

Smallpox was the first vaccination to change the world - now we have a new opportunity to improve our lives

Contents

Introduction	1
How smallpox vaccination changed our lives	1
Vaccination added a new stage - education - to our lives	2
Retirement then became a second new stage in life	2
Can the progress of the past 200 years continue?	3
A new demographic transition is now underway	4
We have the opportunity to add two more stages to life	5
The New Normal team	12

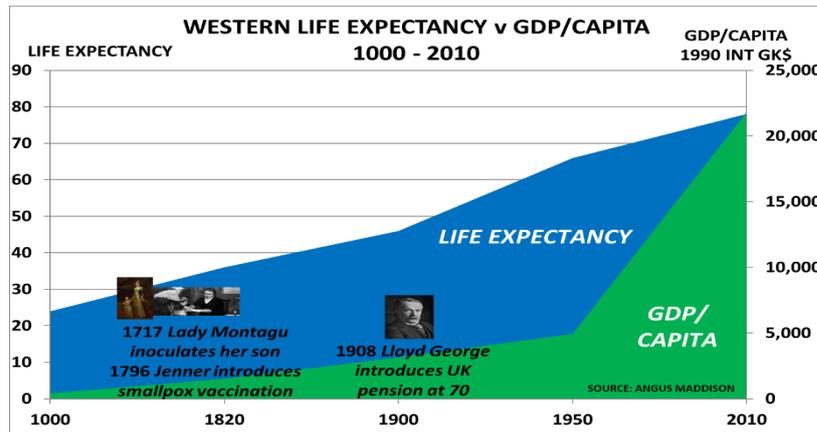


Chart 1: Increased life expectancy led to a dramatic increase in GDP/capita

We are living in a completely different world from 200 years ago. In fact, were it not for costume dramas on Netflix, it would be hard to understand how much has changed for ordinary people. And even these dramas gloss over the dirt and disease that were ever-present in day-to-day life. No film crew would agree to work in such conditions today, let alone the stars of the show.

Life for ordinary people was mostly still "solitary, nasty, brutish and short" as Thomas Hobbes observed in his 1651 work, 'Leviathan'. It still had just three stages for most people in 1820. A child would be born, often killing its mother in the process. If it survived, the child would then work until it died.

Political stability was certainly seeing a steady increase after centuries of civil and international wars, but daily life had hardly changed. And even the rich had no defence against the pandemics of the time. As Voltaire highlighted in his 1733 "Letters concerning the English nation":

"Out of a hundred people in the world at least sixty have smallpox, and of these sixty, twenty die of it in the flower of their youth and twenty keep the unpleasant marks for ever."

Life expectancy was very low, around half today's level. So there was little opportunity for the expansion of knowledge. Most parents struggled just to pass on what little they had learnt to their children. Grinding poverty meant only the rich had access to any kind of schooling. And yet, despite these seemingly insuperable obstacles, the Industrial Revolution was establishing itself in the UK, and about to transform the world.

It therefore seems worth looking more closely at one key development in the 1700s, which will help us better understand the background to the Revolution's success. In turn, this will help us understand the key opportunity for today.

HOW SMALLPOX VACCINATION CHANGED OUR LIVES

We need to start by paying tribute to two remarkable people. One is Lady Mary Wortley Montagu, wife of the British ambassador to Turkey in 1716 – 1718. The other is Dr Edward Jenner, a country doctor in Gloucester from 1773. Their importance resonates strongly today, as they were the pioneers of vaccination. Their target was smallpox, the great killer of the time.

As Voltaire reports, the English upper classes had begun to adopt the Turkish practice of variolation, which involved people infecting themselves with live smallpox in the form of pus. This innovation was due to [Lady Montagu, whose](#) 5-year old son was the first English person to be variolated, in 1717. After returning to London, she persuaded the Princess of

Smallpox was the great killer, until Jenner's discovery of vaccination

Editor:

Paul Hodges

+44 (0)7785 354809

phodges@new-normal.com

Published by

newnormal

new-normal.com

Life expectancy and GDP/capita hardly changed for hundreds of years until smallpox vaccination

Wales to variolate her own daughters in 1722. Royal approval encouraged many in court circles to follow suit.

Her innovation was good news for life expectancy. But sadly, the use of live virus killed 2 per cent of those who were variolated. This highlights the importance of Edward Jenner, who took up his practice just before James Watt's 1776 development of the steam engine. Jenner had a keen interest in smallpox, having been variolated at school in 1757. He became aware that milkmaids rarely got smallpox, and hypothesised they were being immunised by contracting cowpox, a bovine form of smallpox. He famously proved his theory in 1796 with his gardener's son as patient, and named the discovery vaccination.

Events then moved quickly, although the Royal Society rejected his first paper in 1797. A Royal Jennerian Society was established in 1803 under the patronage of the Prince and Princess of Wales, and the UK quickly became the global centre of smallpox vaccination. Smallpox became the [first infectious disease to be eradicated](#) in 1980, due entirely to vaccination.

Revolutions on the scale of the Industrial Revolution don't happen in isolation. But by 1820, increasing political stability and the success of smallpox vaccination were combining with the new focus on innovation to create fertile ground for a new world to open up. As chart 1 shows, the result was that life expectancy and GDP/capita began to increase in tandem:

- ◆ Angus Maddison's [Western data](#) shows that life expectancy only increased from 24 to 36 years between 1000 – 1820. Over the same period, GDP/capita only rose from \$750 to \$2100
- ◆ But a virtuous circle then began to evolve. The wealth created by the Industrial Revolution was raising UK living standards. And rising life expectancy encouraged Victorian reformers to press for the introduction of primary education

VACCINATION ENABLED THE VICTORIANS TO ADD A NEW STAGE IN LIFE - EDUCATION

The writer Charles Dickens was one influential champion of education for the working classes. And in his 1854 novel 'Hard Times', he also savaged the concept of rote learning in the shape of Mr Gradgrind's belief that:

"You can only form the minds of reasoning animals upon Facts: nothing else will ever be of any service to them".

Forster's 1870 Education Act was the breakthrough for the reformers. Its introduction of universal primary education for 5 – 12 year olds increased social mobility by ensuring education was no longer the preserve of the rich. It added a new stage to life, whereby a child would be born and educated, before working and dying. Hobbes would have been astonished by this development.

He would have been more astonished 75 years later by RA Butler's 1944 Education Act. This provided universal free education up to the age of 15, further increasing social mobility. Although its 11+ examination later proved unpopular, any child passing it could obtain a free place to a grammar school, opening up the route to universities and further education for the first time.

THE IDEA OF RETIREMENT BECAME THE NEXT NEW STAGE IN LIFE

Essentially, the impact of increasing life expectancy was like a stone being dropped in the middle of the pond. One important new circle was added in 1908 with the introduction of the state pension by future UK prime minister, David Lloyd George. He recognised that with life expectancy now at 50, the government needed to provide for those who could no longer support themselves. His Act followed Bismarck's in 1889 in Germany, and paid a small means-tested pension to those aged over 70, benefiting 600k people in its first year.

They were only a small proportion of the UK's 44 million population. But the pension added another stage to life: children could be born and educated, before working and then potentially retiring before they died. Importantly, the introduction of this safety net also meant parents no longer needed to have large numbers of children, in the hope that some might survive to look after them in old age. Instead, they could choose to concentrate their resources on improving the life chances of a smaller number of children, creating a further potential boost to GDP/capita.

The virtuous circle created by the combination of the Industrial Revolution and vaccination also encouraged the growth of cities. As Jane Jacobs showed in 'Cities and the Wealth of Nations', healthy cities are critical to economic growth as they are constantly evolving to

Editor:

Paul Hodges

+44 (0)7785 354809

phodges@new-normal.com

Published by

newnormal

new-normal.com

The past 200 years has seen a dramatic increase in prosperity

generate trade and innovation to create wealth.

Today's exodus from our major cities, due to fears of contagion from the pandemic, reinforces the critical importance of smallpox vaccination and other health-related innovations to the growth of cities (such as the 1898 introduction of [drinking water chlorination to eliminate typhoid and cholera.](#))

The past 200 years has not only seen a dramatic increase in UK prosperity. The growth of universal education, and the increased social mobility that it enabled, means that prosperity is no longer the preserve of a small number of rich people. Without smallpox vaccination, and its role in adding education as a new stage in life, it seems unlikely that this cultural and economic change could have taken place. The UK's central role in smallpox vaccination was critical in enabling the nascent Industrial Revolution to reach its full potential.

CAN THE PROGRESS OF THE PAST 200 YEARS CONTINUE?

This brings us to the key question of whether the spectacular progress of the past 200 years can continue? Or has it now peaked with the post-War BabyBoom generation? Since 1950, the UK population has risen from 50 million to 67 million today, and the Boomers are clearly the wealthiest generation in UK history. They have confounded Thomas Malthus' 1798 forecast in his 'An essay on the Principle of Population' that increasing population would inevitably destroy overall prosperity.

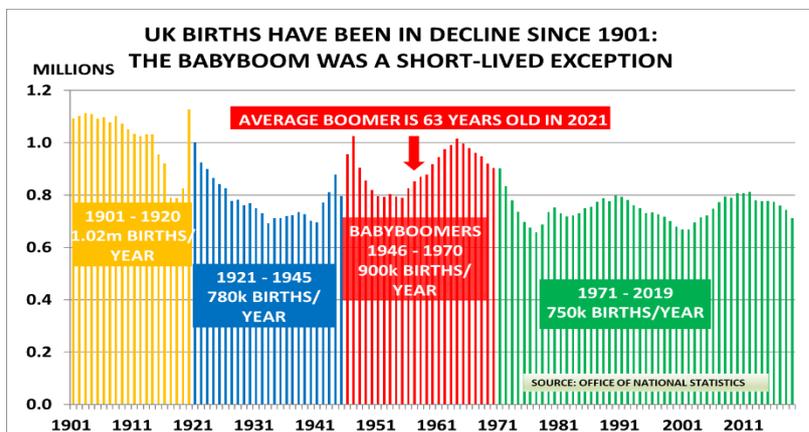


Chart 2: The average number of UK births is at new lows

Chart 2 suggests that the benefits provided by this virtuous circle are starting to play out.

- ◆ Average births were 1.02 million/year in 1901-1920, but fell to 780k in 1921-1945
- ◆ They rose to 900k in the 1946-1970 BabyBoom, but have been 750k/year since 1970

The issue is that UK fertility rates have been in overall decline since 1820, when they were 5.4 births/woman. The rate fell to 3.5 in 1900, and to [2.1 in 1950](#). And since 1970, it has been below the 2.1 level needed to replace the population.

The establishment of the NHS in 1946 helped to mitigate this impact, as child mortality fell from 65/thousand in 1945 to [just 4/thousand today](#). And the decline in average family size provided a further boost for GDP/capita, as smaller families meant women no longer had to stay at home to look after children.

To appreciate the radical impact of this development, we only have to look back to the 1950s, when it was still "normal" for women to leave work if they got married – on the basis that it was the man's role to provide for his family.

This position changed with the rise of the women's liberation movement – which led governments to pass the Equal Pay Act of 1970 and the Sex Discrimination Act of 1975, which established the Equal Opportunities Commission. By the 1980s, the 'two income family' was starting to become the norm, effectively turbo-charging growth in GDP/capita.

Today, as chart 3 shows, the combination of increasing life expectancy and falling fertility rates is dramatically changing the age profile of the UK population. The UK is no longer dominated, as it was until 2000, by the Wealth Creator 25-54 age group and their babies.

Editor:
Paul Hodges
+44 (0)7785 354809
phodges@new-normal.com

Published by
n new normal
new-normal.com

PETROCHEMICALS

The urgency of forward planning is underlined by today's record levels of global debt at a time when interest rates are rising

A new demographic transition is now underway

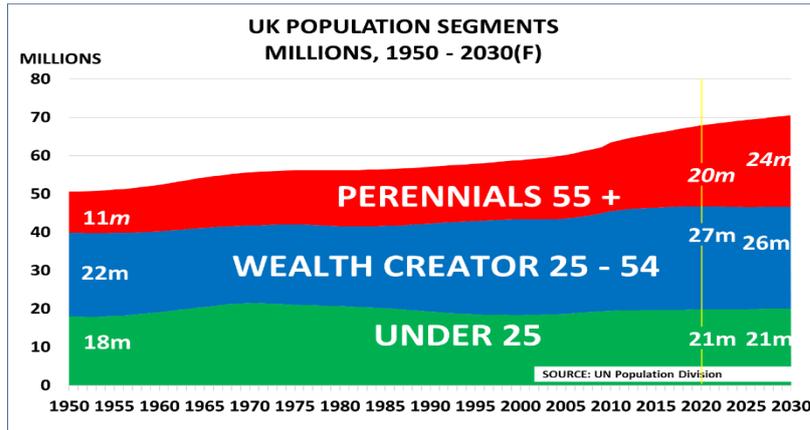


Chart 3: The majority of UK population increase to 2030 is in the over-55 generation

Instead, the importance of the Perennials 55+ generation is now steadily increasing. They will account for the majority of population growth over the next decade, and will be close to overtaking the Wealth Creator generation in terms of size by 2030.

As a result, the recent Gates Foundation-funded ['Lancet' study](#) suggests that the UK population will peak at 75 million in 2063, and then return to current levels by 2100. It also warns of a potentially "profound shift in age structure" in many countries, with the expected decline in the numbers of working age adults having a major impact on productivity and GDP growth rates.

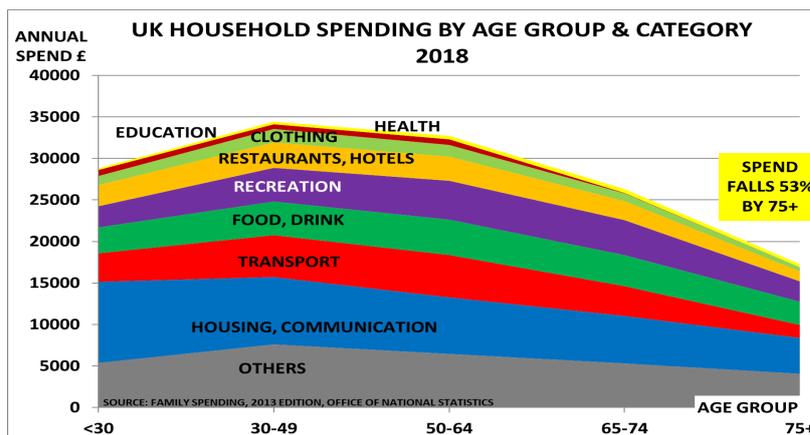


Chart 4: Consumer spending falls away quite sharply as people get older

The issue is that UK GDP, like all developed economies, is driven by consumer spending. The young Boomer population was very good news for GDP, as young adults needed to spend when they set up home for the first time. And they expanded their purchases when babies were born and as their own careers progressed.

By contrast, as chart 4 [confirms](#), individuals' spending typically halves from its peak by the time they reach 75+. Not only do Perennials have lower incomes in retirement, but they also already own most of the consumer products they need and are effectively a replacement economy.

A NEW DEMOGRAPHIC TRANSITION IS NOW UNDERWAY

The demographic transition now underway therefore creates a major headwind for UK GDP/capita growth, as shown in chart 5. It plots the dramatic changes that have taken place since 1820, using Hans Rosling and Angus Maddison's data.

It suggests that the UK, like most major economies, is moving into a New Normal world defined by relatively low fertility rates and increasing life expectancy. But does that mean we now have to reverse Malthus' forecast, and accept that an ageing and declining population could see lower prosperity and perhaps an actual decline in GDP/capita?

It certainly seems unlikely that fertility rates will return to previous levels, given the limited impact of policies in France and elsewhere designed to increase birth rates. And

Editor:
Paul Hodges
+44 (0)7785 354809
phodges@new-normal.com

Published by
n newnormal
new-normal.com

PETROCHEMICALS

The urgency of forward planning is underlined by today's record levels of global debt at a time when interest rates are rising

We have the opportunity to allow people in their 50s/60s to retrain for a new role or career

even if the Fourth Industrial Revolution delivers on all its promises for artificial intelligence and robotics, it seems unlikely to change the underlying paradigm shift.

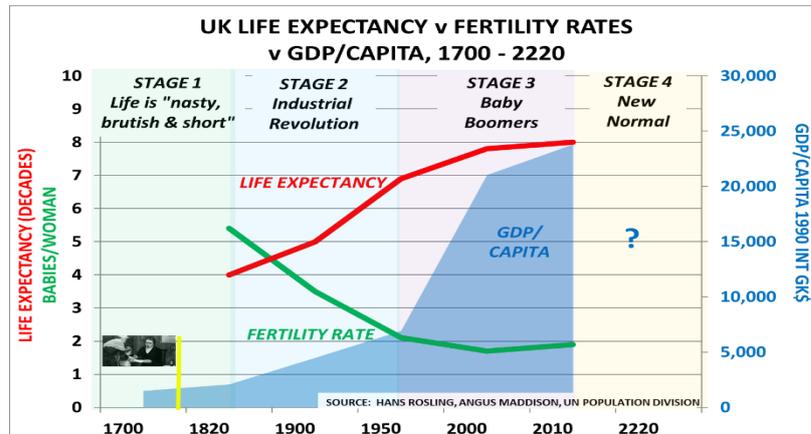


Chart 5: UK GDP growth will be challenged by the demographic transition now underway

But why should we fear the arrival of an ageing society? Shouldn't we instead aim to be much more imaginative in our approach to retirement? Rather than seeing it as a "right" to spend the last decades of our life watching breakfast TV from the couch, couldn't we instead think more creatively about the concept of retirement.

WE HAVE THE OPPORTUNITY TO ADD TWO MORE STAGES TO LIFE

Why couldn't we, for example, aim to introduce at least another two stages in life over the next two centuries? Understandably, many people are bored with their work by late middle age, and manual work is not a serious option for senior citizens. But what if we offered people the opportunity to retrain at this point in their lives, and encouraged them to make use of the life skills they have accumulated as well as their academic and technical skills.

We could then move to a society where:

- ◆ Babies would be born, educated and enter the job market
- ◆ In their 50s/60s, people could then retrain and take up a new role or career

The concept of retirement would return to Lloyd George's original definition of covering the last few years of life, when people may be unable to continue to support themselves because of illness. Of course, special provision would need to be made for those suffering from long-term illness – but this also highlights the importance of medical research into these diseases as a value-added contributor to the economy.

200 years ago, the seed of the Industrial Revolution dropped into the fertile soil created by smallpox vaccination and began to transform our lives. Wonderfully, it withstood the impact of wars and economic depressions, due to its ability to increase national prosperity whilst also broadening its reach. If we want to maintain this progress, we need to focus on the potential for life to begin again around the age of 60, and encourage people to retrain for a fulfilling second career.

The past two centuries have seen extraordinary growth in GDP/capita and social mobility, due to our success in expanding the stages of life beyond basic levels. We should now aim to build on this achievement by adding two more stages to our lives.

Editor:

Paul Hodges

+44 (0)7785 354809

phodges@new-normal.com

Published by

n newnormal

new-normal.com

About the New Normal team

This Report is published by New Normal GmbH, a Swiss-based strategy consultancy advising Fortune 500 and FTSE 100 companies, investment banks and fund managers.



Paul Hodges phodges@new-normal.com

Is a trusted adviser to major companies and the investment community, and has a proven track record of accurately identifying key trends in global marketplaces. He is chairman of New Normal Consulting and a Global Expert with the World Economic Forum. His analysis of the key role of demographics in driving the global economy has attracted increasing interest from senior policymakers and executives.

Paul also serves as chairman of Ready for Brexit, as Advisory Board chairman for Infinity Recycling and non-executive Chairman of NiTech Solutions, and is a senior adviser to I.C.I.S Pricing and Recycling Technologies. Prior to moving into consulting in 1995, Paul spent 17 years with Imperial Chemical Industries (ICI) in the UK and USA. He held senior executive positions in petrochemicals and chloralkali, and was Executive Director of a \$1 billion ICI business.



Daniël de Blocq van Scheltinga daniel.dbvs@new-normal.com

Was the first foreigner to be granted permission to run the finance company of a top-tier Chinese State Owned Enterprise, when establishing and managing ChemChina Finance Company. Previously, Daniël held a variety of senior positions in corporate and investment banking, including as Asia Pacific Head of Chemicals and Asia Head Asset Based Finance for ABN AMRO.

He moved to Hong Kong in 2001, and continues to spend much of his time in China, advising international and Chinese firms, as well as leaders in the public and private sectors. Daniël is a graduate of Leiden University, the Netherlands, with a Master of Law degree with a specialty of International law.



David Hughes dhughes@new-normal.com

Is an expert on the Middle East, having lived and worked in Riyadh, Saudi Arabia for 5 years after leading SABIC's global business redesign programme in 2009. He has held a range of senior executive positions with SABIC, Huntsman and ICI, where he led a range of global \$1bn+ businesses based in the Middle East, Europe and the USA. He also served on a number of industry bodies, including as Vice-Chairman of the Board of Petrochemicals Europe, the Asian Clean Fuels Association and the Methanol Institute.



Paul Satchell psatchell@new-normal.com

Has worked in the chemical industry as an equity analyst with some of the world's leading investment banks, and directly with chemical companies. For 21 years to 2017, he covered the global chemical industry for banks including ING, Merrill Lynch and Investec, making market recommendations and undertaking advisory work in M&A and lending. He was particularly well known for his development of the Chemicals Volume Proxy, a unique real-time monitor of chemicals demand. Before this, he spent 16 years in the industry itself, mainly with BP/BP Chemicals. He is Honorary Treasurer of the Royal Society of Chemistry and previously chaired its Investment Committee.

Editor:

Paul Hodges

+44 (0)7785 354809

phodges@new-normal.com

Published by

newnormal
new-normal.com

Disclaimer

This Research Note has been prepared by New Normal Consulting for general circulation. The information contained in this Research Note may be retained. It has not been prepared for the benefit of any particular company or client and may not be relied upon by any company or client or other third party. New Normal Consulting do not give investment advice and are not regulated under the Swiss Financial Services Act. If, notwithstanding the foregoing, this Research Note is relied upon by any person, New Normal Consulting does not accept, and disclaims, all liability for loss and damage suffered as a result.