

Demographics

Investing with children is difficult, investing without children is impossible.

Here at Equitile we have been spending a lot of time on our Longevity Project, studying demographics and the challenges of investing through the next phase of the demographic revolution. We are pleased to say our studies have left us more optimistic. We are living longer healthier lives. Population growth is slowing and will soon reverse, making environmental sustainability achievable. But there are challenges ahead. Fertility rates are low and will likely fall further. As baby-boomers retire, dependency levels, the ratio of retirees to workers, will rise quickly. An increasingly top-heavy society, with more pensioners and fewer children, will stretch government finances, challenge our pension systems and change the way asset markets behave. Again, on these issues, we are optimistic. We believe the forthcoming investment challenges can be navigated, but not without planning and action.

*Due to its length, we have split this note in two. **Part 1: Demographics – The Good News** is background reading, hopefully, an entertaining explanation of the forces driving the two demographic revolutions that have played out for almost two centuries. If you enjoy social and economic history read on. If you would rather get directly to the investment side of the story, we suggest skipping directly to **Part 2: Demographics – The Challenges and Opportunities***

If you would like to receive the second part, please email us at Longevity@equitile.com and we will happily send you the report and add you to our future distribution list.

Part 1: Demographics – The Good News

Falling mortality

The John Snow pub sits at the corner of Lexington Street and Broadwick Street in London's Soho district. On the pavement outside the pub is a Victorian era water pump. The pub is named after Dr John Snow, who in 1854, together with the water pump, helped start the long process of declining human mortality. This was the first of the two big demographic revolutions to start in the mid nineteenth century, the second was falling fertility rates. Both revolutions are still in progress today.

Dr [John Snow](#) was an early pioneer of anaesthetics. He twice administered Chloroform to Queen Victoria during the birth of her children. He was also a pioneer of epidemiology, the study of how diseases spread through populations and how they can be controlled.

The John Snow pub and that water pump on the pavement, sit close to the centre of London. Today that puts them in one of the world's most desirable addresses, surrounded by chic coffee shops, up market offices and expensive restaurants. In Victorian England, the centre of London was one of the world's least desirable addresses. The area around the John Snow pub was an overpopulated urban slum where multiple families shared single rooms, in poorly constructed houses, built over open cesspits.

By the mid nineteenth century the industrial revolution was well underway, people were migrating from the countryside to towns to work in the new industries. The populations of towns and cities expanded faster than the housing stock and faster than their rudimentary sewerage systems could handle. Cholera, unknown in England prior to the industrial revolution, became common place. Tens of thousands of people were killed by Cholera

epidemics in 1831, 1849, 1854 and 1866. The disease was especially prevalent in densely populated inner-city communities and in coal mines, both of which suffered from poor sanitation. The Thames had become a stinking open sewer and people believed Cholera was spread by the foul-smelling air, or miasma as doctors called it. Efforts to control Cholera focussed on masking bad smells. They were not successful.

In late August 1854 a small area of Soho, centred around Broad Street, now Broadwick street, suffered an especially potent Cholera epidemic. On Thursday August 31st 1854, 200 people died and the next day another 127 died. Over 600 people died within a few days. John Snow immediately began investigating the outbreak. He noted that all the effected people lived in a small area of the city. He also noted that within the area was a brewery whose workers appeared entirely immune to the disease. He realised the effected families all drew their drinking water from a single pump in Broad Street, whereas the brewery workers drank only their own beer, made from a different water source. While the two populations suffered the same foul-smelling miasma they had different sources of water. From these observations, John Snow deduced Cholera was a water born disease and the epidemic was caused by contamination of the Broad Street pump. On September 8th he had the handle of the pump removed. The Cholera epidemic stopped soon afterwards.

Sadly, he did not live long enough to see his ideas gain the recognition they have today. He died at just a few years later, probably due to repeatedly anaesthetising himself, during London's [Great Stink](#) of 1858. In that year the unusually warm summer made the smell of the Thames bad enough to disrupt parliament. The Great Stink caused the government to commission a new sewerage system for the city, constructed between 1859 and 1875, overseen by [Joseph Bazalgette](#). They also passed the Metropolis Water acts, 1852 to 1902, ensuring London's water supply came from clean sources outside the city, not from the polluted water of the Thames. The new sewerage system allowed the closure of an estimated 200,000 cesspits in the city. Together with the cleaner water, this cured London of its recurring Cholera problem.

With better drains and better water supplies, London was then ripe for a revolution in household sanitation. Thomas Crapper, inventor of the U bend, opened the world's first showroom for bathroom equipment and flushing toilets, in 1886 in Chelsea. From the middle to the end of the nineteenth century improvements in sanitation, water supply and personal hygiene caused a dramatic fall in communicable diseases. At the same time a series of breakthroughs were improving the production, preservation and transportation of food.

The great Peruvian [Guano Bonanza](#) ran from 1840 to 1870. The Chincha islands, off the southern coast of Peru, were home to large bird colonies and therefore to large deposits of Guano or bird droppings. Guano was found to be a potent fertilizer. Following a revolution, the newly independent Peruvian government, who needed to pay their debts to their London bankers, exported 12 million tonnes of Guano. The Guano was sprinkled on the fields of North America and Europe. Crop yields increased and people became better nourished.

The Guano business was so profitable it made William Gibbs, senior partner of the London merchant bank [Antony Gibbs and Sons](#), the richest commoner in England, inspiring the contemporary lyric: "William Gibbs made his dibs selling the turds of foreign birds". Keen to get in on this lucrative trade, the US government, passed the 1856 [Guano act](#) encouraging Americans to acquire Guano bearing islands on behalf of the United States. Ninety-four islands were acquired under the Guano act, sixty-six of which eventually became American territories and some the future platforms of American naval power.

The rich profits of the Guano trade encouraged entrepreneurs and inventors to look for other sources of fertilizer. [John Bennet Lawes](#), entrepreneur and agricultural scientist, patented a method of treating phosphates with sulfuric acid to make the first commercial inorganic fertilizer. Others followed his lead, the modern fertilizer industry was born. These chemical fertilizers allowed the boom in crop yields to continue even after the Guano had been exhausted.

In the 1860s the French microbiologist [Louis Pasteur](#) showed how heating milk and fruit juices could kill bacteria keeping food fresher for longer. Pasteurised milk lasted longer and could be transported over longer distances. Pasteurised milk was no longer a source of disease, so cows, which had been kept in cities to provide milk, could be relocated to farms. Food became safer and cities became healthier. The incidence of Tuberculosis declined.

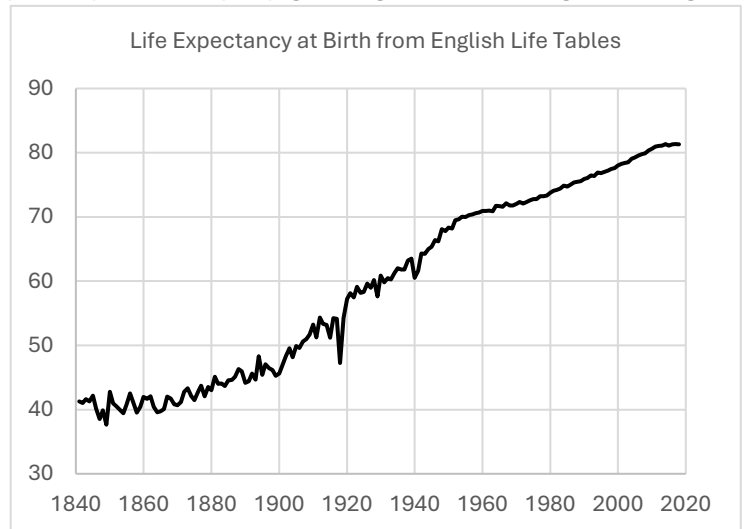
Between them, Pasteur and Snow made our food and water much less dangerous and taught us how to combat communicable disease.

While Pasteurization allowed fresh milk to be transported from farms to cities another invention allowed fresh meat to be transported between continents. In 1877 Joseph James Coleman was asked by the owners of the Bell shipping company to develop the newly discovered technique of refrigeration into a system usable on commercial ships. The Coleman-Bell compressed air system was used in 1882 on the Dunedin, the first ship to transport frozen meat from New Zealand to London. The journey lasted 98 days but the meat arrived in good condition and was sold at Smithfield market. The Bell-Coleman company then used its technology to open a chain of refrigerated butcher's shops, selling safer chilled meat.

Mechanical refrigeration allowed the vast agricultural lands of North and South America, Australia and New Zealand to supply fresh food anywhere on earth, especially to the rapidly growing industrialising cities. Again, nutrition improved.

The overarching story of the second half of the nineteenth century is one in which, in just a few decades, a series of revolutionary breakthroughs were made in the fields of epidemiology, medicine, sanitation, hygiene and nutrition which came together to have an overwhelmingly positive effect on the lives of people living in the towns and cities of the industrialising world.

Living conditions became cleaner and healthier, food became more abundant and more nutritious, and we better understood how to stay healthy. Human mortality rates began declining sharply from the 1850s onward causing average life expectancy to move steadily higher. At the



Period expectation of life at birth (years). English Life Tables, ONS

beginning of the nineteenth century the average person could expect to live to 40 years old, by the start of the twentieth century they could expect to live for 60 years, and 80 years by the start of the twenty-first century. On current trends a child born at the end of this century may expect to live for 100 years.

In 1651 Thomas Hobbes described human life as “solitary, poor, nasty, brutish and short”, in the 1850s that characterisation started becoming less true, and is still becoming less true today. We don't know if there is an upper limit to human longevity but if there is we don't seem to have reached it yet. We are enjoying longer healthier lives and can expect our children to enjoy even longer healthier lives.

Falling Fertility

The second demographic revolution we are living through is falling fertility rates, the average number of children a woman can expect to have in her lifetime.

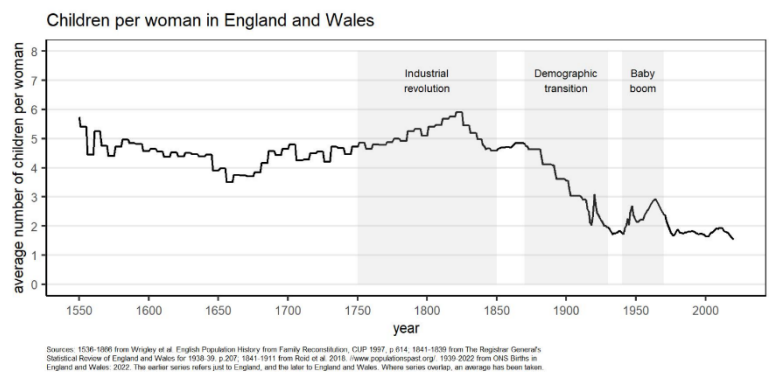
In the United Kingdom mortality rates began declining around 1850 and fertility rates began declining about three decades later in 1880. As with declining mortality, declining fertility has been driven by multiple processes. Some of which remain contentious and emotive.

Contraception and abortion, together with female education, emancipation and workplace participation have all undoubtably contributed to declining fertility. Other plausible drivers are financial and economic forces. In recent years, as fertility has started falling again, people have begun attributing the fall to financial pressures. These issues will be discussed in Part 2.

Ironically, [Thomas Malthus](#) the man who famously worried about excessive fertility, may have started the movement most responsible for its decline. In 1798 Malthus published [An Essay on the Principle of Population](#),

in which he observed high fertility rates caused populations to expand to the point of starvation: *“Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio. A slight acquaintance with numbers will shew the immensity of the first power in comparison of the second. By that law of our nature which makes food necessary to the life of man, the effects of these two unequal powers must be kept equal. This implies a strong and constantly operating check on population from the difficulty of subsistence.”*

Malthus’s observation was both simple and true. It was an accurate characterisation of the human condition throughout history. Interestingly he appears to have understood the connection between hygiene and communicable disease even before John Snow, but worried it was pointless fixing the problem as it would only cause more population growth followed by malnutrition and a return of disease: *“BY GREAT ATTENTION TO CLEANLINESS, the plague seems at length to be completely expelled from London. But it is not improbable that among the secondary causes that produce even sickly seasons and epidemics ought to be ranked a crowded population and unwholesome and insufficient food.”*



[Cambridge Group for the History of Population and Social Structure](#)

Malthus’s warnings helped ignite a birth control movement aimed at escaping this Malthusian misery. In 1832 the American doctor [Charles Knowlton](#) published [The Fruits of Philosophy: A Treatise on the Population Question](#). The book’s first chapter is titled *“To limit at will the number of their offspring”*. The book argues for controlled and lower fertility rates and gives advice on birth control techniques. Despite having only limited success selling his book, Knowlton was prosecuted and briefly imprisoned for promoting what were considered immoral ideas. Twenty-seven years after his death, in 1877, Charles Bradlaugh and Annie Besant republished *The Fruits of Philosophy* in England and were similarly prosecuted. That prosecution backfired, turning the book into a national bestseller – 125,000 copies were sold, the birth control movement received a huge boost. In the year of the trial the [Malthusian League](#) was founded to advocate for birth control. In the latter part of the nineteenth century organisations teaching women techniques for, and the benefits of, controlling fertility proliferated in North America and Europe.

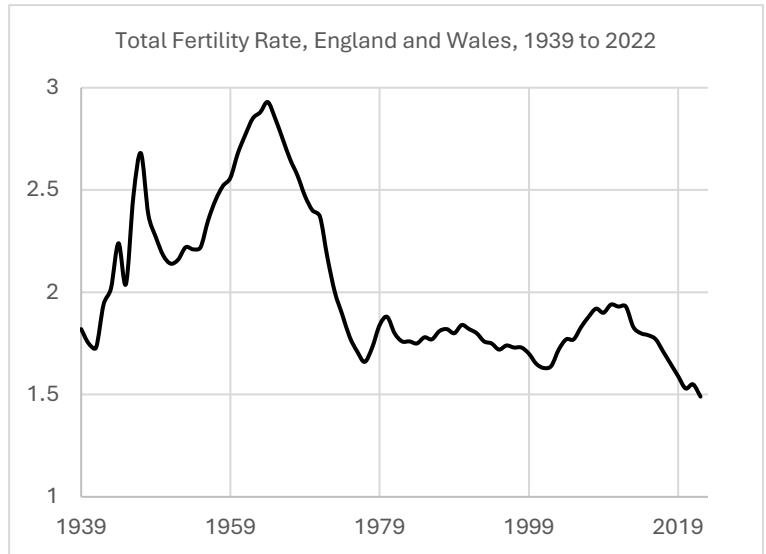
Dr Knowlton’s techniques were less than perfect but technology started helping. In 1844 the American inventor [Charles Goodyear](#) patented a process for vulcanising rubber. Vulcanisation gave rubber greater tensile strength, flexibility and durability making it a viable material for the manufacture of condoms. By 1858 the mass production of rubber [Condoms](#), or Rubbers, had started. The next big breakthrough in contraceptive technology came in 1960 when the FDA approved [Enovid](#), the first oral contraceptive. The pill, as it became known, was made available in the United Kingdom through the NHS in in [1974](#). Abortion was legalised in the United Kingdom in [1967](#).

Fertility rates began falling noticeably in the United Kingdom from 1880 onwards. Up until then the average woman could expect to have five or more children in her lifetime, by 1900 fertility had fallen to 3.5. Fertility continued a steady decline, reaching a low of less than two children per woman during the years of War II, when the absence of men was also a contributory factor. After World War II, through the 1950s and 60s fertility rates recovered to a peak of almost three children per woman by the late 1960s, before declining again to around 1.75 by the late 1970s. That temporary post-war recovery in fertility was the baby-boom period.

In 1968 fears of the Malthusian misery were reignited by the publication of [The Population Bomb](#) which predicted the earth’s population would surge to 16 billion accompanied by mass famine. This bestselling book began with the dire warning: *“The battle to feed all of humanity is over. In the 1970s and 1980s hundreds of millions of people will starve to death in spite of any crash programs embarked on now. At this late date nothing can prevent a substantial increase in the world death rate”*.

Resurgent fears of excess population levels, the availability of new contraceptives, legalisation of abortion and greater female participation in higher education and the workforce came together in the 1970s to bring the baby boom to an end.

By the end of the 1970s the baby boom was over, the average woman in Britain was then having fewer than the 2.1 children necessary to maintain the population. From the 1980s onwards British women have typically had a fertility rate of only 1.75. In the last decade fertility rates have started declining once more. In 2022 fertility fell to just [1.49](#) births per women. This is far below the level required to maintain a stable population. We have now moved from baby-boom to baby-bust, triggering new concerns over population collapse.



[Births in England and Wales from the Office for National Statistics](#)

The [World Bank](#) collates data on fertility rates around the world. Some of the countries with the lowest fertility are: South Korea 0.8, Spain 1.2, China 1.2, Italy 1.2, Japan 1.3, Poland 1.3, Canada 1.3, Norway 1.4, Russia 1.4, Germany 1.5 and United States 1.7. Absent immigration, these countries are all destined for contracting populations. At the other end of the scale the world's poorest countries still have high fertility rates: Mali 6.1, Democratic Republic of Congo 6.1, Chad, 6.2, Somalia 6.2 and Niger 6.7.

The World Bank also reports the evolution of fertility rates for the whole world. The global fertility rate peaked at around 5 in the early 1960s and has been falling steadily ever since. Global fertility is now at an all-time low of 2.3 and looks set to fall below the 2.1 replacement rate within a few decades. This means the growth of the world's population is already slowing quickly and will likely come to a halt within a few decades. Thereafter, if current trends continue, the global population will begin contracting.

In 1968 the world's population was expected to reach a peak of 16 billion people when mass starvation was expected to bring its expansion to a halt. The [UN's latest forecast](#) is less alarmist, forecasting a population peak of 10.3 billion in 2080 and decline gradually thereafter. Other forecasters are suggesting lower numbers and a quicker movement toward contraction. "[Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2100](#)" suggests a peak of 9.7 billion by 2064 and a decline to 8.8 billion by 2100. [People and Planet: 21st Century Sustainable Population Scenarios...](#) models two scenarios, a central case with a peak of 8.8 billion by 2050 and a contraction to 7.3 billion by 2100, and an accelerated pace of change with a peak of 8.5 billion by 2050 and just 6 billion people by 2100.

The resumption of the decline in fertility rates since lockdown appears to have taken demographers by surprise, so forecasts may soon be revised lower again. While we cannot say exactly when the world's population will peak, we can say with a high degree of confidence we are already close to the peak and the population contraction that is already happening in many countries will soon happen at the global level. To put this into context, if you are reading this note, there is a good chance you will one day be a member of the world's peak population and will then live to see humanity begin contracting. Some younger readers may live to see the world's population shrink by up to 25% from today's level. For reference, at the time of writing there were 8,078,646,888 of us, according to the [world population clock](#).

The good news is Thomas Malthus was wrong. We are not condemned to the Malthusian misery. We have learned how to live longer healthier lives, and we have also learned to control our fertility. We are the only species to escape the Malthusian trap. Provided we can eventually arrest the forthcoming process of population reduction – more on this later – we can look forward to reaching a long-term sustainable population level, where we can enjoy long lives with high standards of living, without continual environmental degradation. Limiting population

growth is not a sufficient condition for environmental sustainability but it is the most important necessary condition.

To summarise so far, we have been going through two near simultaneous demographic revolutions: falling mortality and falling fertility. Initially the falling mortality was the dominant force causing populations to expand rapidly. We are now moving to a point where falling fertility is becoming dominant, causing population contraction. The pace and eventual extent of this contraction is as yet unknown. In the next few decades, the baby boomers are going to retire, and fewer children will be born. Old age dependency ratios will increase substantially, changing the behaviour of economies and asset markets. The second part of this note discusses the challenges and potential opportunities arising from these changes.

As noted above, due to its length we have split this note into two parts. If you have got this far and still the have appetite for more send us an email to Longevity@equitile.com, we will add you to our future distribution list and send you Part 2 “Demographics: the challenges and the opportunities”.

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