 100 (e.g. 132). The extent to which they fall below this average gives them a negative index number (e.g. 78). The formula used to calculate the running index numbers for a given year is:

$$\text{Index number} = \frac{\text{Ti} / \text{T}}{\text{Ni} / 365.25} \times 100$$

Where:
- Ti = the number of demographic events (births, marriages, deaths) in that month
- T = the total number of such demographic events in that year
- Ni = the number of days in the month for which the index is being calculated.

APPENDIX II

TABLE 1: PRIMARY SOURCES

General

ILCV	E. Diehl (ed.), *Inscriptiones Latinae Christianae Veteres* (3 vols, reprint, Berlin, 1961)

Greek Epigraphy

IGCV	C. Wessel, cur. A. Ferrua and C. Carletti, *Inscriptiones Graecae Christianae Veteres* (Bari, 1989) = *ICI 1*

Rome

IC 1	I. B. de Rossi (ed.), *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* 1 (Rome, 1857)
IC 2	I. B. de Rossi (ed.), *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* 2 (Rome, 1861)
IC Suppl	I. Gatti (ed.), *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores, Supplementum* (Rome, 1915)
ICUR 1	I. B. de Rossi and A. Silvagni, *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* n.s. 1: *Inscriptiones incertae originis* (Rome, 1922)
ICUR 2	I. B. de Rossi and A. Silvagni, *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* n.s. 2: *Coemeteria in viis Cornelia Aurelia Portuensi et Ostiensi* (Rome, 1935)
ICUR 3	I. B. de Rossi, A. Silvagni and A. Ferrua, *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* n.s. 3: *Coemeteria in via Ardeatina cum duabus appendicibus* (Rome, 1946)
ICUR 4	I. B. de Rossi and A. Ferrua, *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* n.s. 4: *Coemeteria inter vias Appiam et Ardeantinam* (Rome, 1946)
ICUR 5	I. B. de Rossi and A. Ferrua, *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* n.s. 5: *Coemeteria reliqua viae Appiae* (Rome, 1971)
ICUR 6	I. B. de Rossi and A. Ferrua, *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* n.s. 6: *Coemeteria in viis Latina Labicana et Praenestina* (Rome, 1975)

ICUR 7 — I. B. de Rossi and A. Ferrua, *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* n.s. 7: *Coemeteria viae Tiburtinae* (Rome, 1980)

ICUR 8 — I. B. de Rossi and A. Ferrua, *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* n.s. 8: *Coemeteria viarum Nomentanae et Salariae* (Rome, 1983)

ICUR 9 — I. B. de Rossi, A. Ferrua and D. Mazzoleni, *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* n.s. 9: *Viae Salariae Coemeteria reliqua* (Rome, 1985)

ICUR 10 — I. B. de Rossi, D. Mazzoleni and C. Carletti, *Inscriptiones Christianae Urbis Romae septimo saeculo antiquiores* n.s. 10: *Coemeteriae viae Salariae veteris et Viae Flaminiae* (Rome, 1992)

SICV — H. Zilliacus (ed.), *Sylloge Inscriptionum Christianarum Veterum Musei Vaticani* (2 vols, Helsinki, 1963)

RAC — *Rivista di Archeologia Cristiana* (Rome, Città Vaticana), 36 (1960) to 69 (1993)

Italy

CIL 5.1 — Th. Mommsen (ed.), *Corpus Inscriptionum Latinarum* V.1: *Inscriptiones Galliae Cisalpinae Latinae, pars prior: Inscriptiones Regionis Italiae Decimae comprehendens* (Berlin, 1872)

CIL 5.2 — Th. Mommsen (ed.), *Corpus Inscriptionum Latinarum* V.2: *Inscriptiones Galliae Cisalpinae Latinae, pars posterior: Inscriptiones Regionum Italiae Undecimae et Nonae* (Berlin, 1872)

CIL 9 — Th. Mommsen (ed.), *Corpus Inscriptionum Latinarum* IX: *Inscriptiones Calabriae, Apuliae, Samnii, Sabinorum, Piceni Latinae* (Berlin, 1883)

CIL 10.1 — Th. Mommsen (ed.), *Corpus Inscriptionum Latinarum* X.1: *Inscriptiones Bruttiorum, Lucaniae, Campaniae, Siciliae, Sardiniae: Inscriptiones Bruttiorum, Lucaniae, Campaniae comprehendens* (Berlin, 1883)

CIL 10.2 — Th. Mommsen (ed.), *Corpus Inscriptionum Latinarum* X.2: *Inscriptiones Bruttiorum, Lucaniae, Campaniae, Siciliae, Sardiniae: Inscriptiones Siciliae et Sardiniae comprehendens* (Berlin, 1883)

CIL 11.1 — E. Bormann (ed.), *Corpus Inscriptonum Latinarum* XI.1: *Inscriptiones Aemiliae et Etruriae comprehendens* (Berlin, 1888)

ICI 2 — D. Mazzoleni, *Regio VII: Centumcellae* (Bari, 1985)

ICI 3 — G. Giacomo Pani, *Regio IV: Cluviae, Interpromium, Sulmo, Corfinium, Superaequum, Peltvinum, Aveia, Marruvium, Supinum Vicus, Alba Fucens, Carsioli, Amiternum, Interocrium* (Bari, 1986)

ICI 4 — V. Fiocchi Nicolai, *Regio VII: Ager Capenas* (Bari, 1986)

ICI 5 — M. Buonocore, *Regio III: Regium Iulium, Locri, Taurianum, Trapeia, Vibo Valentia, Copia, Thurii, Blanda Iulia* (Bari, 1987)

ICI 6 — G. Binazzi, *Regio VI: Umbria* (Bari, 1989)

ICI 7 — G. Mennella, *Regio IX: Dertona, Libarna, Forum Iulii Iriensium* (Bari, 1990)

Africa

ICKarth 1 — L. Ennabli, *Les inscriptions funéraires chrétiennes de la basilique dite de Sainte-Monique à Carthage*, Collection de l'École Française de Rome 25 (Rome, 1975)

ICKarth 2 — L. Ennabli, *Les inscriptions funéraires chrétiennes de Carthage, II: La basilique de Mcidfa*, Collection de l'Ecole Française de Rome 62 (Rome, 1982)

ICKarth 3 — L. Ennabli, *Les inscriptions funéraires chrétiennes de Carthage, III: Carthage infra et extra muros*, Collection de l'Ecole Française de Rome 151 (Rome, 1991)

Duval — N. Duval, avec la collaboration de Françoise Prévot, *Recherches archéologiques à Haïdra, I: Les inscriptions chrétiennes*, Collection de l'Ecole Française de Rome 18 (Paris, 1975)

Haïdra 1 — J. Marcillet-Jaubert, *Les inscriptions d'Altava*, Publications des Annales de la Faculté des Lettres, Aix-en-Provence, n.s. 65 (Aix-en-Provence, 1968)

Gaul

Le Blant 1	E. Le Blant, *Inscriptions chrétiennes de la Gaule antérieures au VIIIe siècle, I: Provinces Gallicanes* (Paris, 1856)
Le Blant 2	E. Le Blant, *Inscriptions chrétiennes de la Gaule antérieures au VIII siècle, II: Les Sept Provinces* (Paris, 1865)
Le Blant 3	E. Le Blant, *Nouveau recueil des inscriptions chrétiennes de la Gaule antérieures au VIIIe siècle* (Paris, 1892)
RICG 1	N. Gauthier, *Receuil des inscriptions chrétiennes de la Gaule antérieures à la Renaissance carolingienne, I: Première Belgique* (Paris, 1975)
RICG 15	F. Descombes, *Receuil des inscriptions chrétiennes de la Gaule antérieures à la Renaissance carolingienne, XV: Viennoise du Nord* (Paris, 1985)

Spain

Vives	D. José Vives, *Inscripciones Cristianas de la España Romana y Visigoda*, Monumenta Hispaniae Sacra: series patristica 2 (Barcelona, 1942; 2nd edn, Barcelona, 1969)

TABLE 2: PERSONAL RELATIONSHIPS
(CHRISTIAN DATE-AT-DEATH INSCRIPTIONS: ROME)

	N =	% =
Nuclear Family	1427	97.3
Conjugal Relations		
Husband to Wife	441	30.0
Wife to Husband	212	14.5
Total	653	44.5
Descending Nuclear Family		
Parents to Children	4	–
Parents to Son	130	8.9
Parents to Daughter	113	7.7
Father to Son	85	5.8
Father to Daughter	73	5.0
Mother to Son	57	3.9
Mother to Daughter	48	3.3
To Son	51	3.5
To Daughter	64	4.4
Total	625	42.6
Ascending Nuclear Family		
Children to Parents	0	0
Children to Father	11	–
Children to Mother	9	–
Son to Father	24	1.6
Son to Mother	21	1.5
Daughter to Father	2	0
Daughter to Mother	6	–
To Father	4	–
To Mother	1	–
Total	78	5.3

Siblings in the Nuclear Family		
Brother to Brother	37	2.5
Brother to Sister	16	1.0
Sister to Sister	8	–
Sister to Brother	10	–
Total	71	4.8
Outside the Nuclear Family		
To Extended Kin		
Nephew to Aunt	1	–
Aunt (*amita*) to Niece	1	–
Grandchildren to Grandparents	8	–
Grandparents to Grandchildren	5	–
Son-in-Law to Father-in-Law	2	–
Father-in-Law to Son-in-Law	1	–
Father-in-Law to Daughter-in-Law	2	–
To a '*cognatus*'	1	–
To '*germani fratres*'	1	–
Total	22	1.5
To Non-Kin		
To slave	1	–
To freedman/woman	3	–
To *alumnus/a*	5	–
To *amicus/a*	9	–
Total	18	1.2
Total of all categories		1467

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