EVOLVING VIEWS OF AGEING AND LONGEVITY FROM HOMER TO HIPPOCRATES: EMERGENCE OF NATURAL FACTORS, PERSISTENCE OF THE SUPERNATURAL*

During the three centuries from Homer to Hippocrates, views of human ageing and longevity evolved in a socio-cultural sense, with relationships to Greek medicine and science. I, as a biomedical scientist, examine ancient literature for roots of the idea that life-course outcomes can be influenced by tangible ‘natural’ factors, whether these are environmental or the result of lifestyle. The concept that an individual has any choice in health and ageing departs radically from ancient, persistent beliefs in the primacy of the supernatural, that the gods could predestine one’s life span by birth or could alter it at any time.

Modern biomedical research has identified many specific factors affecting ageing and longevity. Although individuals differ in life span and ageing patterns, only one-third of longevity is genetically inherited in humans and animals.1 Thus, in part, individual variations are attributable to lifestyle and environment. An early precedent is Herodotus’ description of Ethiopians who lived 120 years on milk and boiled meat, while Persians lived but 80 on bread and wine (3.22–3).2 Tangible factors in health are also represented in the Hippocratic writers, who asserted that disease is attributable to the environment or lifestyle, rather than the supernatural.

‘Old age’ in the Graeco-Roman world has been extensively analysed from cultural, demographic, political, and social perspectives.3 In

* I am grateful for comments from Stanley Burstein, Solomon Golomb, Paul Potter, William Race, William Thalmann, and Rosalind Thomas. Professors Burstein and Thalmann receive particular thanks for detailed critiques. The anonymous reviewer gave helpful suggestions on ancient demography. The editors gave generous encouragement to the ideas I was exploring, particularly in relation to the cultural and political developments of that era. Doris Finch, as always, gave helpful comments on style. Lastly, I acknowledge Ludwig Edelstein, the great Hippocratic scholar, with whom I was lucky enough to discuss ancient medicine in 1962 while a greenhorn graduate student at the Rockefeller University.


3 H. Brandt, Wird auch silbern mein Haar: Eine Geschichte des Alters in der Antike (Bochhau Verlag Historische Anthropologie, 2005); T. R. Cole and M. G. Winkler (eds.), The Oxford Book
these ancient societies, older persons had recognized roles, with rights, responsibilities, and expected behaviours for ‘age-groups’ defined by social status and gender as well as age. 4 Gruman’s 1977 benchmark monograph on prolongevity (History of Ideas about the Prolongation of Life) considered natural factors and lifestyle, but did not explore ancient understandings of ageing and health in relation to developments in culture, medicine, and natural philosophy. Here I describe the evolving concepts of ageing, health, and longevity from the eighth to the fifth century BCE in four overlapping phases distinguished by diminishing emphasis on the supernatural and increasing emphasis on environmental and lifestyle factors. Table 1 gives a chronology of major texts; there are, however, few verifiable records of life span. These and other limitations on reconstructing ancient life history are discussed in context.

Phase 1: ageing, health, and longevity in the Archaic Period

Ancient Greeks generally believed that the life span was not under human control, as exemplified by Homer: ‘But the great leveller, Death: not even the gods can defend a man, even one that they love, that day when fate [moira] takes hold and lays him out at last’ (Od. 3.270). 5 The moira of fate, meaning allotment or portion, refers here

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to the finite life span. To be human was to be inescapably mortal.
– death was determined by supernatural forces. The gods could take offence at human actions and deliver destruction and death, as in the greatly feared plagues. The *Iliad* famously opens with angry Apollo sending a plague upon the Acheans: raging for ten days, it killed mules and dogs in droves, and then the men themselves (*Il. 1.43–70*). Supernatural causation could be abstractly invoked as *moira* or attributed to a particular god or group of gods, and this mindset is critical to understanding ancient Greek views on health, ageing, and longevity.

Homer consistently contrasts the immortality of the gods with human mortality. The gods’ key to immortality was their special diet of nectar and ambrosia; they never touched bread and wine, the sustenance of mortals. Clay has shown key associations of the word for mortal men (*brotoi*) with diet, the ‘eating of grain’ (fruit of the field) (*Il. 21.462–6*). As sacred agents, nectar and ambrosia could prevent putrefaction of a corpse (as for Patroclus, *Il. 19.43*), while ambrosia was used cosmetically by the goddess Pallas Athena to restore bloom to Queen Penelope’s cheeks before her reunion with Odysseus (*Od. 18.220*). These attributes of nectar are consistent with Levin’s etymology: *nectar* (‘death-surpassing’) or *nectar* (‘un-dying’). Thus, our earliest Greek text identifies food as a key agent in longevity that differentiates humans and gods.

Homer’s epics frequently portray ageing as physically debilitating, with gnarled limbs and waning strength. Moreover, in several places, the elderly are represented as a specific group: retired warriors were seated above the gates (*Il. 3.146*). Strikingly, Achilles’ imagined war-shield portrayed a city under siege with ‘innocent children on the ramparts flanked by elders bent with age’ (*Il. 18.520*). These may be the first representations of the elderly as an ‘age group’ in ancient Greek art or literature; a review of demography below supports the existence of a grandparental age group.

The earliest model for alternative patterns of ageing may be the tragedy of Tithonus from the Fifth Homeric Hymn. Tithonus, a mortal man and lover of the goddess Eos, had asked for eternal life.
Eos, to Tithonus’ undying regret, forgot to ask Zeus for eternal youth, and so Tithonus gradually incurred the worst of ageing. This tragedy began when Eos, seeing his greying hair, ceased her nightly visits. But more terrible was Tithonus’ slide into perpetual senescence and isolation: ‘She laid him in a room and closed the shining doors. There he babbles endlessly, and no more has strength at all, such as once he had in his supple limbs’ (Homeric Hymn V, 218–38). This passage also represents the end stages of Alzheimer’s and other senile dementias that increase after the age of sixty. Immortality, as was made clear, did not guarantee perpetual youth.

The fate of dementia is not indicated for all, or even most, who achieved longevity in the ancient mythology. Homer’s epics did not portray mental impairment in any elder: for example, ‘heroic Aegyptius…a man stooped with age but infinitely wise’ (Od. 2.18) and venerable King Nestor who, after ruling for three generations, ‘excels all men for sense and justice, his knowledge of the world…he seems a deathless god’ (Od. 3.241). Even aged dogs kept their wits: Argos recognizes Odysseus after his absence of twenty years, an extreme age for domestic canines. Homer sets this scene deprecatingly: poor old Argos is lying outside upon a dung heap, so wasted and tick-ridden that he cannot rise to greet his old master, then dying almost immediately (Od. 17.329–60). Thus Homer associated old age for man and dog with many physical infirmities but with no mental feebleness, which is sadly untrue. In these heroic tales, few warriors survived to middle age; the few who did, such as Aegyptius and Nestor, were treated as sages. Nestor is also important as one of the few for whom Homer gave some index of age. If Nestor was king by twenty-five, assuming a generation interval of about twenty-five years, his rule over three generations might have made him seventy-five years old. However, no life span is known with certainty from the Archaic Period.

Hesiod’s Works and Days, contemporary to Homer’s epics, describes how the gods created five races with decreasing longevity and faster ageing, as the successive races regressed from godlike to miserably human (Hes. Op. 129–90). Curiously, there is no mention here of

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12 A generation length of twenty-five years is used in human evolutionary genetics. Because of high early age mortality before 1900, twenty-five years approximated the maternal age needed to produce one child who survived to reproductivity.
nectar, ambrosia, or other food or drink. These mythic races were identified with five metals of increasing corruptibility, from gold to iron. The initial, golden race had finite life spans, but did not suffer ill-health during ageing: they were demigods, offspring of a god and a mortal human; their gentle passing ‘as though they were overcome with sleep’, suggested painless death in old age. The ensuing silver (less noble) race had a prolonged ‘hundred-year childhood’ and short adulthood. Zeus destroyed them for failing to properly honour the gods. This hundred-year childhood is unusual, apart from its length: nowhere else did Hesiod or Homer number life stages or life spans. Last and least fortunate is the rapidly senescing iron race, heading to ageing by birth: ‘Zeus will destroy this race of mortals when they come to have grey hair on the temples at their birth… Men will dishonour their parents as they grow quickly old’.

The Bible also linked longevity to respect for the older generation: ‘Honour thy father and thy mother, as the lord God commanded that their days may be long’ (Deuteronomy 5:16). While we lack evidence that ancient Greeks knew of Hebrew texts or their translations into Greek after the third century BCE (the Septuagint), it is worth noting that the Greek and Hebrew alphabets both stemmed from the Phoenician system about 1000 BCE, just one of the western Asian influences on Greek culture. Stretching farther east, Hesiod’s metallic metaphors may find correspondence with the Hindu epic Mahabharata, in which world ages (yugas) are designated by colours, yellow to black. After beginning with gigantically long life spans, longevity was progressively curtailed, owing to the spread of evil. Thus, for mythic races from West to East, longevity is ultimately god-given and may be gained by proper respect for the gods, as well as one’s earthly parents.

Beliefs in a golden age with great longevity and health span are recurrent in many cultures. The Pandora myth in Works and Days and the expulsion from the Garden of Eden in Genesis describe catastrophic loss of health and life span as the result of divine displeasure. The fruit of the Tree of Life would have given immortality, just as Greek nectar did. The Pandora myth also mentions contagious disease: ‘And he [Zeus] called this woman Pandora, because all they who dwelt

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13 Clay, Wrath (n. 6), 173–85.
15 Gruman (n. 3); West (n. 13); J. Barr, The Garden of Eden and the Hope of Immortality (Minneapolis, MN, 1992); J. O’Brien, ‘Nammu, Mami, Eve and Pandora: “What’s in a Name?”’, CJ 79 (1983), 35–45.
on Olympus gave each a gift, a plague [scourge] to men who eat bread’ (Hes. Op. 80); before Pandora’s act, there had been no terrible diseases ‘roaming the earth, coming silently, bringing evil to mortals’ (Op. 100). The Greeks greatly feared plagues, as noted above and indicated in Herodotus (6.27, 7.171, 8.115.3) and Thucydides (2.7).

Others evoked mythic races free of dreadful old age, somewhere beyond civilization. Pindar, in the era of aggressive Greek colonizing, describes the Hyperboreans, literally those living beyond the north wind, Bore(a): ‘No sickness or ruinous old age is mixed into that sacred race; without toil or battles’ (Pind. Pyth. 10), suggesting a relict golden race. Other ‘Hyperborean myths’ of remote peoples of great longevity included those of exotic Ethiopia, where Herodotus told of 120-year life spans. Pindar also associated favourable ageing as a reward for good works: ‘From labours borne in youth and with justice, life becomes gentle toward old age. Let him know that he has received marvellous happiness from the gods’ (Pind. Nem. 9.43–54). Thus, good works throughout life might earn a blessed old age. In sum, old age in the Archiac-era literature consistently shows the paramountcy of the supernatural, whether through the grace of the gods or through magic foods or drugs.

The sparse use of numbers for life spans in this early literature may be considered in relation to the development of chronology and calendars. Early Greek chronology used local polis records of successive rulers – the Athenian archon-list of 435–415 BCE may be the earliest. Later chronologies took the first Olympics as a pan-Hellenic reference. However, although few early dates of birth and death are reliable, age groups as stages of development were well defined, as shown in the military training of Spartan boys from their seventh to their twentieth year. Nevertheless, attempts to extract chronological data for ageing and longevity must reckon with the dominance of oral traditions and limited literacy that persisted into the Classic Period.

16 Lloyd (n. 7).
Phase 2: numbering of the life span and life stages

As the Archaic Period ended, life spans and stages of ageing were increasingly accorded measures in years. In words attributed to Mimnermus, we hear ‘Would that my fated death might come at sixty, unattended by sickness and grievous cares.’\(^{19}\) This suggests an expectation of chronic disease and disability in the seventh decade, which might be five to ten years earlier than in modern populations.\(^ {20}\) Mimnermus may have been the first in this literature to wish for death as a release from burdensome ageing, again appealing to the supernatural.

A more developed concept about the length of the life span is attributed to Solon: ‘If we set the limit of a human life at seventy years... these 70 cycles provide 26,250 days, and any one of these days is completely unlike any other. And so, Croesus, human life is pure chance’ (Herodotus 1.32). Solon also divided the seventy-year human life history (which may have become the norm by the later seventh century BCE) into ten stages of seven years (\textit{hebdomades}), of which I discuss the last two:

In the 6th [age 35–42 years] a man’s mind is trained for everything and he is no longer willing to commit acts of foolishness. In the 7th and 8th he is by far best in thought and speech. In the 9th [56–63] he still has ability, but his speech and wisdom give weaker proof of a high level of excellence. If he were to... reach the 10th [63–70], he would not have death’s allotment prematurely.\(^ {21}\)

The mental weakening in the ninth hebdomad corresponds to a statement by Mimnermus, Solon’s contemporary: ‘hideous old age, hateful as well as dishonoured, hangs over one’s head... and hampers eyes and mind’ (\textit{Nanno}; Stob. \textit{Flor}). Nonetheless, some reached advanced ages intact: for example, Sophocles wrote \textit{Oedipus Coloneus} towards the end of his productive life, reportedly at ninety-one years old. Possibly just before Solon’s writings in the seventh century, Sparta instituted the \textit{Gerousia}, composed of twenty-eight elders elected for


life by the Spartan Assembly; vacancies were ‘to be supplied out of the best and most deserving men past 60 years old…wisest and fittest, entrusted forever with the supreme authority of the commonwealth’. Solon’s formulation of age stages was apparently the first written use of hebdomades, which Falkner described as an ‘abstract model of the life-course, dissociated from the traditional classifications of age’. This paradigm-shifting numbering of life stages broke from the traditional age stages defined by physical function and social status. The Iliad differentiated post-pubertals who were not yet warriors (Telemachus) and senior warriors (Odysseus). Solon’s hebdomades also codify human behaviour and function for each age stage but are now denumerated. While this would seem to deny individual differences in life history, I suggest that the hebdomades also gave a basis for recognizing variations in the schedule of ageing and of life span, as later noted by Herodotus.

Solon also addressed filial responsibility to ageing parents: ‘no son was obliged to support his father unless he had first been taught a trade’ (Plut. Vit. Sol. 22.2). This passage, transmitted to us six centuries later, was among the earliest civic codes for the welfare of the elderly. Athenian laws from the fifth and fourth centuries also specified that sons must provide their elderly fathers with food and housing, protect them from violence, and provide proper funerary rites, with filial neglect punishable by loss of citizen’s rights for life. Further inquiry could reveal a complex politics of concerns for the elderly, extending to gender differences, such as those Saller noted for property rights. These civic codes parallel the increasing representation of ageing in literature and sculpture.

Solon’s hebdomadic metric of life history became widely used, for example in the Hippocratic De Hebdomadibus and many other

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22 Finley (n. 3).
23 J. Dryden, Plutarch’s Lives of Illustrious Men, revised by A. H. Clough (New York, n.d. [c.1890]), i.91.
28 Brandt (n. 3); Garland (n. 4); Gruman (n. 3); Richardson (n. 3).
Seven also appears in the Pythagorean School system of mystic numbers, which had major influence from the fifth century. However, I have not found indications that numbers given to life span were associated with the Pythagoreans. The seventy-year life span is also named in the Hebrew Bible: ‘The days of our years are three-score years and ten [70 years]’ (Psalm 90:10). This may not be a coincidence among these neighbouring cultures, as noted above.

A 120-year life span is mentioned several times by Herodotus, first for the life span of King Arganthonius (1.163) and then for the Ethiopians (3.22), in contrast with the Persian’s 80 years. Like many other statements, these are not ‘data’ in any modern sense. Nonetheless, they are remarkable as the first ethnic distinction made on the basis of life span. As Minois noted, ‘The question of the superiority of one people over another is set not on level of wealth or military power, but on human longevity.’ The recurrence of the ‘120-year life span’ suggests a longevity symbol of long standing.

The numbering of life spans fits within a context of the increasing use of numbers in many domains, particularly the development of calendars. Before the sixth century, there are no verifiable records for the year of birth or death of any individual. Subsequent use of numeric ages expanded with the developing local civic annals and pan-Hellenic calendars, which also enabled dating of birth and death. By the later fifth century, the year of birth was important in many cities, and Athens had archon lists extending back into the seventh century. Pan-Hellenic calendars developed by Hippias and other used the first Olympiad as a historical reference (now reckoned as taking place in 776 BCE). There was increasing synchronization of the lunar and solar calendars: Herodotus calculated the number of days of Solon’s normative seventy-year life span by adding intercalary months (1.32); this calculation is another indication of the growing emphasis on numerically specified life spans. Moreover, time within

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32 Minois (n. 3), 18.
33 See Möller (n. 17); Clarke (n. 17).
34 Minois (n. 3), 3, 68; Clarke (n. 17), 21.
the day was increasingly noted. Athens was known for its sundial, and for the water timer (clepsydra) that regulated presentations in law courts. Meanwhile, governmental representation was specified in increasing numeric detail, as in Cleisthenes’ reforms of the Athenian government (507 BCE). Finally, there was increasing standardization of weights, measures, and coins. Stamped coins were introduced from Lydia in 600 BCE. By 500, Athenians had official weight standards cast in bronze; by 370, weights were standardized by civic inspectors (metronomoi). The increasing use of coinage, the development of calendars, and the numbering of life spans suggests an emerging culture of numbers across many domains. In my opinion, further inquiry about the numbering of life spans will fruitfully join the discussion of the growth of numeracy and of skills in manipulating numbers.

Connections to Greek mathematics as an academic discipline seem less obvious, however, because of its focus on geometric relationships and proportions, with little use of numbers.

How do the numbers of 70, 80, and 120 correspond to actual life spans? To summarize a prolonged controversy, demographers have reached a consensus for ancient life expectancy at birth in the range of twenty to thirty-five years. These short life spans were limited by high mortality rates mostly due to infections. Recent studies have focused on Roman populations but the general conclusions are considered valid for ancient Greeks, who also lived in high-mortality environments. The broad range reflects uncertainties from many factors. Tombstone dates are confounded by age exaggeration (it was prestigious to be known for a long life span); by burial customs (specification of age on epitaphs was not routine until the Roman period); and by age rounding. Skeletal age estimates are only reliable for broad age

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31 Möller (n. 17); Clarke (n. 17).
36 Woods (n. 38); Scheidel (n. 38).
37 T. G. Parkin, Demography in Roman Society (Baltimore, MD, 1992); Scheidel (n. 38).
groups: juveniles and young versus older adults. Problems of age dating and statistical sampling arise from local variation of burial customs for children as opposed to adults; differential loss of younger skeletons in acidic soils; adult bone-age exaggeration from wear and tear; and mortality fluctuations from war, infectious disease, and malnutrition.

Despite high early mortality, those surviving to adulthood apparently had considerable remaining life expectancy. Saller’s demographic modelling estimates that females aged thirty would survive for an average of 26.1 more years, which would allow 70% of them to have a living parent. Thus, the majority of children whose mother was thirty or younger would have living grandparents. These demographics are consistent with an ample group of elderly men for the Gerousia and, more generally, for a stable group of elderly in the population. Saller’s estimates resemble the demographics of twentieth-century hunter-gatherers, who also lived under high levels of infectious disease and early age mortality: after age thirty, about 80% survived to forty-five years and 50% to sixty-five, again allowing a defined group of grandparents.

For the upper ages in ancient Greece, demographic models indicate that few survived beyond eighty. We may dismiss extreme life spans of more than a hundred years in Herodotus and those, centuries later, in Pliny’s *Natural History* and Lucian’s *Macrobius*, which continued the Herodotean tradition of gathering information on exotic peoples. In the healthiest modern nations, centenarians are extremely rare, at 0.01–0.02% of the population. By strict documentation, fewer than

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42 Harlow and Laurence (n. 4).
fifteen individuals have exceeded 115 years. Among the twentieth-century hunter-gatherers, few reached eighty-five, and no centenarians are documented. Claims of extreme longevity have been debunked for rural South America and Asia, though this gero-mythology persists. Assuming that the human genome has not changed, centenarians could not have exceeded 0.01% of ancient populations. However, further advances in our understanding might come from analysis of ancient DNA for longevity genes.

**Phase 3: tangible natural and cultural factors in health and life span**

As described earlier, ancient Greeks recognized individual variability in conditions of ageing and in life span. An unusual example from Hesiod is the influence of a difficult marriage, where an unfortunate choice of wife could accelerate ageing prematurely: ‘there’s nothing worse than one who’s bad – a glutton who will snatch! And, as she does, delivers him to premature old age.’ (Op. 703–5). This may be the earliest mention of the effect of social stress on ageing and life span, which has been amply documented by modern research.

Further tangible natural factors are associated with longevity in fifth-century texts. Herodotus noted three extrinsic factors – diet, drink, and dirt – as important to life span, in describing a spying mission sent by Cambyses II to the Ethiopians in the late sixth century BCE.

[The Ethiopians]…asked what the Persian king ate and the longest life span of a Persian man. They said he ate bread, related how the wheat was grown, and set 80 years as the longest life span for a man. The Ethiopians replied it was

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50 Ill-fated claims of supercentenarians in remote mountains by a National Geographic Society expedition were withdrawn: Finch (n. 2); W. Sullivan, ‘Very Old People in the Andes are Found to be Merely Old’, *New York Times*, 17 March 1978, A8.

51 Even in 1987, Minois considered the 120-year age of Herodotus’ Ethiopians as ‘still within the bounds of possibility for these mountain people’ (Minois [n. 3], 19).

52 Rare familial genes favour exceptional longevity: see Finch (n. 1), 351–68; G. M. Martin, A. Bergman, and N. Barzilai, ‘Genetic Determinants of Human Health Span and Life Span’, *PLoS Genetics* 3 (2007), e125. Longevity genes could be sought in DNA from ancient graves, e.g. usable DNA has been extracted from mass burials of Athens at the time of the plague: see M. J. Papapiggorakis, P. N. Synodinos, and C. Yapijakis, ‘Ancient Typhoid Epidemic Reveals Possible Ancestral Strain of *Salmonella enterica* serovar Typhi’, *Infections, Genetic, and Evolution* 7 (2007), 126–7.
no wonder they survived only for a few years if they subsisted on dung, and that they would not have been able to live [even] that long if they did not restore themselves with [wine]; as he made this remark, he pointed to the wine, for at least in this respect he admitted his own people were inferior to the Persians. … [The Persian spies53] in turn asked the king about the life span and diet in his country. He told them that most of his people lived to the age of 120 years, and some even surpassed this age. They ate boiled meat and drank milk… When [the spies] were amazed at this life span, they were led to a spring…which smelled of violets, and the liquid was so light that nothing could float on top, wood or anything lighter than wood. This liquid, if it truly is as described, then their constant use of it must be why they are so long-lived. (Hdt. 3.22–3)54

We must be mindful of various biases. Foremost of these, the bad blood between Greeks and Persians would lead Herodotus’ readers to enjoy deprecatory comments about Persians. Among other strange things that Herodotus related was the black colour of Ethiopian semen (3.101). Nonetheless, he is considered accurate for embalming protocols and some other information on Egyptian culture. In the end, the veracity of these statements is less important to my argument than their evidence for the cultural recognition of alternatives to supernatural influences on health and life span.

*Diet and drink*

To the Ethiopian king, the Persians’ superior wine ameliorated the dirty bread (‘subsisting on dung’) and enabled them to live as long as eighty. This is a direct statement of cause and effect in diet, drink, and life span. The Libyan nomads, ‘the healthiest of all people’ (Hdt. 4.187), also had a diet of milk and meat (4.186), but we are not told of their life spans. These associations of diet and drink with health and longevity suggests a link to the Hippocratic emphasis on diet and drink, for example ‘[For some] milk is natural nutriment, for others it is not. For some wine is nutriment, for others not. So with meats and the other many forms of nutriment, the differences being due to place and habit’ (*Nutrition*, 28). The Libyans’ preferred meat was goat, also cited by the Hippocrates as a factor in their health (*Sacred Disease*, 2.35). While Herodotus did not specifically refer to Hippocrates or

53 For clarity, I have omitted the reference to the Persian spies as ‘fish-eaters’, who were chosen as Cambyses’ envoys because they spoke the Ethiopians’ language (Hdt. 3.19). The diet of the fish-eating ‘spies’ does not seem important to Herodotus’ main narrative or to this analysis.

54 Adapted from Strassler and Purvis (n. 36).
his followers, there are many connections among these contemporary writings.55

But wait! According to Herodotus’ tale, the Ethiopian diet was incidental to longevity. It was the strange spring whose scented ethereal fluid (‘if it is truly as described’) conferred great longevity. Caveat lector! Not only is the magic spring incredible, but Burstein argues from archaeological data and historical texts that this spy mission is a ‘fantasy’.56 The 120-year life span is also fantasy and part of the mystique of the Ethiopians as macrobius, the long-lived,57 among other exotic peoples whom Herodotus brought to his readers. Could these magical waters be the literary precedent for the fountain of youth? Their benefits were interpreted by Gruman58 in terms of a ‘wet–dry’ humoral theory of ageing that attributes senility to the loss of tissue moisture: ‘if the waters are lighter than ordinary, then they partake of the characteristics of vital moisture and by frequent contact with the body might actually lengthen life’. This suggestion relates to Aristotle’s theory of old age as ‘cold and dry’ (On the Length and Shortness of Life, 5), which is the opposite of the ‘hot and moist’ quality associated with youth.59

Dung, hygiene, and wine

The Ethiopian king’s statement that the Persians ‘subsist on dung’ (Hdt. 3.22) is preceded by the statement about how the grain was grown.60 I suggest two readings of this passage: the first is a slur on the Persians; the second makes reference to manuring of the soil in order to improve crop yield. ‘Dung-eating’ was a highly insulting statement made to the Persians by the Ethiopian king: Greek plays and poems often used scatological humour to disparage or insult, for example in Aristophanes’ The Clouds: ‘Since you imitate the rooster in everything,
why don’t you eat dung and sleep on a perch?’ (Ar. Nub. 1421–31).
This comedy, probably written just after Herodotus, parodied the
new thinking in natural philosophy that some human behaviours are
shared with animals. Thus, ‘eating dung’ represents more than just the
Ethiopians’ opinion, being a Greek proxy for the disgusting Persian
invaders living downstream.

The implication that the Persian’s bread was dirty because it
was made from grain grown in manured soil refers to the common
practice to improve crop yield by manuring the soil with dung from
domestic animals or human night-soil.61 Although kópros in Herodotus
does not distinguish human and animal faeces (there was no special
word for ‘night-soil’),62 Homer tells that ‘[Odysseus’] old hound Argos
was resting…on a pile of dung from mules and cattle…collecting
till Odysseus’ serving men could cart it off to manure the king’s
estates’ (Od. 17.298). Argos could rest firmly upon the dung of these
herbivores because of its high fibre content, unlike the softer dung of
omnivores (human, dog, or pig).

Herodotus’ reference to soil manuring is supported by chemical
analysis of faecal bile acids in archaeological soils, which can
distinguish human faeces from those of various animals.63 Although
soils from archaic Greece have not been analysed, those from
Minoan Pseira indicate use of human night-soil in conjunction with
pottery fragments. The Minoans also used sewage wastewater for
crop fertilization, collected through skilfully engineered conduits at
Knossos and Thera.64

Exposure to excreta was unavoidable in daily life. Hesiod gives
protocols for urinating and defecating in public so as not to offend
the gods (Op. 725–32), possibly a gesture to reduce offal stinks. The
ancient Greeks also developed extensive sanitary engineering, with
urban sewers and interior toilets in the houses of the rich and many
civic buildings in Herodotus’ era, while aqueducts brought fresh
However, households commonly dumped their wastes onto the street, for collection by _koprologoi_. Millennia before, the Anatolian city of Çatalhöyük (7500–6000 BCE, in the uplands above Helicarnassus and Cos, the birthplaces of Herodotus and Hippocrates, respectively) had dense apartment complexes with clean and dirty zones, identified by bile acids. Thus, some hygienic practices and technologies were part of long-standing urban cultures.

The dirty sense of dung is also a link to early hygiene. Bathing and personal cleanliness was valued by the ancient Greeks, Egyptians, and some neighbouring cultures (Hdt. 2.64). Even Nestor’s palace had a bathtub. The _Iliad_ describes how visitors to royal houses were welcomed with hot baths, oil-rubs, and fresh clothing that would have minimized skin parasites. Ticks, lice, and other ectoparasites were endemic, as noted by Homer for tick-ridden Argos, and could spread infections. Thus, some elements of public health were known to the ancient Greeks, despite their misunderstanding of infections. Nonetheless, infectious diseases were prevalent, with high childhood mortality and recurrent plagues. Fever and infections were a major concern in Hippocratic medicine: for example, ‘Those who drink stagnant water...show protruding bellies and enlarged spleens’ (_Aer_. 24); while fever was attributed to polluted air (_Breaths_, 6–8), probably indicating malaria. More could be discussed in relation to environmental deterioration, since malaria became endemic by the fifth century BCE, following what may have been the healthiest era in ancient Greece. It was precisely because infectious disease was so poorly understood that supernatural explanations remained popular.

Lastly, I note that wine and beer, as common beverages used throughout life, were important to health because the fermentation process can ameliorate microbial contaminants. Giving children diluted wine or weak beer was customary in Europe until very recently, where water was often faecally polluted. Water-born infections are a major source of mortality in pre-industrial populations and were

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65 Antoniou (n. 60).
67 Angelakis, Koutsouyianis, and Tchobanoglous (n. 60).
69 Grmek (n. 3), 278–83.
70 Ibid., 282.
unquestionably relevant to ancient health, as recurrently emphasized by the Hippocratics.

Gericide

Targeted elimination of feeble elderly people is another tangible factor in life span that differed ethnically in Herodotus’ accounts. Among the central Asian Massegetai, ‘whenever someone grows very old, all his relatives assemble and sacrifice him together with some sheep. Then, after stewing the meat, they feast on it, believing this to be the most blessed way to end one’s life. If someone dies from an illness, they do not eat his flesh’ (Hdt. 1.214). This eschewing of the sick (presumably those with an infectious disease) may have been done to avoid transmission of a curse by ingestion. In contrast, the Padaioi, a group of far eastern nomads, killed and ate only the sickly among their elders (3.99). These descriptions of gericide join the examples of climate, diet, and drink as determining longevity in different peoples through tangible, non-deistic factors. Nonetheless, it could still have been felt that these customs were simply ‘god-given’, and not open to individual choice.

Phase 4: individual choice and interventions in outcomes of ageing

The idea of individual choice in outcomes of ageing defines a further phase in the socio-cultural evolution of ageing and longevity. Two domains of choice may be considered: drugs to treat specific conditions of ageing; and a healthy regimen of the right choice of diet, drink, and exercise. Both domains are also important in the growth of ancient Greek medicine as *ars* and *techne*.

Drugs

In the Homeric texts, the mythic substances of nectar and ambrosia were used as anti-ageing agents in two senses: as the food that sustained the immortal gods and as an agent that could slow post-mortem putrefaction. However, nectar and ambrosia were not identified as drugs (*pharmaka*), a term understood by archaic Greeks to include healing agents and poisons, as well as spells and incantations. Nevertheless,
were the mythic nectar and ambrosia precedents for seeking drugs or other agents to slow ageing?

Empedocles, a contemporary of Herodotus, may have been the first to mention the use of drugs for the ills of ageing in his poem ‘On Nature’:

And thou shalt master every drug [pharmaka] that e’er
was made defense ’gainst sickness and old age—
For thee alone all this I will fulfil.  (DK, fr. 11)71

Among the various meanings of pharmaka, the intended meaning here was for healing.72 However, Empedocles continues into the supernatural:

And thou shalt calm the might of tireless winds
...change black rain to drought, at seasons good for men,
And the long drought of summer shalt thou change...

Controlling the wind and rain implies supernatural powers beyond geriatric medications.

Empedocles is best known for his theory that the physical world is composed of fire, earth, air, and water, designated as rizomata, or roots of things.73 He also rejected practices of blood sacrifice and meat-eating, which he considered polluting. The mythic realm in the poem above is explicit about the double nature or double determination of the world. It was widely accepted by the ancient Greeks that a human act or a property of nature could be tangible and natural, as well as divinely attributable.74 Nevertheless, believing in supernatural causes did not prevent Empedocles (or many since) from exploring nature with empirical tools, as in his remarkable experiment that showed that air was not empty space.75

72 Lloyd (n. 7), 10–11.
73 Ibid., 24–6.
75 Using a clepsydra, the water-timer mentioned above, Empedocles showed that water could not enter the bottom of the vessel when the top hole was blocked. From this he deduced that the invisible substance of the air within the vessel prevented the water from entering.
Diet, drink, and exercise

Diametrically opposed to Empedocles’ association of drugs with the supernatural was the naturalistic medicine of Hippocrates and his many followers, who for several centuries propagated the initially radical idea that all diseases had only natural causes.76 Diseases were treated with natural products and lifestyle modification; however, no demons were exorcised, no magic invoked. The anti-mystic and anti-magic tenets of the Hippocratic writers seem fundamental to the development of other sciences. Nonetheless, as discussed by Edelstein, Nutton, and Wickkiser, the Hippocratic texts clearly recognize the divine character of nature (Airs, Waters, Places; Regimen; Sacred Diseases; the last even allows prayer and sacrifice at shrines and temples).77 The Hippocratics’ references to the religious thus show the pervasive spiritual currents throughout daily life in ancient Greece.

The Hippocratic method was careful and skilled observation of each individual (Regimen in Acute Diseases; VM 3). For example, on the use of milk in therapy: ‘To give milk to headache sufferers is bad… also for those who pass much blood… Milk is beneficial in cases of consumption without high fever’ (Aphorisms, 64). Caution in using milk suggests recognition of lactose intolerance, a common inherited trait. Wine and other extracts of fruits are also treatments in Regimen in Acute Diseases (62–4), but without referring to pharmaka. (Herodotus, in contrast, referred to wine as a pharmakon in telling how Croesus tricked the Massegetae, who were milk drinkers, to become drunk, leading to their slaughter [Hdt. 1.207]. Here wine was a poison, not a remedy.)78 Exercise, together with carefully chosen drink and food, was emphasized in optimizing health (Epidemics; Regimen in Acute Diseases), described by Edelstein as ‘ancient dietetics’.79 It is unclear, however, when it was explicitly recognized that individual health habits influenced longevity as much, or more than, supernatural forces.

78 Hartog (n. 30), 67.
The Hippocratic texts mention advanced age as a factor in treatment and in susceptibility to disease: for example, ‘In winter, older people suffer from fever through the hardness of their digestive system’ (*Aer.* 7); and ‘Old men have catarrhs [respiratory infections] because of their flabbiness’ (ibid., 10). The increased vulnerability during ageing to fever and catarrhs implies reduced immunity of the elderly to infections, as is well known. However, it is erroneous that ‘infections kill older men much later’ (*Prognostic*, 22), because the elderly actually suffer higher mortality, and do so today even with modern antibiotics. Lastly, while the ancient Greeks recognized many conditions of ageing,80 malignant growths, which are prevalent among the modern elderly, are strangely under-recorded in their literature and sculpture.81

Ancient Greek medicine was dominated by theories of antagonistic humours, which can be traced to pre-Socratic writers of the early fifth century. Alcmaeon’s lost book *On Nature* is said to have articulated the theory that health depends on a balance of antagonistic forces within the body – dry versus moist, cold versus hot, and so forth – such that imbalance causes disease. Longrigg emphasizes how this theory departs totally from the ancient view that diseases were sent by supernatural forces, by asserting that the balance (*isonomia*) of internal (endogenous) processes is the basis for health.82 Unfortunately, lost writings prevent us tracing earlier discussions behind the theory that disease results from imbalance of four body humours (blood, black bile, yellow bile, and phlegm), as elaborated in the Hippocratic *On the Nature of Man*. Following the first Hippocratic texts, Aristotle specifically elaborated the importance of food in life span according to a humoral theory.83 Meanwhile, some Hippocratic treatments sought to restore humoral balance by diet or exercise, as well as by strong drugs and phlebotomy; the latter was very dangerous, and treatments were largely incidental to recovery.84

80 See the items listed in note 3.
81 Grmek (n. 3), 71. However, bone tumours had a prevalence akin to modern levels in ancient Egyptian and medieval German graveyards: see A. G. Nerlich and B. E. Bachmeieir, ‘Paleopathology of Malignant Tumors Supports the Concept of Human Vulnerability to Cancer’, *Nature Reviews: Cancer* 7 (2007), 563.
82 Longrigg (n. 54), 85–92.
83 Aristotle, *On the Length and Shortness of Life; On Youth, Old Age, Life and Death*; King (n. 58), 86–94.
84 Majno (n. 67), 181–2.
The *Epidemics* and other case studies set standards for careful observations of individual cases that remained the model for rational medicine into recent times.\(^{85}\) Despite the lack of understanding of contagious or systemic infections (sepsis), wounds were often treated successfully with wine and vinegar, recently proven as bacteriocidal.\(^{86}\) Thucydides’ description of the plague of 430–426 BCE is remarkable for its clinical detail and for avoiding the supernatural (Thuc. 2); he clearly recognized transmissibility by observing that the plague spread down the Nile and across to Athens and that physicians incurred greater mortality from their frequent contact with the sick (no arrows of Apollo here).\(^{87}\) Tragically, however, these insights were not developed further: a century later, Aristotle made observations about the appearance of maggots in uncooked meat that led to his theory of spontaneous generation of some life forms from decaying matter (*Gen. an.* 3.11); it is probable that Aristotle’s specimens had already hosted egg-laying flies. Sadly, Aristotle’s mistake about spontaneous generation cast its shadow for two more millennia, thwarting the understanding of infections.\(^{88}\)

Despite the expanding acceptance of rational medicine, there was a major growth of religious cults of healing, particularly the cult of Asclepius, a major god of medicine and healing, who was named in Homer (*II.* 729–32).\(^{89}\) The power and prestige of this cult is demonstrated by the installation of an Asclepian temple in a prime location just below the Parthenon in the later fifth century BCE. If a Hippocratic treatment failed, patients often sought help from the Asclepians, and were advised to do so for incurable and fatal conditions. Moreover, Hippocratic medicine may also have contributed to the Asclepians’ growth, as some temple inscriptions refer to diet


\(^{87}\) Typhoid fever from a *Salmonella* bacterium is the most likely cause indicated by faint DNA traces found in a well-dated Athenian gravesite: Papagrigorakas (n. 51); Hankinson (n. 88), 40.


in treatment.\textsuperscript{90} The slim beginnings of Phase 4 in the fifth century BCE could only go so far in a health-promoting regimen of diet and exercise until the nature of infections was understood.

**Conclusions**

The evolving concepts of individual control over life span were described in four phases of socio-cultural developments from the mythic to the empirical in the eight to fifth century BCE. In Phase 1, Homer and Hesiod portrayed individual ageing as entirely subject to the supernatural. In Phase 2 (the sixth and fifth centuries), individual life span became numbered, while Solon’s hebdomads numbered human life stages with normative changes in ageing. During Phase 3 in the later fifth century, Herodotus recognized ethnic differences in life span associated with food and wine, and with gericidal behaviour. In Phase 4, in the fifth and fourth centuries, Empedocles imagined drugs that could prevent ageing, while still invoking the supernatural, whereas the Hippocratic writers disavowed the supernatural as a cause of disease and sought empirical evidence for tangible factors in health such as food, drink, and exercise.

These phases are not presented as an entelechy of necessary progression as truth is revealed. Rather, there were co-existing and contradictory assumptions about the basis for health and longevity. Life span is now well recognized to be influenced by diet, drink, dirt, hygiene, and exercise as much as by inherited genes, the last a biomedical equivalent of the moira over which an individual has no control. Of course, supernatural beliefs about individual fates in health and life persist even today and are likely to continue. This inquiry suggests that ancient questions about life span and the individual levels of choice have an important place in the beginnings of scientific medicine. These complex topics merit further analyses, with interdisciplinary approaches from anthropology, demography, the histories of calendars and numeracy, and philology. Hopefully, my inquiry will stimulate a new round of discussions on ageing and longevity in antiquity.

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\textsuperscript{90} Longrigg (n. 54), 24–26; Majno (n. 67), 201–5; Nutton (n. 76), 111.