

EMPERORS, ARISTOCRATS, AND THE GRIM REAPER: TOWARDS A DEMOGRAPHIC PROFILE OF THE ROMAN ÉLITE*

THE PROBLEM

The opening pages of the annals of the Roman monarchy tell of long-lived rulers and thriving families. Augustus lived to the ripe age of seventy-six, survived by his wife of fifty-one years, Livia, who died at eighty-six, while her son Tiberius bettered his predecessor's record by two more years. Augustus' sister Octavia gave birth to five children, all of whom lived long enough to get married; Agrippa left at least half a dozen children, and perhaps more; Germanicus, despite his tender age at death, was survived by no fewer than three sons and three daughters. At the same time, longevity and abundant offspring went hand in hand with early death and misery. More than a few luminaries of Augustus' court were less fortunate than their elders: Marcellus died at twenty-three, the elder Drusus at twenty-nine, Augustus' heirs Gaius and Lucius Caesar at twenty-three and eighteen. Drusus had lost a number of children save three that survived;¹ Germanicus buried three of his six sons as infants.²

The reader of *I, Claudius* discovers plots and poison behind many of these tragedies. Can we do better? Is it possible for us to tell which fate was more typical of the exalted few: old age and numerous progeny, or an early grave foreshadowed by a string of hasty burials for their own children? Would emperors aim to limit the size of their families or prefer to leave as many children as possible? Individual examples could easily be used to support either scenario: just as bad cases make bad law, two or three fragments make poor profiles. In this paper, I will make an attempt to construct a demographic profile of an ideal type, 'the' Roman emperor, which is based on an exhaustive collection of quantifiable evidence. While there was no such person as a 'typical' emperor, I will try to show that broad averages can be used to establish some important general trends and characteristics. At the same time, a selective discussion of individual cases will reveal a wide range of different life histories. I will focus on two crucial issues, mean life expectancy and marital fertility of Roman emperors from Augustus (d. A.D. 14) to Heraclius (d. A.D. 641). The ancient data, such as they are, will be interpreted within the framework of predictions generated by modern model life tables and kinship simulations. In separate sections, I will compare these findings with evidence for wider echelons of the Roman élite, such as senators and city councillors, that is susceptible to demographic analysis.

* All biographical data on emperors have been drawn from two recent standard works of reference, D. Kienast, *Römische Kaisertabelle: Grundzüge einer römischen Kaiserchronologie* (2nd edn, Darmstadt, 1996) (for the period up to A.D. 395), and the three volumes of J. R. Martindale, *The Prosopography of the Later Roman Empire, II–III B* (Cambridge, 1980–92). Graham Burton, Richard Duncan-Jones, Bruce Frier, Peter Garnsey, Keith Hopkins and a referee kindly offered comments on earlier versions of this paper.

¹ Thus Suet. *Claud.* 1.6: 'ex Antonia minore complures quidem liberos tulit, verum tres omnium reliquit'.

² Cf. e.g. R. Syme, *Roman Papers IV*, ed. A. R. Birley (Oxford, 1988), pp. 418–29 ('Neglected children on the *Ara Pacis*'), who draws attention to two children of L. Domitius Ahenobarbus (cos. 16 B.C.) and Antonia who must have died as minors.

VAE, PUTO DEUS FIO: LIFE EXPECTANCY

Emperors

In a first step, I have processed all sufficiently precise information on the lifespan of Roman emperors who died of natural causes. Since their age at death is useless for directly calculating mean life expectancy at birth—most emperors having been drawn from the adult population—I have calculated their lifespan from the moment of succession. The results for each case are then compared to the predicted expectation of life at the age at which an emperor came to power. For this purpose, I use four similar projections, Mortality Levels 2, 3, 4, and 6 of Model West Males.³ These models are now commonly thought to cover the most likely range of age-specific life expectancy and age distribution of ancient populations.⁴

Some problems remain. The age of emperors is often not recorded with precision; this is true especially of periods of upheaval such as the third century A.D. Short-lived usurpers are usually too poorly documented to be included, and even some of the less ephemeral rulers pose serious difficulties. Was Claudius really poisoned by Agrippina, and what killed Numerianus? Was Maximinus Daia twenty-eight or forty-three years old when he died? After excluding problematic cases like these, we are left with thirty individuals (Table 1). Although it would be too much to ask for absolute certainty, both their age and the fact of death from natural causes are reasonably well attested.

The attested lifespans from the moment of succession differ only marginally from

³ A. J. Coale and P. Demeny (with B. Vaughan), *Regional Model Life Tables and Stable Populations* (2nd edn, New York and London, 1983), pp. 43–4. On the uses of model life tables in ancient history, see e.g. T. G. Parkin, *Demography and Roman Society* (Baltimore and London, 1992), pp. 67–90. C. Newell, *Methods and Models in Demography* (New York, 1988) offers a lucid general introduction. Model life tables describe the age structure and various demographic properties of ‘ideal’ populations that are characterized by different but constant age-specific rates of mortality. Such models are based on large amounts of empirical data; in the case of the Coale–Demeny life tables, information derived from 652 data sets from actual populations was used to construct four sets (labelled ‘North’, ‘South’, ‘West’, and ‘East’; ‘West’ is regarded as an average pattern) of twenty-five tables for each sex. The twenty-five tables correspond to twenty-five different mortality levels that reflect a wide range of values for mean life expectancy at birth from around twenty (Level 1) to eighty years (Level 25). A term such as ‘Model West Level 4 Males’ is made up of three coordinates (regional set, mortality levels/life expectancy, and sex) that locate a given life table within the grand total of 200 ‘stationary’ populations (where ‘stationary’ refers to a population with a constant size and a constant age structure).

⁴ While Level 3 (with a mean life expectancy at birth [= e_0] of 25 years for women and 22.9 for men) has been considered representative of the Roman population at large, Level 6 (with rates of 32.5 and 30.1 years) is sometimes applied to the upper classes. B. W. Frier, ‘Roman life expectancy: Ulpian’s evidence’, *HSCP* 86 (1982), 213–51, discusses Roman legal evidence suggestive of Mortality Level 2 (but cf. Parkin [n. 3], pp. 27–41); according to R. S. Bagnall and B. W. Frier, *The Demography of Roman Egypt* (Cambridge, 1994), pp. 75–110, the census returns of Roman Egypt are consistent with Level 2 for women and Level 4 (?) for men (but cf. R. Sallares and W. Scheidel, *Disease and the Demography of the Roman World*, forthcoming); B. W. Frier, ‘The demography of the early Roman Empire’, *Cambridge Ancient History*, 2nd edn, vol. XI (forthcoming), posits Level 3 as a rough average for the empire. A life expectancy at birth of about 30–32.5 years for Roman senators was first canvassed by K. Hopkins, *Death and Renewal* (Cambridge, 1983), pp. 147–8. R. P. Saller, *Patriarchy, Property and Death in the Roman Family* (Cambridge, 1994), p. 45, considers Level 6 ‘the probable upper limit of life expectancy at birth’. R. Duncan-Jones, *Structure and Scale in the Roman Economy* (Cambridge, 1990), pp. 93–6, argues that the *album* CIL IX 338 is consistent with Model South Level 6 (or 4) for the decurions of Canusium (but see below, third section). In general, there is no obvious reason why the wealthy should have outlived the poor: see the final paragraph of this paper.

TABLE 1. Attested and expected life expectancy of Roman emperors who died of natural causes

Emperor	Age at accession	Years lived afterwards				
		Attested	Expected (Mortality Levels)			
			2	3	4	6
Augustus	36	40	19.8	20.8	21.7	22.6
Tiberius	55	23	11.2	11.8	12.3	12.8
Vespasian	60	10	9.2	9.6	10.0	10.5
Titus	40	2	17.9	18.7	19.6	20.4
Nerva	66	2	7.1	7.4	7.7	8.0
Trajan	45	19	15.6	16.4	17.1	17.8
Hadrian	41	21	17.4	18.3	19.1	19.9
Antoninus Pius	52	23	12.5	13.1	13.7	14.2
Lucius Verus	31	8	22.3	23.4	24.4	25.5
Marcus Aurelius	40	19	17.9	18.7	19.6	20.4
Septimius Severus	47	18	14.7	15.4	16.1	16.8
Claudius II	54	2	11.7	12.2	12.8	13.3
Carus	58	1	10.0	10.5	10.9	11.4
Diocletian	39	29	18.3	19.2	20.1	21.0
Constantius I	43	13	16.5	17.3	18.1	18.7
Constantine I	35	30	20.3	21.3	22.2	23.2
Constantius II	7	37	36.4	37.9	39.4	40.9
Jovian	32	1	21.8	22.8	23.9	24.9
Valentinian I	43	11	16.5	17.3	18.1	18.8
Theodosius I	32	16	21.8	22.8	23.9	24.9
Arcadius	6	25	36.9	38.5	40.0	41.5
Honorius	9	30	35.3	36.8	38.2	39.7
Theodosius II	7	42	36.4	37.9	39.4	42.3
Marcian	58	7	10.0	10.5	10.9	11.8
Leo	56	17	10.8	11.3	11.8	12.8
Zeno	44	17	16.1	16.8	17.6	19.1
Anastasius	51	37	12.9	13.5	14.1	15.3
Justin	67	9	6.7	7.1	7.4	8.0
Justinian	45	38	15.6	16.4	17.1	18.5
Heraclius	35	31	20.3	21.3	22.2	24.1
Mean	41.13	19.27	17.35	18.20	19.02	20.62

those predicted by the models. The mean difference between evidence and model for these thirty emperors amounts to +1.92 years for Mortality Level 2 and -1.35 years for Level 6. Implied life expectancy at birth is 26.3 years; the best fit is with Level 4. Given the small size of the sample, the fit with the conventional range is surprisingly close. Despite a considerable amount of mortality variation in individual cases, the aggregate data revert to the predicted mean.

Figure 1 shows the distribution of variation in life expectancy from the expected average (at Mortality Level 4). Once converted into three-cohort moving averages,⁵ the graphic representation of the distribution of variation closely resembles a bell curve:

⁵ Moving averages reduce chance irregularity in small sets of data; they are centred on a given target digit or bracket and assign the mean of the values of this digit or bracket and of a number of adjacent ones (two, four, six, . . .) to the target digit or bracket.

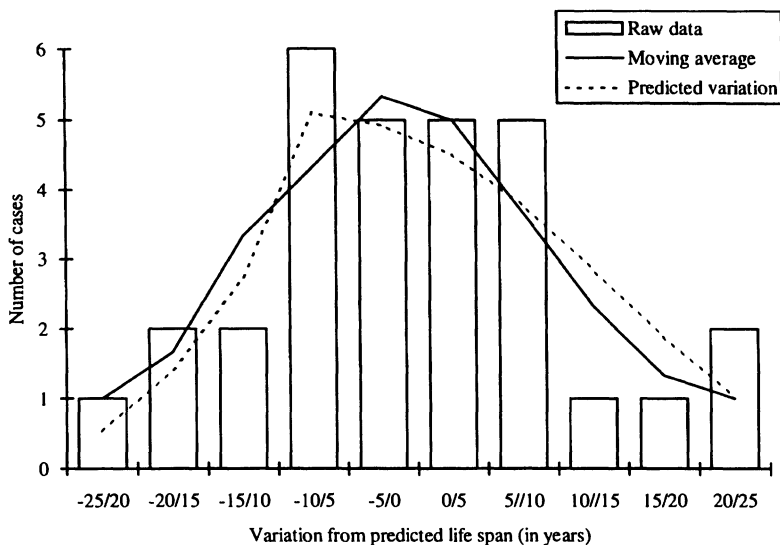


FIGURE 1. Variation from the predicted mean in the life expectancy of Roman emperors.

the incidence of variation decreases with rising scale. Twenty-one of thirty cases, or 70 per cent, fall within a range of plus or minus ten years off the predicted mean, whereas outliers are rare. This can be taken to suggest that the observed fit between the data and the model is not coincidental. The actual lifespans of the emperors show a normal distribution of variation. In a further step, I have calculated the predicted distribution of variation for each of these thirty emperors (based on Model West Level 4 Males) and compared the mean distribution derived from these individual patterns (the dotted line in Figure 1) to the attested distribution of variation. Again, the fit between evidence and model is extremely close: on average, the age-specific death rates of emperors who died of natural causes are consistent with the predictions generated by our model life tables.

The vital statistics of the wives and daughters of emperors are only rarely known. Nevertheless, some tentative quantification seems possible. The ages at death of seventeen such women from the first to the fifth centuries are attested with sufficient precision to group them into age cohorts. Because of the shortcomings of the evidence, the decades from age fifty to fifty-nine and from sixty to sixty-nine have to be conflated into a single cohort, and likewise all cases over the age of seventy.⁶ Figure 2 reveals a close match with the age-specific distribution of mortality predicted by

⁶ Age 20–29: Constantia, daughter of Constantius II and wife of Galerius, aged c. 21; Julia Drusilla, sister of Caligula, aged 21–23; Flavia Julia, daughter of Titus, aged c. 28. Age 30–39: Eudocia, daughter of Valentinian III, aged 33; Constantina, daughter of Constantine I, aged c. 34; Faustina the Elder, wife of Antoninus Pius, aged c. 35. Age 40–49: Licinia Eudoxia, wife of Valentinian III, aged c. 40; Faustina the Younger, wife of Marcus Aurelius, aged c. 46. Age 50–69: Vibia Sabina, wife of Hadrian, aged c. 51; Pulcheria, daughter of Arcadius, aged 54; Galla Placidia, daughter of Theodosius I, aged 57 or 58; Ulpia Marciana, sister of Trajan, aged 50–68; Pompeia Plotina, wife of Trajan, aged over 53; Matidia, niece of Trajan, aged over 51. Age 70+: Helena, mother of Constantine I, aged c. 80; Livia, wife of Augustus, aged 86; Domitia Longina, wife of Domitian, aged over 70.

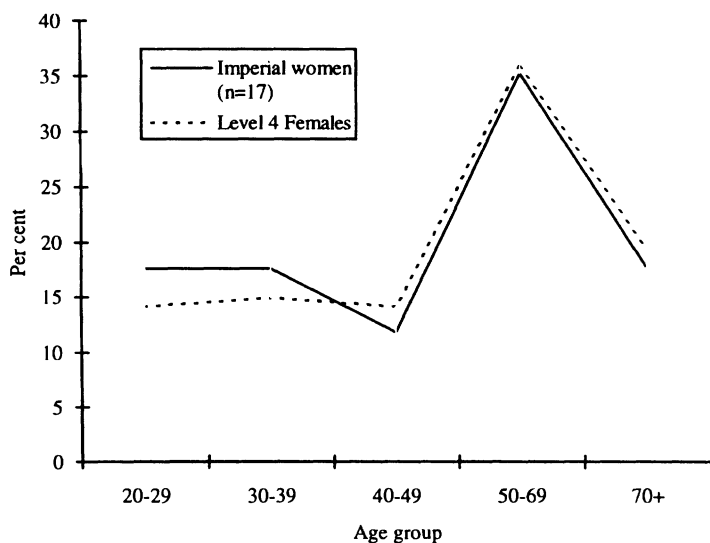


FIGURE 2. The age distribution of mortality among imperial women.

Model West Mortality Level 4 Females ($e(0) = 27.5$), the same mortality level that is consistent with the data for the emperors themselves. It ought to be stressed that because of the exiguous size of this sample, the observed fit may to some extent be coincidental. The attested pattern does, however, indicate a relatively even scattering of deaths across the adult life phase, a unique characteristic of high mortality populations (cf. below, Figure 3). For this reason alone, the sketchy data for women are strongly suggestive of low life expectancy at birth, most likely within or close to the range of twenty to thirty years.

This impression is further corroborated by anecdotal evidence of imperial women whose precise age cannot be ascertained but who must have died young. Titus' first wife Arrecina Tertulla would barely have been twenty at the time of her death. Julian's wife Helena died after two miscarriages. The first wife of Theodosius I, Aelia Flavia Flacilla, died ten years into their marriage after giving birth to three children, her successor Galla after seven years as empress and a further three children. Aelia Eudoxia, the wife of Arcadius, died nine-and-a-half years after their wedding, the mother of five children. Eudocia, Heraclius' first wife, died after two years and two deliveries. Stories such as these indicate that the death of fertile women in the prime of life was far from unusual and so hint at low levels of life expectancy overall.

Senatorial families

The probable life expectancy of Roman senators during the Principate has briefly been discussed by Hopkins and Burton. They observe that if a body of 600 members was sustained by an annual intake of twenty quaestors aged twenty-five, life expectancy at that age must have been about thirty years.⁷ This estimate must be

⁷ Hopkins (n. 4), pp. 146-9; accepted by R. J. A. Talbert, *The Senate of Imperial Rome* (Princeton, 1984), p. 133.

TABLE 2. The probable life expectancy of Roman senators

Annual intake of men aged 25	Total number of senators	$e(25)$	Implied $e(0)$	Nearest Mortality Level (Model West Males)
21.0	570	27.14	25.1	3
20.5	570	27.80	25.5	4
21.0	600	28.57	27.0	4
20.5	600	29.27	28.5	5
21.0	630	30.00	30.0	6
20.5	630	30.73	31.6	7

broadly correct but calls for further elaboration. First of all, we can only guess at the actual size of the senate. While Augustus seems to have cut its membership to about 600, this figure was 'almost certainly . . . just a notional optimum'.⁸ Below, I will reckon with a band of variation of plus or minus 5 per cent. Adlection, the introduction of additional senators by way of the conferring of a nominal rank rather than through the quaestorship, is usually thought to have had only a small impact on overall numbers. We know of at least twenty-five cases from Claudius to Domitian (an annual mean of 0.45 or over) and of thirty-five from Nerva to Commodus (0.36 per year).⁹ This indicates a minimum average of about 0.4 cases per year, and although our information is clearly imperfect, it appears unlikely that the actual rate was much higher (say, more than twice as high). Many of those thus promoted would have been in their thirties and forties. Positing an annual rate of 0.4 to 0.8 entries, these new members would have represented the survivors of an annual cohort of about 0.5–1.0 men aged twenty-five, who need to be added to the annual quota of twenty quaestors (Table 2). Quaestors were allowed to join the senate during their twenty-fifth year of life, as opposed to after their twenty-fifth birthday, and in addition, they were granted one year's remission for each child.¹⁰ This, too, would have changed little: a difference by up to one year is negligible, and few men would have any children in their early twenties;¹¹ some might have become quaestors after their twenty-fifth year. Hence, twenty-five appears to be a sufficiently reliable mean for the age of entry.

The resultant range of life expectancy at birth ($e(0)$) is relatively narrow, about six years, and largely overlaps with the traditional range of twenty to thirty years. It also accommodates the rates established for emperors and imperial women (see previous section). A reasonable amount of variation in the size of the senate does not affect this estimate. For computational purposes, we may use Mortality Level 5 as a plausible mean and mode (based on a senate of 600 and a 'low' level of adlection). This level is also very close to the mean for ruling families (Mortality Level 4).

What were the implications of such levels of mortality for the career chances of Roman senators? A demographic perspective helps modify existing views. Table 3 is based on the following set of assumptions: an average of 0.4 men (see above) were adlected in any given year, half of them (on average) at age thirty, the other half at age

⁸ Talbert (n. 7), pp. 131–4, esp. p. 132. It deserves notice that in reorganizing the senate, Sulla seems to have believed that an annual intake of twenty *thirty-year* old quaestors would create a body of 600 senators.

⁹ Talbert (n. 7), p. 134, cf. pp. 15–16.

¹⁰ Ibid., p. 18.

¹¹ Saller (n. 4), pp. 45–6, 48–65.

TABLE 3. Career chances of Roman senators in the mid-second century A.D.

Age	Survivors		Available candidates	Office	Available positions
	Patricians	Plebeians			
25	1.876	18.124		Quaestor	20
27-8		17.46	17.46	Aedile/Tribune	16
30	1.739	17.00*	18.739	Praetor	18
32-3	1.667		1.667	Consul	1.667
40		14.25*			
42-3		13.41*	13.41	Consul	7.433

*Including *adlecti*.

forty; patricians could not be tribunes and were excused from serving as aediles; on average, 9.6 consuls were elected every year; all patrician senators who survived to their early thirties were made consuls; about one-sixth of all consuls were patricians; most other senators would attain the consulate between the ages forty and forty-five; and 0.5 consular positions per year were taken up by emperors, their heirs and consulars serving twice.¹²

This schematic tabulation shows that by the middle of the second century, competition for offices other than the consulate must have ceased to exist. Talbert is therefore too cautious in merely referring to an easing of competition for such positions.¹³ On average, even allowing for some small number of *adlecti* before that stage, every senator surviving to the age of thirty was guaranteed a praetorship. In fact, the suggested fit between the number of candidates and the number of positions is so close that in some years fewer than eighteen slots could have been filled from the cohort of men who had been quaestors five years earlier, while in other years there would have been one or two candidates too many; these would serve in 'poor' years. In the long run, a sufficient number of praetors must have been available. We find that the emperors had gradually expanded the number of praetorships to the maximum that could be sustained within the existing framework; all survivors were potential candidates for propraetorian posts. The concomitant slackening of competition for the consulate has also been consistently underestimated in modern scholarship.¹⁴ Even with one-sixth of all consulates being taken up by patricians and occasional appearances by members of the ruling family and former consuls, some 55 per cent of all

¹² Duties and age of patricians: G. Alföldy, *Konsulat und Senatorenstand unter den Antoninen: Prosopographische Untersuchungen zur senatorischen Führungsschicht* (Bonn, 1977), p. 36; Talbert (n. 7), p. 18. The average number of consuls rose from four since 5 B.C. to six in the first half of the first century, six to ten under the Flavians, six to eight under Trajan, eight under Hadrian, eight to ten under Antoninus Pius, ten under Marcus Aurelius and twelve under the Severans: Talbert, p. 21, and see Alföldy, p. 20 for Pius; this yields a mean of about 9.6 for the years from A.D. 138 to 180. Proportion of patricians: Alföldy, p. 56, calculates that between A.D. 138 and 161, thirty to forty out of 220 to 225 consuls (or 13–18 per cent) were patricians. Age of consulate for plebeians: Alföldy, p. 36. Emperors and ex-consuls: from A.D. 138 to 161, 4.5 per cent of consuls were rulers or ex-consuls (Alföldy, p. 20); of sixty-nine reasonably well attested consuls from A.D. 138 to 192, six held the consulate twice (three of them were patricians), or 8.7 per cent (Alföldy, pp. 327–45), but their share of *all* consulates must have been much lower (cf. also W. Eck, *Senatoren von Vespasian bis Hadrian: Prosopographische Untersuchungen mit Einschluß der Jahres- und Provinzialfasten der Statthalter* [Munich, 1970], pp. 60–3, for iteration under Domitian). Five per cent seems a reasonable mean for Pius and Marcus.

¹³ Talbert (n. 7), pp. 18, 20.

¹⁴ Cf. e.g. Hopkins (n. 4), p. 149; Talbert (n. 7), p. 21.

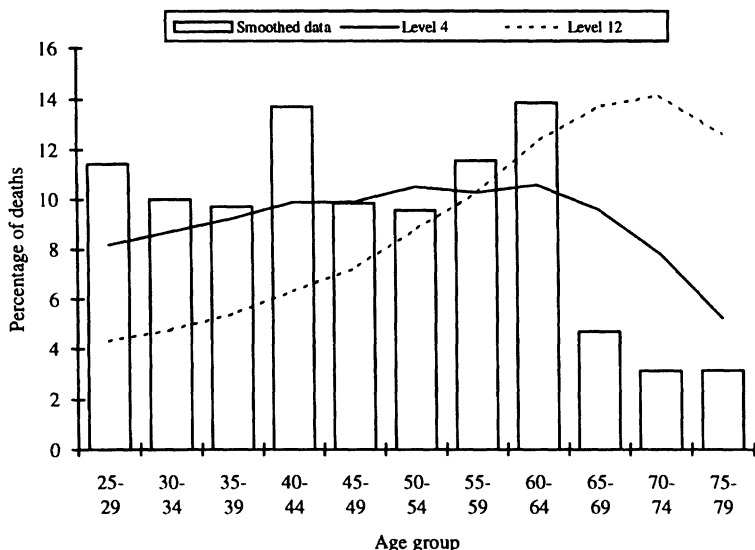


FIGURE 3. The age distribution of mortality among late Roman aristocrats compared to model life tables (I).

plebeian senators surviving into their low forties would become consuls. Between 60 and 65 per cent of all senators who survived to a suitable age were made consuls. From Septimius Severus—unless the size of the Senate changed¹⁵—these rates may have risen to about 70 and 75 per cent, respectively.

The range of estimates for the life expectancy of Roman senators is consistent with the evidence for the ruling families but cannot be underpinned by comparable series of data from the Principate. To some extent, quantifiable information from the fourth century A.D. helps to fill this gap. Etienne and his collaborators have undertaken a demographic reconstruction of several grand senatorial clans of that period—the Anicii, Petronii, Caeionii, Symmachi, Nicomachi, Turcii, Valerii, and Aradii—as well as the family of Ausonius.¹⁶ As a general rule, pre-adult mortality is impossible to measure: infant mortality is almost invisible, and deaths in childhood and adolescence are only haphazardly recorded.¹⁷ A perusal of the available data suggests twenty-five as a lower age-limit for any quantitative appraisal. In many of these remaining cases, however, age at death has merely been estimated from the intervals between the year in which a person held an office and the year of death.¹⁸ This method creates potential problems that will be addressed below. In Figure 3, I have gathered the attested and reconstructed ages at death of 106 members of these families aged between

¹⁵ There is no compelling reason to think so: Hopkins (n. 4), p. 147, n. 39.

¹⁶ R. Etienne, 'La démographie de la famille d'Ausone', *Annales de démographie historique* (1964), 15–25, and 'La démographie des familles impériales et sénatoriales au IV^e siècle après J.C.', in *Transformation et conflits au IV^e siècle ap. J.-C.* (Bonn, 1978), pp. 133–68.

¹⁷ For the same and other reasons, the data gathered by R. Etienne, 'Ces morts que l'on compte dans la dynastie flavienne', in F. Hinard (ed.), *La mort, les morts et l'au-delà dans le monde romain* (Caen, 1987), pp. 65–90, are unsuitable for demographic analysis.

¹⁸ Thus Etienne, 'Familles' (n. 16), p. 136, n. 21. From A.D. 315, he reckons with a minimum age of forty for the consulate and with forty-two to fifty for the praefect of Rome. See below.

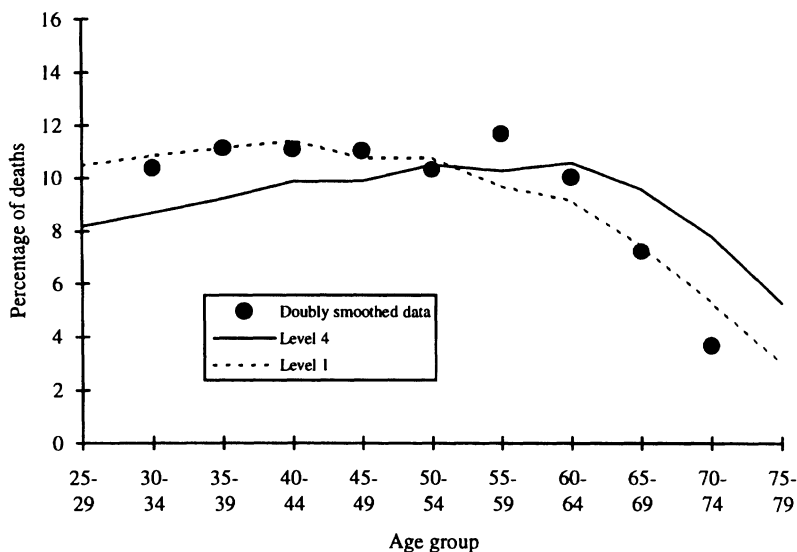


FIGURE 4. The age distribution of mortality among late Roman aristocrats compared to model life tables (II).

twenty-five and seventy-nine.¹⁹ In order to smooth fluctuations between individual years of age, the data have been converted into seven-year moving averages and then consolidated into five-year age-brackets.²⁰ The generated pattern is compared to the age-specific distribution of deaths predicted by Model West Mortality Level 4 Males, which provides the closest fit for Roman emperors and lies in the centre of the range from twenty to thirty years of life expectancy at birth.

For most quintiles, the smoothed data are roughly consistent with the model, documenting as they do a relatively even spread of deaths over adult life and a moderate rise towards the age of sixty. As I have already pointed out above, these two features are defining characteristics of an 'ancient' mortality pattern that differs from any other mortality regime. This is well brought out by the comparison with Mortality Level 12, with a life expectancy at birth of forty-five, which was typical of the English aristocracy in the second half of the eighteenth century. In the latter scenario, in spite of relatively high levels of mortality overall, mortality is heavily concentrated between the ages sixty and seventy-five. The absence of an analogous clustering in the late Roman sample points to a significantly lower level of life expectancy.

Yet even the smoothed data are far from perfect. The reported ages show some heaping on forty and sixty which is indicative of age-rounding and thus imprecision. More importantly, fewer people than expected can be shown to have lived beyond the age of sixty-five. Because of this apparent lack of old people, mean life expectancy at the age of twenty-five is only 24.245 years. This value is consistent with Model West Mortality Level 1 Males, with a life expectancy at birth as low as eighteen years. Once the general drift of the data has been clarified by consolidating them into three-quintile moving averages, we find that the same applies to the age distribution of deaths (Figure 4).

¹⁹ Based on Etienne, 'Ausone' (n. 16), 21, and 'Familles' (n. 16), Tables II-VII.

²⁰ The same procedure has been adopted by Bagnall and Frier (n. 4), pp. 82, 101.

Rather than accepting this fit at face value, we may suspect a certain amount of underageing. When age at death is calculated from the interval between certain offices, such as the consulate, and death, the individual in question is thought to have held that office at the minimum age. This is probably unrealistic in that some senators may well have been a few years older than required. At the same time, given the eminence of these families, many of their members will have pursued their careers without serious delays, and the mean difference between the minimum age and their actual age of holding office cannot have been very substantial. The required correction of the reconstructed ages would help even out the age distribution of deaths and extend it backwards.

Because of this insurmountable deficiency, these data do not permit us to estimate the most plausible level of life expectancy. There can be little doubt, however, that it did not fall short of Level 1 and that in all probability it was somewhat higher, albeit by no more than a few years. Reckoning with a relatively small mean gap between the minimum age and the actual age of office-holding, the mean amount of underageing from the age of twenty-five is unlikely to exceed six years (the difference in $e(25)$ between Levels 1 and 6, with a life expectancy at birth of eighteen and thirty, respectively), and may well have been smaller than that. This may be taken to suggest that actual life expectancy at birth would probably have fallen within the conventional range from twenty to thirty years.

City councillors

Duncan-Jones has advanced the idea that the *album* of Canusium (*CIL* IX 338) gives us an idea of life expectancy in the upper reaches of Roman society.²¹ This document provides a complete list of the patrons and councillors of this Apulian city in A.D. 223: thirty-one senatorial and eight equestrian patrons; seven *quinquennalicii*, or councillors who held the *duovirate* in a census year; four *allecti inter quinquennalicios*; twenty-nine 'ordinary' former *duovirs*; nineteen former *aediles*; nine former *quaestors*; thirty-two *pedani*, or members of the council who had not held any office; and twenty-five *praetextati*, or junior members who would stand for office in the future. In brief, Duncan-Jones's argument runs as follows. Each year, two *quaestors* were elected. They entered the ranks of the *quaestoricii* and subsequently went on to become *aediles* and *duovirs*. The inscription enumerates sixty-eight (current and) former magistrates. On the assumption that this figure equals the total number of councillors who had held the *quaestorship* at the age of twenty-five and were still alive at the time of the census, it is possible to calculate average life expectancy at that age for the members of the *ordo*. This in turn permits us to infer their approximate life expectancy at birth. Thus, the presence of sixty-eight survivors is taken to imply 'that expectation of life at twenty-five (e 25) is thirty-four years'. If the four *allecti*, who may have bypassed some or all of the lower ranks, are excluded from the sample, this expectation drops to thirty-two. This alternative is considered 'less well supported'.²²

As Duncan-Jones himself concedes, his model depends on strict regularity in office-holding and would be affected by the presence in the list of councillors who

²¹ Duncan-Jones (n. 4), pp. 93–6. I shall discuss this inscription in more detail in another paper, 'Death and renewal in a Roman local élite: the *album* of Canusium reconsidered', *CQ* (forthcoming).

²² *Ibid.*, p. 94. For a similar calculation, see the preceding section of this paper.

became quaestor at an age other than twenty-five and by the adlection of influential individuals who skipped the quaestorship altogether. While he holds that such sources of distortion would only have a limited impact on the results, Parkin and Saller in particular have cast doubt on the representative value of the data and the predictability of local customs of office-holding. Parkin points out that in selecting the appropriate model life table, one could equally well opt for Model West as for Model South (chosen by Duncan-Jones),²³ and stresses that the recorded number of ex-magistrates need not be identical with the long-term average.²⁴ Indeed, it is *a priori* unlikely that the number of former office-holders present in any given year equals the actual mean. Even minor fluctuations would affect our calculations. From a different angle, Saller criticizes the supposedly orderly sequence of quaestorship, aedileship, and duovirate required by Duncan-Jones's model with reference to epigraphic evidence of occasional deviation from 'normal' career patterns.²⁵ Fuller documentation of such irregularities has been provided by Jacques.²⁶ Saller concludes that the data furnished by the *album* are insufficient to 'fix Roman life expectancy within the probable range or to differentiate among segments of the population'.²⁷

These criticisms have merely exposed potential weaknesses of the model without proving it wrong. Duncan-Jones's calculations are based on the assumption that the population of sixty-four or sixty-eight magistrates and ex-magistrates consists in its entirety of the two quaestors of A.D. 223 and all their predecessors who were then still alive. This is, however, impossible even in theory. If no one who had not been a quaestor had ever joined the ranks of the magistrates at a later stage, the council could not have elected two aediles, let alone two duovirs, on an annual basis. Owing to intervening mortality, only a certain proportion of two quaestors aged twenty-five would still have been alive *n* years later to serve as aediles or duovirs. In the Roman senate, this problem did not arise because the number of positions decreased with increasing seniority (see above). By contrast, the *ordo* of Canusium depended on two different means of filling these vacant slots: co-optation and iteration.²⁸

For the sake of argument, let us assume for a moment that the council chose to co-opt some individuals who had never been quaestors to fill some of the positions for aediles, and a larger number of notables who had not served in either capacity but wished to become duovirs. Under the conditions of Model West Mortality Level 5 Males, and if the average age of aediles and duovirs was thirty and forty, respectively, 7.5 per cent of all aediles and 23.5 per cent of all duovirs would not have served as quaestors; 17.5 per cent of duovirs would not have been aediles either.²⁹ These estimates are based on the questionable assumption that, on average, these privileged members served as aediles and duovirs at the same age as former quaestors. Indivi-

²³ Cf. also B. W. Frier, 'Statistics and Roman society', *JRA* 5 (1992), 289.

²⁴ Parkin (n. 3), pp. 137–8.

²⁵ Saller (n. 4), p. 17, n. 22, mainly on the skipping of the quaestorship.

²⁶ F. Jacques, *Le privilège de liberté: politique impériale et autonomie municipale dans les cités de l'Occident romain (161–244)* (Rome, 1984), pp. 489–93.

²⁷ Saller (n. 4), p. 18. For another, less critical, discussion of Duncan-Jones' model, see F. Dal Cason Patriarca, 'Considerazioni demografiche sulla lista decurionale della tabula di Canusium', *Athenaeum* 83 (1995), 246–8.

²⁸ Duncan-Jones briefly refers to both mechanisms but does not fully appreciate their possible impact on the structure of office-holding. He also seems to take it for granted that each aedile surviving to the age of forty became a duovir, which is far from self-evident.

²⁹ I derive this mortality level from my analysis of the Roman senate (above, second section). Adjacent levels would not significantly affect the results.

duals who were free to take a shortcut to the more prestigious functions may well have been likely to be younger than their fellow office-holders. This possible bias, in turn, would reduce mean life expectancy even further. In any case, a larger number of twenty-five year olds would have been necessary to build up a population of sixty-four or sixty-eight ex-magistrates than Duncan-Jones allows for. Instead of just two persons of that age, 2.61 were necessary to replenish that subset of the *ordo*. Hence, the number of survivors relative to the number of entrants aged twenty-five (irrespective of whether they actually joined at that age or later in life) would be considerably smaller than suggested. Life expectancy at the age of twenty-five would be as low as 24.5 (if $n = 64$) or 26.1 (if $n = 68$), implying life expectancy at birth to be of the order of eighteen to twenty-two years.

If anything, these rates do not provide more than a lower limit to the probable range. While it is likely that the small number of additional candidates for the aedileship (about one every six or seven years) were recruited from among the *pedani*, at least some of the vacant slots for duovirs would have been filled by former duovirs serving a second term. Unfortunately, the frequency of iteration is impossible to ascertain with sufficient precision. All we know is that three of the four most senior *duoviralicii* who did not rank among the *quinquennalicii* had served twice.³⁰ This suggests that many if not all *quinquennalicii* had also been duovirs more than once, the second time during a census year. This idea is supported by inscriptions from other towns.³¹ In fact, if the average *quinquennalicus* was close to fifty years of age (having served in this capacity some ten years after holding the duovirate for the first time),³² about seven members of this exclusive group would have been alive at any given time; seven of them are attested in the *album*. Even so, there are still problems. The probable career path of the four *allecti inter quinquennalicios* is rather more obscure: were they councillors who had served as duovirs twice, each time in ordinary (non-census) years, or had they been co-opted from outside? Three of the seven *quinquennalicii* and one *allectus* are also listed as equestrian patrons.³³ It is possible that the first three had held their first duovirate in a census year and never served for a second time; the equestrian *allectus* may never have been a duovir at all. If 0.15 aediles were co-opted every year and all vacant duovirates were held by former duovirs serving a second term, life expectancy at the age of twenty-five may be put at 29.6 ($n = 64$) to 31.5 years ($n = 68$). If the four equestrian patrons (or the four *allecti*) were co-opted from outside, the lower of these figures might be closer to the truth. Located between the rates predicted by Model West Mortality Levels 5 and 6 Males, it implies a life expectancy at birth of about twenty-nine years ($e(0) = 29.2$).

A high level of co-optation as discussed above suggests very low levels of life expectancy at birth of around twenty years. High rates of iteration combined with a small number of adlections point to a figure close to thirty years. Again, these figures stake out the conventional range of life expectancy at birth, and are thus consistent with our previous findings.

³⁰ A. Caesellius Proculus (the twelfth most senior councillor listed in the *album*), L. Faenius Merops (no. 13), and Q. Iunius Alexander (no. 15).

³¹ See Jacques (n. 26), pp. 474 and 475, n. 148 (and cf. p. 476, n. 152).

³² Jacques (n. 26), p. 474.

³³ T. Ligerius Postuminus (the most senior councillor), T. Aelius Rufus (no. 4), T. Aelius Flavianus (no. 5), and C. Galbius Soterianus (no. 8). On the patrons of Canusium, see M. Silvestrini, 'Aspetti della municipalità di Canusium: l'albo dei decurioni', *MEFRA* 102 (1990), 597–602.

Results

On the basis of this evidence, we may conclude that the prevailing models, which posit a life expectancy at birth of between twenty and thirty years, provide a suitable yardstick even for the most privileged segment of the Roman population. Unfortunately, owing to the small amount of documentation it is not feasible to use this material for further fine-tuning. Even though the data for Roman emperors and their families superficially point to Mortality Level 4 with a life expectancy at birth of 25.3 years for men and 27.5 years for women, similar mortality levels remain equally plausible. The same is true for the evidence discussed in the last two sections, some of which appears to favour an estimate between twenty-five to thirty years. Suffice it to stress that by indicating a level of life expectancy at birth that falls within the conventional range, these new samples of demographic data share a crucial characteristic with other sets of written ancient evidence that have been subjected to quantitative demographic analysis.³⁴

CUM RECENTI LUCTU PROCREAVI: REPRODUCTION

Child mortality and family size

The most important reason why model life tables that correspond to the attested life spans of Roman emperors and other ancient data predict levels of life expectancy at birth as low as twenty to thirty years is that up to one-half of all persons ever born are thought to have died within the first five years of life.³⁵ The actual extent of infant mortality in particular (defined as death before the first birthday) is often difficult to determine even for more recent populations. Ancient sources do not normally provide direct evidence at all.³⁶ As a consequence, levels of mortality in infancy and early childhood are usually inferred from the age distribution in later years of life.³⁷ It has been argued that at very high levels of mortality, the standard model life tables may give a somewhat misleading impression of infant deaths.³⁸ However, there can be little doubt that levels of adult mortality that are very high by modern standards necessarily imply massive loss of life at the beginning of the lifecycle, even if precise figures are beyond our grasp.

It is fortunate for the purpose of the present survey that those few morsels of ancient evidence that afford us the occasional glimpse of infant and child mortality invariably refer to rulers and aristocrats.³⁹ If we are to trust Ktesias, only five of the

³⁴ Compare Frier, 'Demography' (n. 4).

³⁵ See Coale and Demeny (n. 3), pp. 42–4: at Level 2 (Model West), 53 per cent of males are dead by age 5; at Level 6, 36 per cent of all females die during the same period.

³⁶ Although a few graveyards document plausibly high levels of infant burials (e.g. S. B. Pomeroy, *Families in Classical and Hellenistic Greece: Representations and Realities* [Oxford, 1997], p. 121 and n. 66), most skeletal samples clearly conceal the true extent of early mortality; social factors often seem to have distorted the age-composition of cemetery populations. See e.g. Parkin (n. 3), pp. 41–58.

³⁷ Thus Frier, 'Life expectancy' (n. 4); Bagnall and Frier (n. 4).

³⁸ This problem is discussed by R. Woods, 'On the historical relationship between infant and adult mortality', *Population Studies* 47 (1993), 195–219. Cf. also S. H. Preston, A. McDaniel, and C. Grushka, 'New model life tables for high-mortality populations', *Historical Methods* 26 (1993), 149–59.

³⁹ More often than not, even these sources fail us, as R. Syme, *Roman Papers VI*, ed. A. R. Birley (Oxford, 1991), p. 241, notes: 'Forgotten wives and evanescent children, such is the

thirteen children of Dareios II and his wife and half-sister Parysatis survived their early years of life. Of the three sons and two daughters of Hekatomnos of Caria, including the famous Mausolus, only one son left a child.⁴⁰ After the death of Tib. Sempronius Gracchus, his wife Cornelia lost nine of their twelve children; the two future tribunes were the only surviving sons.⁴¹ Quintilian's wife died at nineteen, followed by their two sons, aged five and nine.⁴² By the time of the death of his (only?) daughter Timoxena at the age of two, Plutarch had already buried two of his four sons.⁴³ The senator M. Cornelius Fronto suffered even worse losses. Near the end of his life, left with a single surviving daughter, he penned a bitter résumé:

I have lost five children under the most distressing circumstances possible to myself. For I lost all five separately, in every case an only child, suffering this series of bereavements in such a way that I never had a child born to me except when bereaved of another. So I always lost children without any left to console me and with my grief fresh upon me I begat others (*cum recenti luctu procreavi*). . . . Then afflicted by the most distressing calamities I have further lost my wife, I have lost my grandson. . . . Even if I were of iron I could write no more just now.⁴⁴

The recipient of this letter, his former pupil Marcus Aurelius, was no stranger to such blows. His wife Faustina was the only one of the four children of Antoninus Pius who was still alive when her father was made emperor. Her mother had not lived beyond her mid-thirties, and Faustina herself was to die at or around the age of forty-six. Before that, she gave birth to thirteen (or perhaps eleven or twelve or fourteen) children, including two (?) pairs of twins. Not one of these is known to have lived past their forties, and eight died as minors:⁴⁵ Annia Lucilla's twin (if it existed), soon after birth; T. Aelius Aurelius, before the age of three; T. Aurelius Fulvius Antoninus, Commodus' twin, at four; M. Annius Verus at around seven; T. Aelius Antoninus before the age of nine; Annia Aurelia Galeria Faustina around the age of ten; and Hadrianus and Domitia Faustina before the age of fourteen, and possibly much sooner. Of the remaining five who were still alive at the time of their father's death, two were killed (Annia Lucilla at the age of thirty-two and Commodus at thirty-one), and three seem to have died of natural causes: Cornificia at the age of thirty; Fadilla, who is last attested when she was thirty-three; and Vibia Aurelia Sabina, who may have died in her forties.

Was Marcus Aurelius just unfortunate? The experience of his contemporary Fronto suggests that, at the very least, the emperor's case was not unique. Indeed, a survey of the evidence shows it may even have been rather unexceptional: tough, to be sure, but

constant rubric of mortality at Rome.' In *The Augustan Aristocracy* (Oxford, 1986), pp. 21–4, Syme draws attention to the impact of epidemics on the Roman élite.

⁴⁰ Ktesias *FGrHist* 688 F 15 § 49 (F. W. König, *Die Persika des Ktesias von Knidos* [Graz, 1972], pp. 19–20); S. Hornblower, *Mausolus* (Oxford, 1982), p. XXVI. Both cases involved brother–sister marriage, which may well have increased the incidence of child mortality: see W. Scheidel, *Measuring Sex, Age and Death in the Roman Empire: Explorations in Ancient Demography* (Ann Arbor, 1996), pp. 9–51, esp. pp. 20–9.

⁴¹ Plut. *Tib. Gracc.* 1.3–5 (but cf. K. M. Moir, 'Pliny *N.H.* 7.57 and the Marriage of Tiberius Gracchus', *CQ* 33 [1983], 144).

⁴² Quint. 6 pr. 4–10.

⁴³ Plut. *Mor.* 608C, 609D, 610E, 611D.

⁴⁴ Fronto, *De Nepote Amissio*, 2 and 4 (pp. 220 and 224, ed. van den Hout) (Loeb trans. C. R. Haines).

⁴⁵ As usual, the following list is based on Kienast, pp. 139–40. For a somewhat different reconstruction with a total of fourteen children, see A. Birley, *Marcus Aurelius: A Biography* (2nd edn, London, 1987), pp. 239, 247–8. Since eight of them are listed as having died as small children, the tally (unlike some of the names) is the same. Cf. W. Ameling, 'Die Kinder des Marc Aurel und die Bildnistypen der Faustina Minor', *ZPE* 90 (1992), 147–66.

far from dramatic. As noted above, Drusus fathered an unspecified number of children, of whom only three survived to adulthood. One of Tiberius' two sons died soon after birth, as did three of the six sons of Germanicus. The Younger Drusus, Tiberius' remaining son, lost two of his three sons, apparently as infants. Claudius soon lost his first child; Nero's only child Claudia died four or five months after birth. Galba had lost his wife and his two sons before he took power at the age of seventy-one. Titus had no sons and two daughters, one whose name is unknown and who presumably died young, and a Julia who died around the age of twenty-eight. Domitian's only son died within the first ten years of life.

A complete lack of surviving children is far from unusual. Nero, Galba, Nerva, Trajan, Hadrian, Commodus, Caracalla, Severus Alexander, and Gordian II had no living children both when they became Augusti and when they died. According to the *Historia Augusta*, Pupienus survived four brothers and four sisters, all of whom died in childhood.⁴⁶ Even if fictitious, a story like this must have been considered credible. No living son is attested for Claudius Gothicus, who died in his mid-fifties, or for Aurelian, who died at sixty-one; the same is true of Probus, dead by the age of fifty.

Diocletian also lacked a son; his only known daughter Galeria Valeria was married to Galerius for twenty-one years but no progeny is reported. Maxentius had already lost his two sons when he drowned in the Tiber after the battle at the Milvian Bridge. Constantius II, who died at the age of forty-four, had gone through three marriages without gaining a single surviving son and heir, and even his only daughter was born after his death. Julian, dead at thirty-two, had lost his wife three years earlier and was childless. Valens' only son Valentinianus Galates had died as a four-year old, and Gratian's only son before that age. Valentinian II, killed at the age of thirty-one, was unmarried and childless. Theodosius, who died in his late forties, had already lost two of his three known sons and one of his two known daughters. Of the survivors, Arcadius was to live for thirty-one years and Honorius for thirty-nine. Only their sister Galla Placidia would survive into her fifties.

Two of Theodosius' II three known children, including his only son, died before their father fell from his horse at the age of forty-nine. Valentinian III, murdered at thirty-six, seems to have had no (living) sons, and neither did Maiorian. Marcian, dead at sixty-five, was survived by a single daughter. Leo, who succumbed to dysentery at seventy-three, had lost his only known son soon after birth; his successor Zeno, who in his sixties died of epilepsy or dysentery, had by then already lost both sons, one of them aged seven. Anastasius, unique in living to be eighty-eight, left three nephews but no children. His successor Justin, childless at seventy-five or seventy-seven, again had to pass on the throne to his nephew, Justinian, who, though married to Theodora for twenty-one years, also died childless. His successor, once more a nephew, left one daughter, Arabia. Tiberius Constantinus, a victim of food poisoning, had lost one child prior to his accession and again left no son. Puzzling as it may seem, none of the nine emperors who succeeded Arcadius and ruled for a total of 174 years was survived by a single son.

The role of sons as co-regents is sometimes suggestive of the total number of an emperor's living sons. Pertinax, at the age of sixty-seven, apparently had only one living son, whom he barred from becoming a co-regent, and one daughter, while Didius Julianus does not seem to have had a single living son with whom he could have shared power. Maximinus Thrax, in his sixties, fell back on one son in his early

⁴⁶ *HA Max. Balb.* 5.2: 'cui fratres quattuor pueri fuerunt, quattuor puellas, qui omnes intra pubertatem interierunt'.

twenties; Macrinus, in his early fifties, only had a ten-year old son for a co-regent. The same was true for Philippus Arabs, who made his son Augustus when he was only nine or ten. At the age of about sixty, Maximian left one son, as did Galerius, who died at fifty or sixty, and Maximinus Daia. Licinius, at the age of around sixty, had a single living legitimate son.

By contrast, more prolific emperors were rare. Within a quarter of a millennium from the founding of the Principate, Vespasian and Septimius Severus were the only emperors to leave two living sons.⁴⁷ (Pescennius Niger had several adult sons, Clodius Albinus one or two; all of them were disposed of by Severus.) Decius closely missed that mark, as one of his two sons died shortly before his father fell in battle. Gallienus was the third emperor to be survived by two sons, followed, it seems, by one of them, Gallienus. Tacitus and his brother Florianus were alleged to have had several children each, yet the tradition (solely the *Historia Augusta* at its worst) is so poor that we cannot be sure.⁴⁸ Carus left two sons, Carinus and Numerianus; the former, dead at around thirty-five, may have had one son, the latter, dead by thirty-one, was married but childless.

Constantius I, who died at about fifty-six, exactly one-third of a millennium after Octavian had turned into Augustus, was the first emperor ever certifiably to leave more than two sons: Constantine, Dalmatius, Constantius, and Hannibalianus, plus two daughters. His eldest son, Constantine, followed in his footsteps with three surviving sons, a fourth, Crispus, having previously been executed by his father. However, two of these sons were soon killed and the only one to survive for longer, Constantius II, did not have any (surviving) sons at all. Valentinian II left two sons, both of whom had no living sons when they met a violent death; Theodosius was survived by two sons and one daughter, likewise Avitus. Anthemius, five hundred years after the founding of the monarchy, was only the third emperor known to have left three living sons.

It is only at the very end of the period under review that we encounter larger families. When Mauricius was killed in A.D. 602 at the age of sixty-three, not fewer than six sons shared his fate. His three surviving daughters followed them some years later. The perpetrator of this carnage, Phocas, had no son, but Heraclius, after a reign of thirty-one years, was survived by four sons and three daughters.

As in the previous section, these case-histories need to be consolidated into a standardized database that can give us an idea of the mean rates of survival. The number of children ever born is impossible to determine, except (and even then imperfectly) in the unique case of the family of Marcus Aurelius. Only the number of children who were alive when their father died is reasonably well attested in a substantial number of cases. Table 4 lists the known number of living legitimate biological sons and daughters at the moment of the death of each emperor (including those children who died at the same time), and the mean number of living sons predicted by Saller's kinship simulation for men of senatorial rank according to Model West

⁴⁷ Like Vespasian, his brother Sabinus also produced two sons and one daughter who lived long enough to be married. One of them, T. Flavius Clemens, fathered at least seven children, only three of whom are known by name. All we know is that some of them survived long enough to be tutored by Quintilian but in each case even their approximate age at death remains obscure. For all we know, most or all of them could have died in childhood. Seven successive generations of Flavians are discussed by Etienne (n. 17), who at one point speculates (69) that at least three of Clemens' children were already dead by A.D. 96: the truth is that we cannot tell, and that the lack of proper evidence usually prevents us from investigating the families even of close relatives of Roman emperors.

⁴⁸ *HA Tac.* 16.4: 'et Floriani liberi et Taciti multi exstiterunt'.

Mortality Levels 3 and 6.⁴⁹ Emperors who died under the age of twenty-five are excluded; none of them is known to have had any living children.

A total of seventy-four emperors yields a mean number of 0.757 attested sons, compared to 0.747 (Level 3) or 0.769 (Level 6) in the model, and 0.804 daughters.⁵⁰ This result is striking for two reasons. First, the attested mean is virtually identical to the predicted values, corroborating the fit between evidence and model in terms of life expectancy observed above.⁵¹ Both predictions are ultimately based on the same model life tables, and in both cases the data match the projection. Second, the attested sex ratio is remarkably balanced. While one might have suspected daughters to be intrinsically less likely to be recorded than sons, especially when the sources are poor, this does not seem to be the case. It is also possible to calculate the mean proportion of emperors with surviving sons, daughters, or children in general (Table 5).

Once again, the evidence is in keeping with the model.⁵² On average, 49.5 per cent of these seventy-four emperors are expected to have had at least one living son when they died (Mortality Level 3); according to our sources, this was true for 43.2 per cent of them. A shortfall by one-seventh is without statistical significance ($p < 0.28$). The match is even stronger for daughters: 52.7 per cent of the seventy-four emperors are known to have left at least one daughter. Some cases are doubtful, but a few daughters may have gone unrecorded. The predicted figure is only marginally higher than for sons, about 50.5 per cent. This results in an extremely close fit ($p < 0.71$).

Because of random variation, a slight difference between the number of sons and daughters is only to be expected, and the observed deviation is so small that it is entirely meaningless. It is true that the proportion of emperors who were not succeeded by children of either sex, 33.8 per cent, seems relatively high, as the predicted rate stands at 27.5 per cent. Thus, emperors dying childless were about 23 per cent more numerous than expected. It would be hard to explain this apparent deficit with reference to missing daughters (on the theory that some of the less well-documented childless emperors may have had unknown daughters), as daughters are already more frequently attested than sons. At any rate, it seems unlikely that this finding points to

⁴⁹ Saller (n. 4), p. 57 Table 3.2.d, p. 63 Table 3.3.d. On these simulations (which are only available for Mortality Levels 3 and 6), see pp. 43–69; they '[generate] a model population by simulating the basic events of birth, death and marriage, month by month, in accordance with the age-specific probabilities of those events as established by the demographic parameters' (p. 44). The final column in Table 4 is based on the following set of assumptions: life expectancy at birth was 25 or 32.5 years (for women, here applied to either sex); mean age at first marriage was twenty-five for men (and fifteen for women); first marriages were distributed between the ages twenty and forty for men (and from twelve to thirty-three for women); after the death of a spouse, men would remarry up to the age of sixty (pp. 45–6). (Different parameters apply for the simulation of non-senatorial kinship patterns.)

⁵⁰ If we speculatively assign three sons to Tacitus, we arrive at a mean of 0.787 sons, against 0.745 in the model, and 0.793 daughters. A general point deserves attention: the figures shown in Saller's tables, whilst calculated to higher accuracy, are rounded off to a single digit behind the comma. The cumulation of rounded-off figures to obtain a grand total and an overall mean therefore introduces a possible margin of error which, however, cannot exceed a range of plus/minus 3.7 sons or 6.6 per cent for the grand total and is unlikely to be larger than plus/minus 3.3 per cent; it is thus fairly negligible.

⁵¹ It is true that two of the last three emperors left over one-sixth of all surviving sons. This peak is, however, offset by the long line of emperors without sons who preceded them. The match between evidence and model does not depend on the cut-off date: for the period from A.D. 14 to 395, a mean of 0.722 surviving sons compares well with 0.744 sons in the simulation; if we stop counting in A.D. 476, the figures are very similar, 0.708 and 0.758, respectively.

⁵² Based on Saller (n. 4), p. 58 Table 3.2.e, p. 64 Table 3.3.e.

TABLE 4. The attested and expected number of surviving children of Roman emperors

Emperor	Attested sons	Expected sons		Attested daughters
		Level 3	Level 6	
Augustus	—	0.6	0.6–0.7	1 (?)
Tiberius	—	0.5	0.6	—
Caligula	—	0.6	0.7	1
Claudius	1	0.7	0.7	2
Nero	—	0.6	0.7	—
Galba	—	0.6	0.7	—
Otho	—	0.9	0.9	—
Vitellius	1	0.8	0.8	1
Vespasian	2	0.6	0.7	—
Titus	—	0.9	0.9	1
Domitian	—	0.9	0.9	—
Nerva	—	0.6	0.7	—
Trajan	—	0.7	0.7	—
Hadrian	—	0.8	0.8	—
Aelius	1	0.9	0.9	2
Antoninus Pius	—	0.6	0.6–0.7	1
Lucius Verus	—	0.9	0.9	1
Marcus Aurelius	1	0.8	0.8	4
Commodus	—	0.6	0.7	—
Pertinax	1	0.7	0.7	1
Didius Julianus	—	0.8	0.8	1–2
Septimius Severus	2	0.7	0.7	2 (?)
Caracalla	—	0.6	0.7	—
Macrinus	1	0.8	0.8	?
Severus Alexander	—	0.4	0.4	—
Maximinus Thrax	1	0.7	0.7	?
Gordian I	1	0.5	0.6	?
Gordian II	—	0.9	0.9	—
Pupienus	2	0.6	0.6–0.7	1
Philippus Arabs	1	0.9	0.9	?
Decius	1	0.8–0.9	0.8–0.9	1 (?)
Trebonianus Gallus	1	0.9	0.9	1
Valerian	2	0.8	0.8	?
Gallienus	2	0.8	0.8	?
Claudius II	—	0.8	0.8	—
Aurelian	—	0.8	0.8	1
Probus	—	0.9	0.9	—
Carus	2	0.8	0.8	1 (?)
Diocletian	—	0.6	0.7	1
Maximinian	1	0.8	0.8	1
Constantius I	4	0.8	0.8	3
Galerius	1	0.8–0.9	0.8–0.9	1
Maximinus Daia	1	0.7	0.8	1 (?)
Maxentius	—	0.7–0.8	0.8	—
Licinius	1	0.8	0.8	—
Constantine I	3	0.7	0.7	2
Constans	—	0.6	0.7	—
Constantius II	—	0.9	0.9	1
Julian	—	0.8	0.8	—
Jovian	1	0.8	0.8	—
Valentinian I	2	0.8	0.8	3
Valens	—	0.9	0.9	2
Valentinian II	—	0.7	0.7	—

TABLE 4. *Continued*

Emperor	Attested sons	Expected sons		Attested daughters
		Level 3	Level 6	
Theodosius I	2	0.9	0.9	1
Arcadius	1	0.7	0.7	3
Honorius	–	0.9	0.9	–
Theodosius II	–	0.9	0.9	1
Valentinian III	–	0.9	0.9	–
Maximus	1	0.8	0.8	–
Avitus	2	0.8	0.8	1
Marcian	–	0.7	0.7	1
Maorian	–	0.9	0.9	–
Anthemius	3	0.9	0.9	1
Olybrius	–	0.9	0.9	1
Leo	–	0.6	0.7	2
Zeno	–	0.7–0.8	0.7–0.8	–
Anastasius	–	0.5	0.5	–
Justin	–	0.6	0.6–0.7	–
Justinian	–	0.5	0.5–0.6	–
Justin II	–	0.7	0.7	1
Tiberius	–	0.9	0.9	2
Mauricius	6	0.7	0.7	3
Phocas	–	0.7	0.7	1 (?)
Heraclius	4	0.7	0.7	3
Total	56	55.3	56.9	59–60 (?)

TABLE 5. The number of Roman emperors survived by their children

Number of children	Sons	Daughters	Either
0	42	35	25
1	18	26	21
2	9	7	13
3	2	5	6
4	2	1	3
5	–	–	3
6	1	–	–
7	–	–	2
8	–	–	–
9	–	–	1

a real deviation from the proposed norm. A mere four additional emperors with at least one child would be sufficient to bring the attested rates into perfect balance, and it would surely be unreasonable to expect this rate of perfection from a small sample or, for that matter, from the members of any real population. Saller himself rightly emphasizes that the predictions generated by his kinship simulation should be taken as broad proportions rather than exact percentages.⁵³ Furthermore, from a statistical perspective, the difference between sample and model remains completely unimpressive ($p < 0.23$).

⁵³ Ibid., p. 47.

Marital fertility

The attested rates of survival are consistent with marital fertility at replacement level. At this rate, the population as a whole would reproduce itself on a one-to-one basis but a certain proportion of all couples would fail to do so. Some lines would become extinct while others expanded. It is interesting to see that Roman imperial families rarely seem to have adopted significantly different reproductive strategies. For instance, attempts to maximize (as far as possible) the probability of full replacement of both spouses might have resulted in an above-average number of surviving children. This practice would have increased the chance of ensuring dynastic rule, and its apparent rarity requires explanation. Two factors may be held responsible. Many emperors, for much of their life, had not expected to become emperors. Hence, the attested fertility regime in part reflects the reproductive behaviour of the Roman aristocracy and other élite groups, such as military officers. As such, it provides some insight into the demography of the Roman upper classes. We must also allow for the possibility that in the legal context of monogamy, it may have been difficult for some imperial couples to raise their fertility even if they did their best: the case of Marcus Aurelius, who fathered all his children as Caesar and Augustus, provides a telling example.

It is often taken for granted that male members of the Roman élite married young and began having children sooner than others.⁵⁴ By implication, this ought to be even more true of emperors, particularly of those who were earmarked for the throne from their youth. Even so, marital fertility of emperors under the age of twenty-five was low. Titus' daughter Julia may have been born when he was twenty-two, but the year is not certain. Domitian's son was born when he was of the same age. Constantius I's first son, Constantine, appears to have been born when the father was in his early twenties, but a later date is also possible. Maxentius' son Valerius Romulus must have been born when his father was still a teenager, and the same is safely attested for Gratian's only son. Arcadius' daughter Licinia Eudoxia was born when he was twenty-one, his first son Arcadius when he was twenty-four. These seven cases are the only ones documented for a period of 670 years, at an average rate of about one per century. Drusus and Germanicus, who in their twenties fathered large numbers of children, were highly exceptional even within the top echelons of the Roman élite.

Given the close fit between data and model and the balanced sex ratio, there is nothing in the evidence that would point to a strong tradition of family limitation. Surviving sons appear to have been relatively rare not because their brothers had been removed in large numbers in order to restrict the number of future heirs but simply because of the underlying demographic regime of high mortality. Daughters were not obviously discriminated against.⁵⁵ Neither Riddle's ideas of widespread family limitation nor even the frequent assumption that at least the Roman élite may have tailored the size of their families according to their perceived needs are corroborated by these data.⁵⁶ Nor is there any need to suspect that the incidence of marital sterility in the

⁵⁴ Syme (n. 39), p. 235, stresses early marriage for Roman senators. See also S. Treggiari, *Roman Marriage: Iusti Coniuges from the Time of Cicero to the Time of Ulpian* (Oxford, 1991), pp. 401–2; Saller (n. 4), pp. 26, 45–6.

⁵⁵ L. Betzig and S. Weber, 'Presidents preferred sons', *Politics and the Life Sciences* 14 (1995), 61–4, discuss male-biased sex ratios among the children of high-status parents.

⁵⁶ Widespread family limitation: J. M. Riddle, *Contraception and Abortion from the Ancient World to the Renaissance* (Cambridge MA/London, 1992), pp. 1–107, and *Eve's Herbs: A History of Contraception and Abortion in the West* (Cambridge MA/London, 1997), pp. 10–90. For related

Roman ruling class might have been much higher than in other groups, times, and places.⁵⁷

Ideally, the age distribution of marital fertility could give us an idea of the frequency of family limitation. In the absence of parity-related forms of birth control, marital fertility rates decline gradually from about the age of twenty until forty, and then sharply in the forties, mainly as a function of declining fecundity as women age. By contrast, family limitation is achieved through a 'stopping strategy' that changes this 'natural' pattern: 'married couples stop procreating after they reach what they regard as a sufficient number of children'.⁵⁸ As a result, married women's birth rates during, say, the second half or the final third of their reproductive periods are significantly lower than they would be without intervention (i.e. abstinence, contraception, or abortion). Unfortunately, it is hard to tell whether—let alone how often—imperial couples employed a stopping strategy. Many of the best-known women either died or were widowed well before menopause.⁵⁹ In such cases, we cannot know whether they would have ceased having children at a later stage when they were still fecund, perhaps in their late thirties. Pertinent evidence is exiguous as well as tantalizing. Faustina the Younger gave birth to all but one of her known children before she reached her mid-thirties. We may speculate that after A.D. 162, the presence of several sons temporarily prompted the imperial couple to abstain from further procreation. The future emperor Commodus and his twin T. Aurelius Fulvius were born in A.D. 161; the latter died four years later. M. Annius Verus lived from A.D. 162 to 169. (Another son, Hadrianus, may also still have been alive in the early 160s.) This means that for a few years from A.D. 162 to 165, Marcus Aurelius was endowed with three (or perhaps four) living sons. However, this number soon dropped to two and finally to one, Commodus, who was only eight years old when his last remaining brother died. At that age, a child still faced a considerable risk of premature death; to make matters worse, the empire was then ravaged by a smallpox pandemic. As a consequence, Marcus and Faustina may well have resolved to aim for a spare. It is tempting to regard their final child, Vibia Sabina, who was probably born between A.D. 170 and 172, as the unwelcome result of this decision. By that time, Faustina had entered the fifth decade of her life.

ideas, see L. Wierschowski, 'Der historisch-demographische Kontext der severischen Abtreibungsverbote', *Laverna* 7 (1996), 42–66. Élite behaviour: P. A. Brunt, *Italian Manpower 225 B.C.–A.D. 14* (Oxford, 1971, repr. 1987), p. 142, claims that 'it was surely the limitation of [aristocratic] families that explains their disappearance'. For a more cautious discussion of Roman élite fertility, see Hopkins (n. 4), pp. 78–107. Of course, emperors might be considered a special case within the élite: see below. Comparative evidence on élite fertility: e.g. S. R. Johansson, 'Status anxiety and demographic contraction of privileged populations', *Population and Development Review* 13 (1987), 439–70.

⁵⁷ Lead poisoning as a cause of sterility has finally gone out of fashion: see e.g. J. Scarborough, 'The myth of lead poisoning among the Romans: an essay review', *Journal of the History of Medicine* 39 (1984), 469–75; L. and D. Needleman, 'Lead poisoning and the decline of the Roman aristocracy', *EMC* n.s. 4 (1985), 63–86. (This is not to say that habitual ingestion of wine mixed with leaded *sapa* could not have resulted in serious health problems: cf. J. Eisinger, 'Lead and wine: Eberhard Gockel and the *colica pictonum*', *Medical History* 26 [1982], 279–302; V. Nutton, 'Bleivergiftung', *Der Neue Pauly* 2 [1997], 709.) There is also little point in replacing the lead-poisoning theory with speculation that gonorrhoea (for which there does not seem to be any specific evidence) may have been a common cause of sterility in Roman society (Needleman, pp. 86–94).

⁵⁸ B. W. Frier, 'Natural fertility and family limitation in Roman marriage', *CPh* 90 (1994), 318–21.

⁵⁹ Widows include the elder and the younger Antonia and Vipsania Agrippina; others died young: see above, p. 258.

There is no reliable evidence of further pregnancies up to her death in A.D. 176.⁶⁰ It is certainly possible and perhaps even plausible that Marcus and Faustina deliberately stopped having children when the presence of several sons seemed to obviate the need for additional offspring, and later resumed their marital duties after an interval of eight to ten years. The case of Septimius Severus and Julia Domna offers somewhat stronger evidence of family limitation. When they married in A.D. 185 or 187, Julia Domna was still a teenager; their sons Bassianus (Caracalla) and Geta were born in A.D. 188 and 189. Although the couple subsequently stayed together for another twenty-two years and Julia Domna cannot have been much older than forty when her husband died, no other children are safely attested.⁶¹ There is no way of knowing whether Julia Domna suffered from some medical condition that made further reproduction impossible. Even so, it is a fair guess that Septimius Severus simply did not desire more than two sons—‘an heir and a spare’—as long as his young wife (if she indeed continued to be fecund) could reasonably be expected to replace them if necessary. As it happened, this pair of brothers outlived their father, and soon even the two of them proved to be one too many. If this interpretation is correct, Septimius Severus and Julia Domna may be said to have adopted a strict ‘stopping strategy’ that kept their fertility well below average. Needless to say, these two possible cases of family limitation cannot support any broad generalizations.⁶² We must conclude that there is no compelling evidence of habitual family limitation in imperial households.

Change over time also remains an elusive issue. Broadly speaking, during the first and second as well as the fifth and sixth centuries the attested number of sons fell short of expectations, whereas the emperors of the third and fourth centuries on average produced a surplus of male successors (Figure 5). However, in that latter period the mean gain relative to the predicted rate amounts to a mere 0.186 sons per emperor, and can easily be explained as random fluctuation.

Moreover, the large number of surviving children of some of the fourth-century emperors and again in the early seventh century has something of a parallel in the numerous offspring of Agrippa and Germanicus. In every period, a few elite families were spared the ravages of child mortality. At the same time, small families were the norm: for every father who was survived by numerous progeny there were several with only one child or none.⁶³ The data set out in Table 5 confirm this unsurprising pattern.

In one of his epigrams Martial celebrates a woman who had been honoured at the *Ludi Saeculares* after giving birth to five sons and five daughters, all of whom were still alive at the time of her death.⁶⁴ The attention her case attracted shows that the family of the emperor Mauricius, who came within one child of matching her record,

⁶⁰ Later miscarriages, which become more frequent towards the end of the reproductive period, cannot be ruled out. Cf. Birley (n. 45), p. 191, for the possibility that she was pregnant at the time of her death.

⁶¹ Although the *Historia Augusta* (8.1) ascribes two daughters to Septimius Severus, their existence is doubtful; moreover, they could also have been borne by his first wife, Paccia Marciana.

⁶² Constantine I was married to Fausta from A.D. 307 to 326 but four of their five children appear to have been born between A.D. 316 and c. 320. The curious lack of children during the first decade of their marriage was probably not the result of family planning; rather, this gap points to the existence of earlier children who died soon after birth and remain unknown to us.

⁶³ Thus already R. Syme, *Roman Papers III*, ed. A. R. Birley (Oxford, 1984), p. 1237.

⁶⁴ Mart. 10.63. Since her age at death and the ages of her children remain unknown, we can only very roughly estimate the odds against ten siblings surviving to the death of their mother; they must have been of the order of 1,000 to 1. This scenario is rendered even more remarkable by the fact that, as Martial notes, all these children shared the same father.

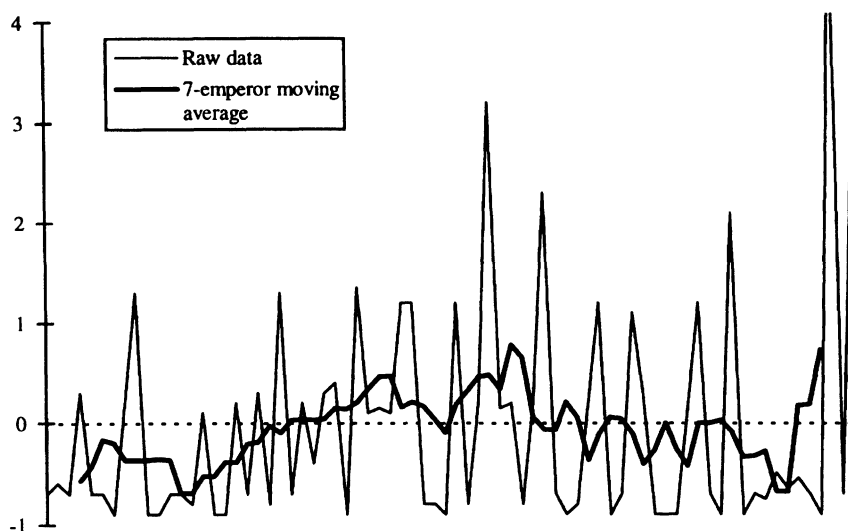


FIGURE 5. The number of surviving sons of Roman emperors relative to the predicted mean.

was likewise bound to be viewed as most extraordinary. In fact, when the elder Pliny was scouring his notes for examples of unusual fertility, the best he could come up with were Q. Metellus Macedonicus (cos. 143 B.C.), who had six children, and the plebeian C. Crispinus Hilarus, father of eight. As Treggiari plausibly observes, 'it seems that better or more recent records were unknown to him'.⁶⁵ He would have had to wait for another five and a half centuries to get a chance to marvel at the numerous progeny of Mauricius and Heraclius.

As I have pointed out above, the close fit between data and model confirms that *as a group*, or *on average*, emperors and their wives achieved reproduction at or around replacement level. It is, however, important to realize that the overall mean conceals considerable variation between individual cases. While some couples aimed to maximize their fertility, other emperors failed to remarry after the death of a spouse or were committed to childless unions. Between A.D. 147 and c. 170, approximately from the seventeenth to the fortieth year of her life, Faustina the Younger went through ten to twelve deliveries.⁶⁶ Thus, the mean interval between births was 2.1–2.6 years. Comparably short birth intervals—which would not have been possible without the employment of wet-nurses—are also attested or implied for other imperial women. Agrippa and Julia produced five children within nine years (a mean interval of two years). Antonia bore Drusus more than three children in about seven years of marriage. Within a period of twelve or thirteen years, Germanicus and Vipsania Agrippina had nine children; this yields a mean birth interval of 1.5–1.6 years.⁶⁷

⁶⁵ Treggiari (n. 54), p. 404. However, Pliny might also have referred to the six surviving children of Germanicus and Agrippina.

⁶⁶ See above, n. 45.

⁶⁷ She is assumed to have married in A.D. 4 or 5. If she was sixteen or seventeen then, she would have given birth to her first child at about seventeen or eighteen; this guess cannot be wide of the mark. Her reproductive cycle was cut short by Germanicus' death in A.D. 19, one or two years after the birth of their ninth child. For a discussion of her reproductive history, see H. Lindsay, 'A

Theodosius' first wife Flacilla gave birth to three children within eight years, his second wife Galla to another three within six or seven years. We know the precise dates of birth of all five children of Arcadius and Aelia Eudoxia. In this case, the average interval between births amounted to a mere 1.4 years, or less than twice the length of a pregnancy.

Event	Date	Interval before next pregnancy
Wedding	27 April 395	17 months
Birth of Flacilla	17 June 397	9 months
Birth of Pulcheria	19 January 399	5 months
Birth of Arcadius	3 April 400	3 months
Birth of Theodosius	10 April 401	13 months
Birth of Marina	10 February 403	(21 months without delivery)
Death	6 October 404	

Constantina bore Mauricius nine (surviving) children within a period of eighteen years at most, or about one every other year. The shortest interval between two births is recorded for Heraclius' first wife Eudocia, who gave birth to a daughter nine months after their wedding and to a son only ten months later; she died three months after that second delivery. Although such cases seem far and between, we cannot dismiss the possibility that other imperial couples, whose life histories are less well documented, adopted a similar regime of very high fertility but—unbeknownst to us—lost many of their children in infancy.⁶⁸

At the opposite end of the spectrum, the long series of emperors in the fifth and sixth centuries who died without leaving a son behind requires explanation. Leo fathered his only known son (who may have been the last of many a failed attempt) at the age of sixty-one; when this child died after only five months, he failed to produce further children. Both of Zeno's sons died before their father. Anastasius became emperor only when he was sixty-one and married Leo's daughter Aelia Ariadne, who would by then have been in her late thirties; this raises the question of what happened to any children whom he might previously have fathered. Justin was also married, and Justinian maintained a childless marriage with Theodora until she died in his sixty-sixth year. Aelia Anastasia became the wife of Tiberius Constantinus only after her daughter from a previous marriage, whom she had betrothed to the emperor, had died; this indicates that she must have been past prime childbearing age. Thus, a mixture of premature deaths and sterile marriages seems to account for these cases. The latter, of course, can be traced back to the very first princes and his spouse. Tiberius did not take another wife after his divorce from Julia at the age of forty. Titus failed to remarry after repudiating his second wife at a time when he was still in his twenties. Prolonged celibacy was, however, extremely rare, and therefore cannot have had a significant impact on the mean number of children of Roman emperors. Most

fertile marriage: Agrippina and the chronology of her children by Germanicus', *Latomus* 54 (1995), 3–17 (who considers the existence of a tenth child possible: 7–8).

⁶⁸ For a possible example, see above, n. 62. It is not clear how long it took the elder Tiberius Gracchus and his wife Cornelia to produce twelve children. The view that these births occurred within a period of twelve years strains credulity (even if we allow for the possibility of multiple births: thus Parkin [n. 3], p. 181, n. 16). Moir (n. 41), pp. 136–45, plausibly argues that depending on the date of Cornelia's marriage, her twelve children were spaced out over fifteen or even twenty-six years. In the light of the evidence presented above, the implied mean birth intervals of 1.4 and 2.4 years both seem acceptable.

emperors would be married for most of the time, at any rate before the onset of old age, and quite a few married more than once. Vitellius, Septimius Severus, Constantius I, Galerius, Constantine I, Valentinian I, Gratian, Theodosius I, and Heraclius, among others, married twice; Nero, Elagabal and Constantius III, three times; Caligula and Claudius, four times. Moreover, a number of emperors whose early lives are obscured from our view may have had first wives who remain unknown to us.

This range of experiences may well discourage us from referring to the reproductive behaviour of 'the' Roman emperors as if it had been governed by uniform preferences and customs; this was clearly not so. All the same, it appears that somewhat extreme strategies, such as the attempt to produce as many children in as little time as possible on the one hand and voluntary celibacy on the other, on the whole tended to cancel each other out, and that most emperors got by with one or two wives who bore them children in numbers that must have been broadly typical of the population of the empire at large. This is, after all, borne out by the match between evidence and simulation observed above (Table 4). Thus, and again on average, the number of their surviving legitimate children was to a large extent determined by mortality.

We cannot tell to what extent this type of reproductive behaviour was representative of the upper classes. It is not inconceivable that, on average, the reproductive success of emperors and 'ordinary' aristocrats was not the same. For the former, preservation of the family fortune was not an issue, while other considerations, such as the spectre of sibling rivalries, might have influenced their preferences. However, given that the mean chance of leaving progeny appears to have been similar for emperors and the masses, we would be forced to assume that these two groups shared a characteristic that set them apart from certain echelons of the élite. In this respect, emperors would have had more in common with peasants than with senators and knights.

Unfortunately, even eminent aristocratic families are not sufficiently well documented for us to calculate the mean number of children per couple who survived to maturity, let alone total rates of marital fertility.⁶⁹ Rates of *social* succession, in terms of maintaining a given rank or holding the same office in consecutive generations, are not identical with rates of biological reproduction, which are generally likely to be higher.⁷⁰ According to a recent count, we know 576 senatorial women with 759 children from the first two centuries A.D.⁷¹ The attested sex ratio of these children of 177 males to 100 females (in itself an indication of serious gaps in the extant documentation) may be balanced by adjusting the attested mean of 1.318 children per women to 1.68.⁷² In view of the sketchy coverage by our sources, it is impossible to relate this figure to the mean number of children ever born. Hence, this calculation does not enable us to establish actual fertility rates.⁷³ Etienne shows that the mean

⁶⁹ The families studied by Etienne readily prove this point: see above, nn. 16 and 17. As a consequence, scholars usually evoke 'soft', literary evidence associating the Roman élite with various forms of family limitation: e.g. K. Hopkins, 'Contraception in the Roman Empire', *CSSH* 8 (1965), 124–51; Frier (n. 58), p. 332.

⁷⁰ For concepts such as 'Family status maintenance' and 'Social reproduction in politics', see Hopkins (n. 4), pp. 61–2. Even social reproduction is difficult to measure: G. P. Burton, 'The inheritance of the consulate in the Antonine period: a problem revisited', *Phoenix* 49 (1995), 218–31.

⁷¹ W. Suder, 'Démographie des femmes de l'ordre sénatorial (Ier–IIe siècle ap. J.-C.): fécondité', *Antiquitas* 18 (1993), 199–201, based on M.-T. Raepsaet-Charlier, *Prosopographie des femmes de l'ordre sénatorial (Ier–IIe s.)* (Leuven, 1987).

⁷² Suder (n. 71), p. 200 (where, strangely, he opts for two children per woman).

⁷³ Suder somewhat disingenuously claims that 'ce qui pour nous est important, c'est non pas d'avoir des chiffres absolus, mais des proportions et un ordre de grandeur' (ibid., p. 201), but if he

number of known children in eight grand senatorial families of the fourth century A.D. is 1.8.⁷⁴ Here, the sex ratio is even more extreme, 2.37 males for every female. After adjustment, we end up with 2.6 children per couple. 84.1 per cent of the attested successors whose age is known are twenty-five and over. In Model West Mortality Level 4 Males, 56 per cent of all deaths occur prior to that age. Thus, controlling for the underreporting of early death in the sample, the mean number of children can be put at 3.9. However, if we assume that all reported descendants whose age is unknown were adults, the average number of children per couple rises to 5.1. But even then we cannot be sure that we know each adult male descendant of each couple in our sample, especially as so many females have been found missing from the record; hence, fertility may have been higher still. The underlying rates of biological reproduction remain unknowable.

Extramarital reproduction

Roman emperors had unlimited access to fecund women, and much like despots in other times and places many of them eagerly exploited their position.⁷⁵ The wealthy and powerful, a few of whom would themselves become emperors, indulged themselves on a proportionately smaller scale.⁷⁶ As far as we can tell, however, this was not a way of providing themselves with heirs and successors. For that, even all-powerful emperors relied on legitimate children. Only three bastards receive passing mention in the corpora on which this survey is based: Galerius' son by a mistress, Candidianus, later executed by Licinius; a natural son of Licinius was initially legitimized by rescript but reduced to slave status by Constantine; and Heraclius' son by a mistress, Ioannes. Their invisibility notwithstanding, scores of children like them must have populated court and capital, but were excluded from power. We may conclude that the surprising 'paucity of allegations' of adulterous conception among late Republican aristocrats that Syme attributed to 'discretion and connivance' on an unparalleled scale⁷⁷ continued throughout the empire, or at any rate that such activities did not attract enough attention to surface in the written record.

CONCLUSION

When the future Augustus married Livia in 38 B.C., he was twenty-five and his bride twenty years of age. Of every sixty couples of twenty-five year old men and twenty year old women joined in matrimony at that time, only one could still have been

means to imply that these figures are to be taken as 'la limite inférieure' (p. 199) for the Total Fertility Rate, we must not forget that this limit may well be very far removed from the true rate.

⁷⁴ Etienne, 'Familles' (n. 16), Table X (97 children of 54 couples).

⁷⁵ See L. Betzig, 'Roman polygyny', *Ethology and Sociobiology* 13 (1992), 309–49, for a substantial survey (and Darwinian interpretation) of pertinent Roman evidence, and her *Despotism and Differential Reproduction: a Darwinian View of History* (Hawthorne, 1986), esp. pp. 70–86, and 'Medieval monogamy', *Journal of Family History* 20 (1995), 181–216, at 183–94, for comparative material.

⁷⁶ See e.g. M. I. Finley, *Ancient Slavery and Modern Ideology* (London, 1980), pp. 95–6; J. Kolendo, 'L'esclavage et la vie sexuelle des hommes libres à Rome', *Index* 10 (1983), 288–97; E. Herrmann-Otto, *Ex ancilla natus: Untersuchungen zu den "hausgeborenen" Sklaven und Sklavinnen im Westen des römischen Kaiserreiches* (Stuttgart, 1994), pp. 256, n. 59, 310–12 (cf. my review in *Tyche* 11 [1996], 274–8, with references to comparative evidence).

⁷⁷ Syme (n. 63), p. 1238.

together fifty years later.⁷⁸ By A.D. 13, Augustus and Livia had become that one couple. When Augustus died the following year, five out of six inhabitants of the empire were unable to remember a time when he had not been their sole ruler. It is hard to overestimate the extent to which the successful launch of the Principate, depending as it did on Augustus' ability to outlive both his rivals and their memory, was facilitated by a statistical fluke. It took four centuries for another emperor, Theodosius II, to rule that long, and if we consider Octavian a co-regent from 43 B.C. onward, his luck was without parallel in Roman history.⁷⁹

Hopkins has urged us to consider what it was like to be a Roman emperor.⁸⁰ The evidence suggests that in matters of life and death, emperors, whether born as princes or as mere aristocrats or officers, were subject to the same constraints as the population as a whole. Up to now, this view could only be sustained by theoretical considerations based on comparative evidence. In this paper, I have tried to show that the results generated by a traditional inductivist approach to ancient sources strongly support such assumptions. Life expectancy at birth among the élite was of the order of twenty to thirty years; on average, the attested marital fertility of Roman emperors is consistent with the predictions of simulations derived from model life tables.

For all their wealth and power, Roman emperors could not hope to live significantly longer than their subjects even if they managed to steer clear of daggers, poison, and the battlefield. The same appears to apply to the Roman élite as a whole. In this respect, they resemble the early modern English aristocracy and other pre-industrial élites.⁸¹ As with all known urban élites up to the eighteenth century, the potential benefits of ample nutrition were more than offset by constant exposure to an aggressive germ community. Roman emperors, who resided in the capital cities of Rome and Constantinople, hotbeds of infectious disease born of high population density and poor sanitation, and sometimes in similarly insalubrious army camps, may well have been outlived by those of their subjects who were poor but occupied lower-exposure, rural disease environments.⁸² The repertoire of ancient medicine and the pricey skills of its most fashionable practitioners were clearly of little help, and on occasion might even have made matters worse.⁸³ Moreover, whatever the sexual mores of Roman

⁷⁸ This calculation is based on Model West Mortality Level 4; see above in the section on the life expectancy of Roman emperors.

⁷⁹ We would have to fall back on the extreme case of the Sasanid king Sapur II, who was crowned at birth and lived to be seventy, to better this record.

⁸⁰ K. Hopkins, 'Rules of evidence', *JRS* 68 (1978), 186.

⁸¹ M. Livi-Bacci, *Population and Nutrition: An Essay on European Demographic History* (Cambridge, 1991), pp. 63–7, and S. R. Johansson, 'Food for thought: rhetoric and reality in modern mortality history', *Historical Methods* 27 (1994), 101–25, at 113–14, summarize pertinent research.

⁸² Cf. Johansson (n. 81), 114, for comparative evidence. There is little to support the notion that Roman 'upper-class mortality may have been substantially lower than general levels' (Frier [n. 58], p. 332, n. 57). Residence in the city of Rome was in itself a serious health hazard: see Scheidel (n. 40), pp. 139–53 (on seasonal mortality), and also pp. 124–9 (on mortality in military units stationed in the capital); Sallares and Scheidel (n. 4), ch. 1 (on malaria in Rome).

⁸³ Soranus, *Gyn.* 2.18, asks mothers to abstain from breast-feeding their babies during the first twenty days after delivery, when in fact maternal milk at that stage is about three times as rich in protein as mature human milk and provides the child with vital antibodies. The same injunction applied to wet-nurses who had very recently given birth (*Gyn.* 2.20). P. Garnsey, 'Child rearing in ancient Italy', in his *Cities, Peasants and Food in Classical Antiquity: Essays in Social and Economic History* (ed. W. Scheidel) (Cambridge, 1998), p. 264, argues that while Soranus' medical advice (which did not pass uncontested) 'would have significantly reduced the life chances of the children concerned', it 'would have had limited impact outside an upper-class clientele'. We may

emperors and the scope of their exploits, their marital fertility was constrained by monogamy and the pressure of rampant mortality that would rob them of their children and spouses—and cast a shadow over their own future.

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suspect that if anyone at all was harmed by fanciful medical theories, it must have been the Roman élite, including imperial families. In most cases, however, infections would take their toll regardless of medical interference.