5 Life Expectancy

When has any such thing been even heard or seen; in what annals has it ever been read that houses were left vacant, cities deserted, the country neglected, the fields too small for the dead and a fearful and universal solitude over the whole earth?... (letter from Petrarch to his brother at the onset of the Black Death in Italy 1348)

In this chapter we consider two main questions. The first is whether, as assumed in the Malthusian model, pre-industrial mortality was a declining function of income? In England, for example, in the years 1540-1800, just as for birth rates, there is no sign of any association between national mortality rates and national income levels, as expected in the Malthusian model. Did England, and perhaps also the Netherlands, escape the Malthusian constraints long before 1800?

The second question is the role of differences in mortality rates (at a given income level) in explaining income differences across societies before 1800. There were substantial variations in incomes across pre-industrial societies. England and the Netherlands, for example, had comparatively high incomes in the eighteenth century, Japan had a very low income. Part of this difference can be attributed to differences in fertility rates. But, as discussed above, part also would have to come from mortality differences. Can we find evidence of such differences?

Life Expectancy

Since in the pre-industrial world, even with various mechanisms for limiting births, fertility levels were high by modern

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standards, mortality rates had to be high also. In a stable population, typical of the pre-industrial world, life expectancy at birth was just the inverse of the birth rate. Life expectancy at birth in England averaged only 37 years between 1540 and 1800. Life expectancy at birth, at 28 in the latter half of the eighteenth century, was even lower in pre-industrial France (which also had a higher birth rate).[106]

These low life expectancies are often misinterpreted in popular writings to mean that few people survived into their forties. But though the chances of living to the biblical three score and ten was much less than now, there were plenty of quite elderly people in the pre-Industrial world. Fully 15 percent of the English men making wills in the seventeenth century died at age 70 or above. Those who lived long enough to become famous had even better prospects of getting to their biblical entitlement. A random sample of ages at death of notables born between 1600 and 1750, for example, shows Berkeley, 67, Goethe, 83, Hume, 65, Kant, 80, Leibniz, 70, Locke, 72, Molière, 51, Newton, 85, Adam Smith, 68, Voltaire, 83.

These considerable ages reflect the fact that life expectancy at age 20 was as high, or even higher, than life expectancy at birth. Natal life expectancy was so low because infant and child mortality were so high. In England from 1580 to 1800 18 percent of infants died within the first year. Only 69 percent of newborns made it to their fifteenth birthday. But those lucky enough to celebrate a fifteenth birthday could then expect to celebrate 37 more.

Tables 5.1 to 5.3 show indicators of mortality and life expectancy for a variety of societies: life expectancy at birth and at 20 years of age, as well as the fraction of people dying within one

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[106] Weir, 1984, 32.

Table 5.1: Life Expectancy for Modern Foragers[107]

*=estimated from shares dying by 15.

Group	e_0	e_{20}	Infant Mortality (%)	Deaths 0-15 (%)
Ache, Paraguay [a]	37	37	12	34
Kutchin, Yukon [b]	*35	-	17	35
Hadza, Tanzania [b]	33	39	21	46
!Kung–Ngamiland, Botswana [b]	*32	-	12	42
!Kung – Dobe, Botswana [b]	30	40	26	44
Agta, Philippines [b]	24	47	37	49

year and 15 years of birth. Table 5.1 shows these measures for modern forager societies. Since these are small populations of innumerate people individual estimates of life expectancy for these groups are subject to a lot of error. Life expectancy at birth in these groups ranged from 24 to 37, with a median of 32.5 years: less than for eighteenth century England, but as good or better than all the other agrarian societies listed in table 5.2.

Table 5.2 shows life expectancy for settled agrarian societies in the Malthusian era. Pre-industrial England stands out as having relatively good life expectancies. There was, however, no trend towards improved life expectancy in England from 1550 to 1800. The other settled agrarian societies before 1800 – Egypt, Italy, France, China and Japan – generally had lower life expectancies.

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[107] [a]Hill and Hurtado, 1996, 196; [b]Pennington, 2001, 192.

Table 5.2 Life Expectancy in Agrarian Economies[108]

Group	e_0	e_{20}	Infant Mortality (%)	Deaths 0-15 (%)
W. Europe				
Italy, Medieval Pistoia[b]	29	25	21	56
England, 1550-99 [c]	38	33	18	30
England, 1650-99 [c]	35	31	18	32
France, 1750-89 [e]	28	-	21	-
England, 1750-99 [c]	38	34	17	30
East Asia and Africa				
Egypt, 11-257 – rural[a]	28	21	-	45
China (Anhui), 1300-1880[f]	28	33	-	-
China (Beijing), 1644-1739[f]	26	30	-	-
China (Liaoning), 1792-1867[f]	26	35	-	-
Rural Japan, 1776-1815 [g]	33	37	25	50
Urban				
Egypt, 11-257 – urban[a]	24	17	-	48
London, 1750-99 [d]	23	-	30	-

Thus on average life expectancy in settled agrarian societies was no higher, and possible a bit lower, than for modern foragers.

Death rates were typically much higher in towns and cities than in the countryside. Urban mortality was indeed so high that,

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[108] [a]Bagnall and Frier, 1994, 334-6, [b]Herlihy, 1967, 283-8, [c]Wrigley at al., 1997, 224, 256, 614, [d]Landers, 1993, 136, 158, 170-1,   [e]Weir, 1984, Flinn, 1981, 92, [f]Lee and Feng, 1999, 54-5. Life expectancy at age 0 assumed three years less than life expectancy at age 6 months. One quarter of girls assumed to have died at birth from infanticide. [g]Jannetta and Preston, 1991, 427-8. Life expectancy at 20 estimated from life expectancy at 15.

were it not for continual migration from the countryside, the cities would have faded from the earth. In London from 1580 to 1650, for example, there were only 0.87 births for every death. Without migration the population would have declined by a half percent every year.

Early towns were generally crowded and unsanitary, so that infectious diseases such as plague, typhus, dysentery, and smallpox spread quickly. Life expectancy at birth in London in the late eighteenth century, a mere 23 years, was thus lower than for most pre-industrial societies, even though London then was perhaps the richest city in the world. As late as 1800 Londoners were not able to reproduce themselves: 30 percent of all infants died in the first year of life. Indeed urban dwellers in Roman Egypt had a better life expectancy than eighteenth century Londoners.

The greater mortality rates of towns shows in the data from the English male testators, though there we only have evidence from smaller towns such as Ipswich, Colchester and Bury St Edmonds, and not from London itself. While life expectancy at age 25 was 56.2 in the countryside, it was only 50.3 in the towns. And while 67 percent of children born in the country survived to appear in their fathers will, in the towns it was only 64 percent. Surprisingly, though, the lower reproduction rate of those in the towns owed mainly to differences in fertility. The average testator in the countryside fathered 5.1 children, while the average town dweller fathered only 4.3.

For the years before 1540 it is generally only possible to estimate adult life expectancy. Table 5.3 shows these estimates. The Roman Empire outside Egypt provides just two reliable pieces of evidence. The first is a list of the hundred town councilors at Canusium, in southern Italy, in AD 223. From the regular succession of office holding it is possible to estimate that life

Table 5.3 Pre-Industrial Life Expectancy at age 20.[109]

Group	Age	Life expec-tancy
Magistrates, Canusium, Italy, AD 223 [a]	25	33
Ex-slaves, Italy, c. AD 200 [a]	22.5	28
England, 1300-48 (tenants) [b]	20+	28
England, 1350-1400 (tenants) [b]	20+	32
England, 1440-1540 (monks) [c]	20	27
England, 1600-1640 (testators)	20	35
England, 1750-99	**20**	**34**
Rural Japan, 1776-1815	20	37
Rural China (Liaoning), 1792-1867	20	35
Modern Foragers	20	40

expectancy for town councilors at age 25 was 32-34. This is upper class male life expectancy. The second piece of evidence is a table constructed by a jurist, Ulpian. This was a guide to the length of time bequests of life annuities, typically to freed slaves, would be a burden on testators' estates. Life expectancy at age 22 was 28 in Ulpian's table. This, if correct, shows lower class life expectancies.

In England life expectancies in the medieval period can be estimated for male tenants of land and cottages on medieval manors, and for members of monastic communities. Zvi Razi used the court records of Halesowen to determine the interval between male tenants' first acquiring property and their death.

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[109] Tables 5.1 and 5.2. [a]Duncan-Jones, 1990, 94-7. [b]Razi, 1980. [c]Harvey, 1993, 128.

Since the minimum legal age was 20 the average age at first property holding must be 20+. The estimated life expectancy of males in their early twenties was 28 years before the onset of the Black Death, and 32 years in the 50 years after the first outbreak. This is close enough to life expectancy in England at age 20 in the years 1580-1800 that we cannot be sure, absent also evidence on medieval infant and child mortality, that life expectancy was in fact any lower in 1300 in England than in 1800.

In both China and Japan life expectancies at age 20 were as high or higher than those in England in 1800. These societies had a different pattern of mortality, with infant mortality relatively greater than in Europe, probably as a result of infanticide, and adult mortality consequently lower.

It would be nice to directly compare the life expectancies for Europe in the years after 1300 with those of communities before 1300, to test further the claim made above that living conditions did not improve between the Neolithic and 1800. Unfortunately while it is possible to estimate the age at death for skeletal remains, no reliable way has been found to translate these estimates into estimates of life expectancy at a given age. Skeletal material from the very young and very old does not survive so well in the ground as that of prime aged adults, so that the surviving remains are unrepresentative.

However, since modern foragers had a higher life expectancy at age 20 than any other group in table 5.3 it suggests that also in the Stone Age life prospects at 20 were better than for the much more technologically advanced societies of Asia and Europe in 1800. Thus, as with material living conditions and fertility, there was probably little change in life expectancy in the pre-industrial world all the way from the original foragers to 1800. Since fertility

was likely similar between forager and settled agrarian societies, the mortality rate must also have been similar.

Income and Mortality

There is no correlation decade by decade in England from 1540 to 1800 between income levels and death rates. Figure 5.1, for example, shows decadal infant mortality rates as a function of income levels. If anything infant mortality is higher in high income periods. Since after 1540 temporary income shocks, such as bad harvests also had little apparent impact on mortality, this has led some to conclude that England escaped the grip of the Malthusian economy long before 1800.[110] However, as the figure shows this pattern may just reflect shifts over time in the death schedule.

Infant mortality rates, however, in eight London parishes in the years 1538-1653 can be compared with the percentage of the households in each parish which were 'substantial' in the tax listings of 1638. Figure 5.2 shows that the infants of the rich had much better survival chances. Indeed the crude measure of household income used here explains 62 percent of the variation in infant mortality rates in London. Further though London had notoriously high mortality rates, with the population only maintaining itself from constant immigration from the countryside, the infant mortality rates of the richer parishes were better than for England as a whole in these years.[111]

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[110] "The results question the usefulness of Malthusian models for early modern European economic history." Weir, 1984, 27.

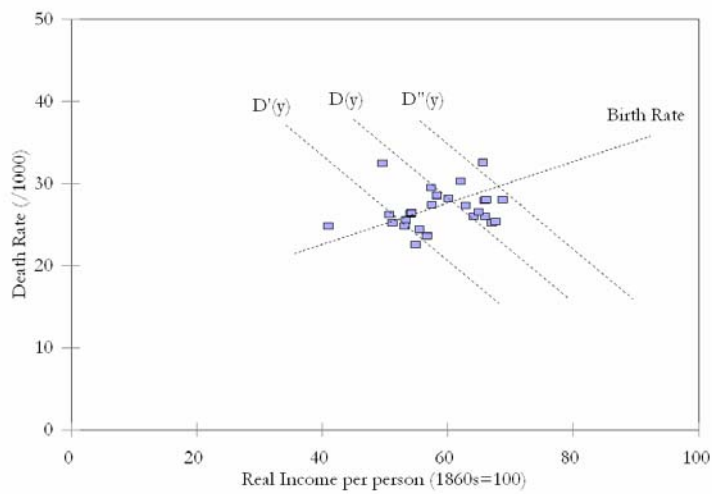[111] The overall infant mortality rate for England in 1580-1649 was 169. Wrigley et al., 1997, 219.

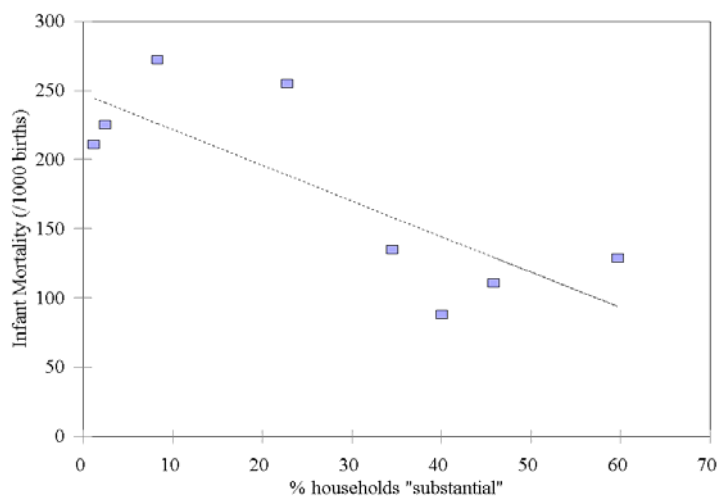**Figure 5.1   English Death Rates and Real Incomes by Decade, 1540-1800[112]**

Figure 5.2   Household Wealth and Infant Mortality, England, 1538-1653[113]

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[112] Death rates from Wrigley et al., 1997, 614.

[113]Landers, 1993, 186-88.

The wills used above to estimate birth rates by income can also give some insight into mortality rates by income. Figure 5.3 thus shows the life expectancy of male testators at age 25 in England in the early seventeenth century. The effects of income on adult life expectancy are modest, but still quite significant. Testators with £500 or more as a bequest had a life expectancy at 25 of 33.5 years, compared to 27.2 years for those with a bequest of £25 or less.

Figure 5.4 shows the fraction of children born to testators by bequest class who survived to be mentioned in the will. Again the effects of income are modest, but clear. While only 63 percent of the children of poorer testators survived, 69 percent of the children of the richer testators survived.

The failure of the aggregate data for England to show any relationship between income or wages and the death rate thus seems to be just the product of shifts of the death rate schedule over time caused by changes in the disease environment, changes in the degree of urbanization (which drove up mortality rates) and improvements in sanitation and medical practices. Figure 5.4, for example, shows the infant mortality rate by decade in England versus real income per person. As can be seen the infant mortality rate shows no decline with income. But this must be because the decline in mortality with income revealed across households at any one time, as in figure 5.1 is being obscured by shifts in the mortality schedule, portrayed by the dotted lines, from period to period.

So, overall, it seems safe to assume that even up till 1800 there was in all societies an inherent, but shifting, tradeoff between income and mortality rates that tied long run incomes to the level which balanced fertility with mortality.
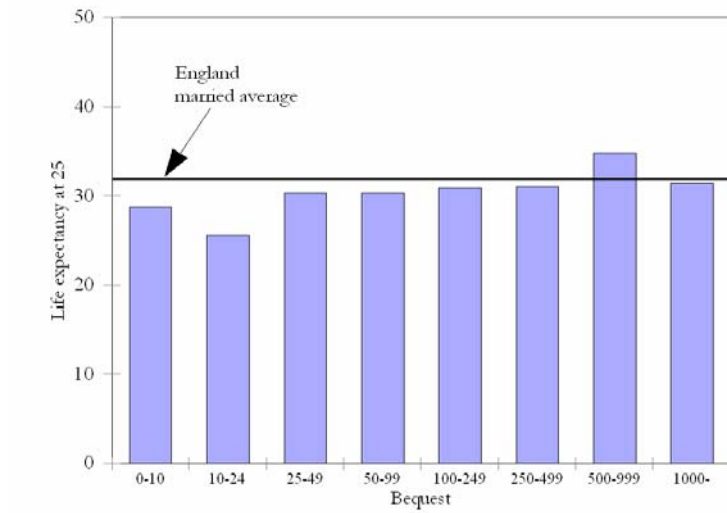
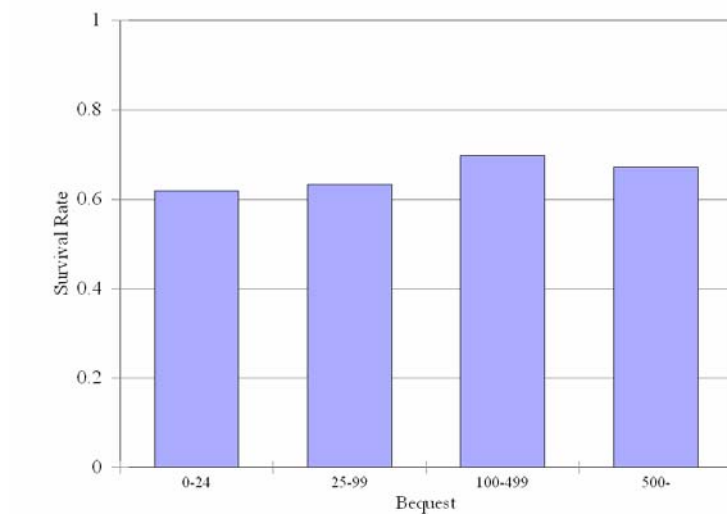**Figure 5.3 Life Expectancy at 25, male testators, England, 1620-40**[114]

Figure 5.4 Survival rates of the children of richer and poorer

[114]Wrigley et al., 1997, 614-5 gives mortality rates. Clark, 2005 and Clark, 2006a give real wage rates.

Mortality and Living Standards

Fertility rates seeming did not vary much across the pre-industrial world, at least where we can observe fertilities. Fertility rates in England in 1800 were no lower than in eighteenth century Japan, or in forager societies. Living standards did vary quite considerably across pre-industrial societies, however. Referring, for example, to figure 3.1 living standards of English laborers in 1450 were three times as high as in 1300, and nearly double the levels of 1800. The bulk of the explanation for this variation in living standards would seem to be variation in mortality rates at a given level of income.

Thus the explanation for the very high living standards of Europeans in the years 1350 to 1600 was undoubtedly the arrival of Bubonic plague in 1347 (the Black Death).[115] Its first on-slaught in the years 1347-1349 carried away 30 to 50 percent of the population of Europe. But the plague continued to strike periodically thereafter for the next 300 years. In England between 1351 and 1485 there were 30 plague outbreaks. As late as 1604, for example, the city of York lost at least a quarter of its population in one year to a Bubonic plague outbreak. Paris had 22 plague epidemics from 1348 to 1596.[116]

Plague outbreaks mysteriously diminished in frequency and severity in western Europe from the late seventeenth century on. The last great European plague epidemics were in 1665 in London, in 1657 in Italy, in the 1660s in France, in 1663 in Holland, and in the 1670s in Austria and Germany. Yet the plague did not disappear elsewhere in the world, but remained endemic in many

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[115]The term "Black Death" for the plague was only introduced hundreds of years after 1349 in England.

[116]Cipolla, 1993, 132. Galley, 1995, 452.

parts of Asia. Plague had been present in Hunan in China since at least 1792, but spread to other parts of China and from there to Bombay in the late nineteenth century, where it killed 6 million, in the 1890s.[117]

The bacterium that causes plague seemed to remain just as virulent as it had been earlier. In the nineteenth century Indian outbreak from 60 to 90 percent of the infected died. 78 percent of the infected in a late outbreak in Marseilles in 1721 died, as did 80 percent of the infected in Noja, Italy, in a small outbreak in 1815. Thus the London outbreak of 1665 killed perhaps 16 percent of the city's population. The 1657 outbreak in Italy killed 44 percent of the afflicted cities.[118]

The continued virulence of the disease in these later outbreaks is one of the reasons its disappearance from Europe remains a medical mystery.

We know a considerable amount about pre-industrial plagues because of the later Asian outbreak of the late nineteenth century. In the course of this outbreak the plague bacteria was discovered independently by French and Japanese investigators, as well as the means of transmission. If the medieval plague was similar to this later outbreak it was transmitted not from person to person, but through the bites of infected fleas. The fleas preferred host is rats, but when rats die from the disease the fleas move on to people, spreading the plague bacteria.[119]

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[117]Benedict, 1988. The plague spread from Bombay to England through rats on grain ships, but was contained there with the loss of only 6 people. There was an even more recent outbreak in India in 1994 that infected at least 700 people.

[118]Cipolla, 1993, 133.

[119]The British did experiments such as suspending guinea pigs at different heights above plague infested fleas to see how high the fleas could jump.

Bubonic plague was so called because of the "buboes" or boils which appear in the groin and armpits of the afflicted.[120] The plague was particularly loathsome because of the appearance of the sick, the diseased apparently exuding an unbearable stench. Agonizing pain accompanies the boils, and sufferers normally died 4 to 7 days after symptoms appeared.

In line with modern beliefs on how the disease was transmitted the epidemic was reported sometimes to be preceded by the appearance of large numbers of dying rats. Since rats do not move great distances the plague would thus spread at a slow pace from one district of a town to another.

Yet in pre-industrial Europe no-one made the connection between rats and the plague. Instead all kinds of absurd theories as to the cause and transmission of the disease had currency, even as late as the London outbreak of 1665. It was widely believed both that people were infectious, and that the plague came from a poisonous cloud called a "miasma" being exuded from the earth in certain localities.[121] Thus a further horror of the disease was that the afflicted were often abandoned to their fate. Sometimes the city or commune would order that their houses be sealed with the sick inside. In the 1665 London outbreak attempts to control the disease thus included such useless measures as killing large numbers of cats and dogs, shutting up the infected into their houses, sniffing herbs to ward off bad air, and burning fires in the streets again to dispel the supposedly poisonous air.

The plague years from 1347 to the 1660s are often taken by historians as a period when Europe was sadly afflicted. If we understand the Malthusian model we see that this was not the

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[120]Caused by swelling of the lymph nodes.

[121]Special tight fitting garments were made for those who administered to the sick and dying to protect them from the miasma.

harsh judgment of a vengeful Old-Testament God on a sinful Europe, but a mild reprove by a beneficent Deity. We saw that the plague, by increasing death rates at any given material living standard, raised living standards all across Europe in these years. Since birth rates were a function of income, these should have increased with the income gains of the plague years, so reducing life expectancy.

But table 5.3 suggests that any reductions in adult life expectancy after the onset of the plague were modest. The life expectancies of tenants and monks at age 20 in the plague years were no worse than for those of tenants before the onset of the plague. After the initial onset the plague offered Europeans a greatly enhanced material life style at small cost in terms of the average length of life. In the Malthusian world, gifts from the God's took surprising forms!

Dutch and English Mortality

The plague explains the high incomes of many European societies in the medieval period. The eventual disappearance of the plague from Europe, because of the disease's dependence on a sufficient rat population in close proximity to people, is probably a sign of improvements in standards of cleanliness in Europe in the seventeenth century. The result, of course, for many European societies was lower incomes. But incomes in both England and the Netherlands remained high compared to most pre-industrial societies, particularly those of South and East Asia. Why were England and the Netherlands comparatively wealthy in the eighteenth century?

Some see this as the first breaking of the Malthusian trap, a break that occurred first in the Netherlands around 1600.[122] But even though both the Netherlands and England witnessed efficiency advances in the seventeenth century that were unusually rapid by pre-industrial standards, these rates of productivity advance were too low to raise incomes much above subsistence given the continued link of population with income.

Figure 5.5, for example, shows real wages in the Netherlands versus the population by decade from the 1500s to the 1810s. In the early sixteenth century the Dutch experienced the same real wage declines as the rest of Europe as populations everywhere grew. But from the 1570s to the 1670s the Dutch were able to expand the production possibilities and experience both rising population and wages. The efficiency advance that appears between the 1570s and 1670s in the Dutch Golden Age was, however, followed by a period of technological stagnation, characteristic of Malthusian economies, from then till the 1810s. In that 140 year period of stasis, when population had plenty of time to adjust to the subsistence level, real wages remained high by pre-industrial standards in the Netherlands.[123]

High Dutch real wages seem to stem from bad health conditions in the Netherlands in two ways. First given the effects we observe in England of income on gross fertility, Dutch fertility remained surprisingly constrained given the high wages. High Dutch wages did not produce the abundance of children that would be expected. Despite these high real living conditions Dutch fertility rates were seemingly no higher than in East Asia. Second the high wages in the Netherlands also did not reduce mortality as much as might be expected.

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[122]See, for example, de Vries and van der Woude, 1997, 687-9.
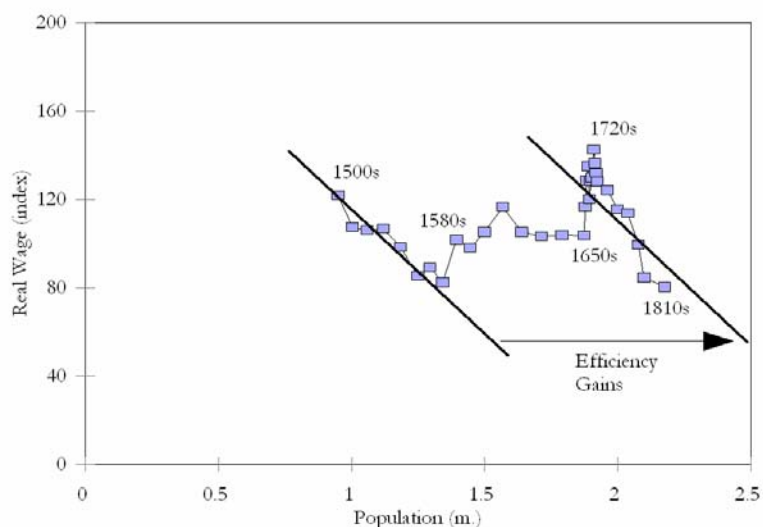
[123]See figure 3.2 and table 3.4

Figure 5.5 Real wages versus Population in the Netherlands, 1500s to 1810s

In England also, where efficiency gains were modest or non-existent between the 1700s and 1790s, again the ability to sustain relatively high real wages must stem from unusually low fertility and high mortality.

One factor that helped keep eighteenth century incomes high in the Netherlands and England was the increasingly urban character of these societies. Figure 5.6 shows the percent of the population in towns in Northern Italy, England and the Nether-lands at 50 year intervals from 1500-1800 (and at 100 year inter-vals before that) compared to real wages. The figure shows two things. The first is that in Europe before 1800 real wages and urbanization were poorly linked, even at the national level. In Northern Italy urbanization was always about 20 percent, even while real wages varied by a factor of 2:1. In England in 1400
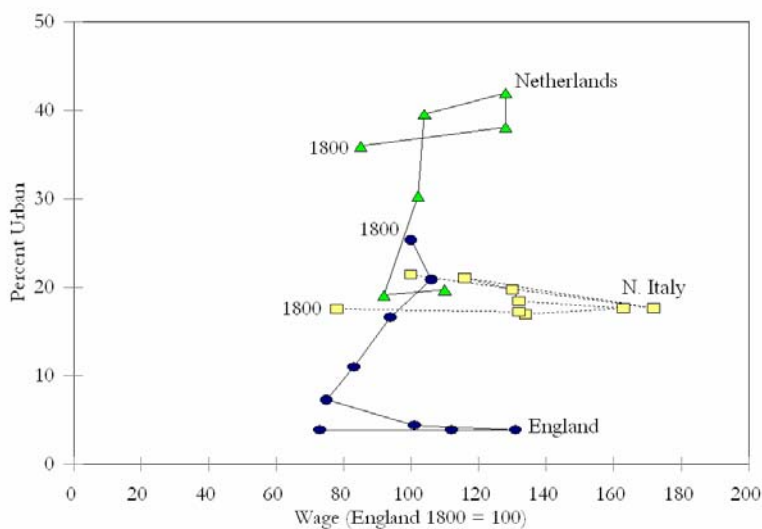
Figure 5.6 Urbanization Rates 1300-1800[124]

urbanization rates were less than 5 percent, even though wages were significantly higher than in 1800 when urbanization rates were more than 25 percent. Factors other than real wages were driving urbanization.

The second feature revealed by the figure is that by 1800 the Netherlands and England were the most urbanized parts of Europe. The evidence from testators and from parish records is that high urbanization rates helped keep down fertility and helped drive up death rates, hence maintaining high incomes. For example, in late eighteenth century England, death rates were about 23 per thousand in the countryside compared to 43 per thousand in London. The existence of London alone pushed up

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[124]Urbanization rates - Northern Italy, Federico and Malanima, 2002, table 1. Netherlands and England, de Vries, 1984, 39 (adjusted upwards to be comparable to N. Italy).

the death rate schedule in England by about 10 percent. Thus the development of trade in the years 1600-1800, which fostered greater urbanization in metropolitan centers such as the Netherland and England, also allowed living standards to rise there, but by purely Malthusian mechanisms.

In the Dutch case another factor driving up mortality was colonial adventures. From 1602 to 1795 the VOC (the Dutch East Indies Company) recruited about 1 million men, of who half died in service. The annual losses from this service counterbalanced the half million immigrants drawn to the Netherlands from elsewhere in Europe in the same years by high Dutch wages. But since these losses were almost all men, it also skewed the sex ration in the Netherlands. In a society with about the equivalent of 35,000 male births per year, counting immigrants, the VOC was consuming annually the equivalent of about 5,000 of these! This skewed the gender ratio. In Amsterdam in 1795 there were 1.32 adult women per adult male. In Delft in 1749 the ratio of adult women to men was 1.5. The skewed gender ratio drove down the percentage of women marrying in Dutch cities. Thus the 1829 census revealed that 24 percent of Amsterdam women aged 40-55 had never married.[125]

Another factor favoring high living standards for Europeans compared to Asians appears to be that Europeans throughout the pre-industrial era were by modern standards, and those of pre-industrial China and Japan, a filthy people, living in dirt and squalor. The low standards of personal and community hygiene are everywhere apparent in pre-industrial Europe. Indeed the travel diaries of European visitors to Japan in the years 1543-1811 frequently stressed the extreme cleanliness of the country by

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[125] de Vries and van der Woude, 1997, 72-75.

contemporary European standards.[126]   This is true even in the account of the Dutchman, Engelbert Kaempfer who resided in Japan in 1690-2. Yet the Dutch of the seventeenth century were reputed to be relatively the most fastidious about cleanliness amongst the Europeans.[127]

One crucial economic problem for hygiene in pre-industrial Europe was that human waste had little or no market value, because it was not socially acceptable to use it as the valuable fertilizer it was for farm and garden purposes.   As Alan Macfarlane notes, "where in Japan, night soil could be used in lieu of rent, in England one had to pay to have it taken away."[128]   Its disposal was thus a major social problem in Europe. Samuel Pepys, for example, complains in his diary in October 1660 that

> *Going down to my cellar...I put my feet into a great heap of turds, by which I find that Mr. Turner's house of office is full and comes into my cellar.*[129]

Neighbors' overflowing turds were apparently just an everyday nuisance in seventeenth century London!

In contrast in China and Japan human waste, urine as well as feces, was a valuable property which householders sold to farmers, and which various groups competed for the right to collect. Waste in Japan and China was thus not dumped into cesspits, sewers and streams, contaminating water supplies.   Instead in cities such as Osaka in the eighteenth century contractors found it profitable even to provide public containers on street corners in order to profit from the waste deposits.[130]   In Japan and China

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[126]Alam, 1987, 238.

[127]Schama, 1987, 375-97.

[128] Macfarlane, 2003, 173.

[129]Pepys, 2000, Oct 20, 1660. It took five days after this complaint for the neighbor to clean out the overflowing privy.

[130] Hanley, 1997, 104-129.

the waste also seems to have been carried away daily, as opposed to being stored in cesspits below houses which were only periodically emptied.

Human waste has dangers as a fertilizer, but the Japanese at least, aware of this, stored the waste in pits and tubs for months before use, allowing fermentation which destroyed many of the infectious organisms.

The Japanese and Chinese also had a much more developed sense of personal hygiene. Bathing was not popular in England, and indeed regarded as an indulgence in the early modern period. Even as late as 1800 Jane Austin's novels contain not a single reference to bathing.[131] But in Japan bathing in hot water was popular and frequent. The Chinese also bathed whenever possible, and employed plenty of soap.[132] The Japanese washed their hands after urinating or defecating, and kept privies clean. In the ten years Pepys kept his diary, only once does he mention his wife having a bath.

> *My wife busy in going with her woman to the hot house to bathe herself….she now pretends to a resolution of being hereafter clean. How long it will hold I can guess*[133]

This bath seems to have indeed been a dramatic event, since he records the next day,

> *Lay last night alone, my wife after her bathing lying alone in another bed.*

Seemingly his newly clean wife objected to his coming to bed dirty, since three days later he notes,

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[131]Dr Robert Willan, the famous London dermatologist, writing in 1801 noted that "most men resident in London and many ladies though accustomed to wash their hands and face daily, neglect washing their bodies from year to year" (quoted in Razzell, 1994, ---).

[132]Lee and Feng, 1999, 45.

[133]Pepys, 2000, 21 February 1665.

at night late home, and to clean myself with warm water; my wife
will have me, because she do herself, and so to bed.

But as Pepys expected, bathing did not become a regular habit and the subject disappears for the next four years of the diary.

Data for soap production in eighteenth century England support the idea that washing of people and clothing was not a frequent activity. In the 1710s when England's population was 5.7 million, taxed soap output was 25 million pounds, less than one fifth of an ounce per person per day for all uses of soap.[134] To show how meager a use of soap this is, note that the Southern Africa Food Security Operation currently aims to supply to their destitute clients 0.4 ounce of soap per day, that transported convicts in Australia in the mid-nineteenth century got a ration of half an ounce of soap per day, and that the ration of soap for the both the Union and Confederate Army at the beginning of the US Civil War was 0.64 ounce per day.

The low attention paid by the English to personal hygiene was expressed in their primitive toilet arrangements. While in Japan toilets were built at some distance from living quarters, the English upper classes seemed to prefer the convenience of adjacent toilets, even with the problems of odors that created.[135] Or they dispensed with toilet arrangements altogether. When the Globe theater was constructed on the south banks of the Thames in London in 1599, there was not one toilet provided for the 1,500 spectators that could be accommodated. Spectators, even those in the 5 d. boxes above the stage (the equivalent of nearly a day's wage of a laborer then), did their toilet in the yard outside, or more likely in the stairways and passages of the theater itself.

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[134]Deane and Cole, 1967, 72.
[135]Hanley, 1997, 19.

Further in Japan the living spaces were kept much cleaner. Houses had raised wooden floors, and outside shoes were taken off at the entrance. They watered the streets outside their houses to keep dust down. In contrast in England the majority of people, until quite close to 1800, lived in dwellings with beaten earth floors covered by rushes that were only infrequently renewed. Into these rushes went deposits of waste food, urine and spit. Indeed the effluvium deposited on floors from the ordinary business of the household was so rich that allegedly when saltpeter men were empowered in the late sixteenth and early seventeenth centuries to dig out earth floors as rich sources of saltpeter (potassium nitrate), they dug not just barn floors but also the floors of houses. The English also lived with a much more extensive domestic menagerie of dogs and cats which made their contributions of fecal material to dwelling spaces and streets.

Thus the comparative wealth of the English, expressed also in their greater physical stature, when we compare them to the Chinese or Japanese in 1800 probably stemmed mostly from the comparative filth that they lived in. For in the Malthusian economy the traditional virtues of cleanliness and hard work gave no reward to a society at large, and indeed just made life harder and incomes lower.

Infanticide

Polynesia was a healthy place before Europeans arrived. The climate was mild, there were no mosquitoes to carry malaria, and the isolation of the islands protected them from many diseases such as the plague. The healthiness of island living shows in the fates of the wives and children of the Bounty Mutineers. After

the 1789 mutiny Fletcher Christian, eight other mutineers, and six Tahitian men settled in 1790 with twelve Tahitian women (some probably kidnapped) on the tiny mischarted island of Pitcairn: two miles long and one mile wide. By 1800 14 of the 15 men were dead, 12 murdered by their companions (and one committing suicide).[136] But the women had borne 23 children by 1808, all of whom survived. So that despite the murderous violence among the men, the population of 27 in 1790 had grown to 34. By 1823 there were 66 people on Pitcairn. Thus in one generation the population doubled. By 1856 there were 196 people on Pitcairn, an island with 88 acres of flat land, and a serious population problem.

The healthiness of the Pacific Islands is confirmed by the death rates of European troops stationed abroad in the early nineteenth century, which are given in table 5.5. British and French troops in the Pacific had lower death rates than when they were stationed in their own countries. Notice also that the death rates for European troops stationed in tropical Africa or the Caribbean were extremely high in comparison. Nearly half of British troops stationed in Sierra Leone died each year.

Fertility was also probably high among the pre-contact Polynesians. Sexual activity among women was early and universal. Why then was Tahiti such an apparent paradise to the visiting English sailors, rather than a society driven to the very subsistence margin of material income as in Japan. The answer seems to be that infanticide was widely practiced before European Christian missionaries, who first arrived in 1797, changed local practices.[137]

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[136]Once conflict broke out, there was no retreat for any of the participants, and no-one could sleep soundly at night until they had dispatched their enemies. Nordhoff, 1934.

[137] Oliver, 1974, 424-6.

Table 5.5 Healthy and Unhealthy locations c 1800 as evidenced by troop mortality[138]

Location	Troops	Dates	Death Rate /1000
New Zealand	British	1846-55	9
Tahiti	French	1845-49	10
Cape Colony	British	1818-36	16
Canada	British	1817-36	16
Gibraltar	British	1817-36	21
Bombay	British	1830-38	37
Bengal	British	1830-38	71
Martinique	French	1819-36	112
Jamaica	British	1817-36	130
Senegal	French	1819-38	165
East Indies	Dutch	1819-28	170
Sierra Leone	British	1819-36	483

Unfortunately since our sources on this are the missionaries who had ever incentive to portray pre-Christian practices as abhorrent, we will never be certain of these reports.[139]

But the estimates from the early nineteenth century are that between two thirds and three quarters of all children born were

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[138] Curtin, 1989, table 1.1.

[139] The first Christian mission was not a success, and the missionaries had limited influence until after 1809 when the social disruption caused by contact with Europeans led many Tahitians to turn to Christianity.

killed immediately.[140]   The alleged methods used included suffocation, strangulation and neck breaking.   All the observers agree that the act was performed immediately after birth. If the child lived for any length of time it would then be treated with great care and affection. One sign of infanticide was the agreement by most visitors that there were more men than women on the islands. The reasons for this Tahitian practice are surprisingly unclear. The paradise of the *noble savage* seemingly had its savage underside.[141]

The Europeans may have been a dirty people, but they did have a horror of infanticide, and there is no evidence of this practice in pre-industrial Europe either as a deliberate strategy, or through differential care of girls and boys.

But infanticide was common enough in other Malthusian economies that European abstinence from this may indeed be regarded as an aberration. In both Roman Italy and in Roman Egypt parents exposed unwanted children in the market places and the streets, though at least some of these unfortunates were rescued and raised as slaves. In pre-industrial China and Japan the gender ratio of the population shows that there was significant female infanticide. In these Malthusian economies infanticide did raise living standards.

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[140] This seems extraordinary, but it is what the missionary accounts record. Captain Cook mentions the practice in his journal, but with no estimate of its incidence. The journals of Bligh, Banks and others contain little information on infanticide.

[141] I thought I was transported into the garden of Eden…A numerous people there enjoy the blessings which nature showers liberally down upon them….Every where we found hospitality, ease, innocent joy, and every appearance of happiness amongst them. (of Tahiti, 1768. Bougainville, 1772, 228-9).

The White Death

In 1347 Europe was invaded by a bacterium from the East, *Yersinia Pestis*, the Black Death, which by raising mortality rates increased living standards in Europe for the next 300 years. In 1492 when Columbus, perhaps the luckiest man in history, stumbled upon a continent whose existence he had no right to expect, the local peoples were visited by death from the West in the form of numerous new diseases. The four major ones constituting the White Death were cholera, measles, smallpox, and typhus. All these had developed relatively recently in the crowded conditions of the Eurasian landmass, and were novel to the Americas which had been cut off from contact with Eurasia for millennia. Similarly the inhabitants of Australia, New Zealand, and the Pacific Islands made acquaintance with these four diseases and others only with the arrival of Europeans.[142]

By analogy with the earlier experience of Europeans with the Black Death, the spread of the White Plague to the New World in the years 1492 and later should have both reduced the native population of the Americas, but also substantially improved living standards for Native Americans. There are some indications of groups in the New World for whom exposure to European diseases may have had the expected beneficial effects on living standards. Thus Boas's studies in 1892 of Great Plains Indians, who were mainly born between the 1830s and 1860s, reveals that despite substantial suffering from exposure to European diseases such as smallpox, the Plains Indians were very tall by the standards of the pre-industrial world.[143] But the bulk of the native populations seemingly got no material benefits. This would be a

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[142] McNeill, 1976.

[143] Steckel and Prince, 2001.

challenge for the Malthusian model, except that the White Plague was typically accompanied by Europeans expropriating native lands and resources, preventing higher mortality rates from having their normal Malthusian effects.

The Neolithic Revolution and Living Standards

The great economic transformation of the pre-industrial era was the Neolithic Revolution: the move from hunter-gatherer societies to those that employed cultivated crops and domesticated animals. Anthropologists and archeologists have long debated what the effect of this transformation was on living standards, but in ways that in the light of the Malthusian model seem confused.

Given that fertility rates of forager and settled agrarian societies were likely the same, material living standards would be higher in the society with the *higher* mortality rate at a given level of income. Thus the ability to store food in settled agrarian societies, which would allow people to survive better lean periods of the year, would reduce living standards. The increase in disease mortality from greater population densities would increase material living standards. The balance of these effects could go either way. Thus the effect of settled agriculture on living standards in a Malthusian world is inherently ambiguous. The evidence from heights seems to suggest that on balance settled agriculture probably reduced living standards by modest amounts.