



# Health Care

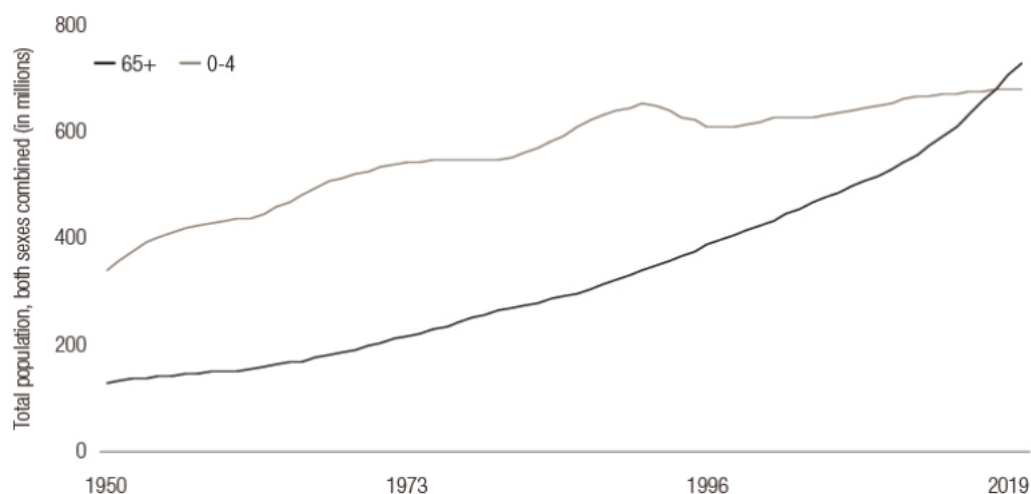
On the Cusp of a Revolution

# Health Care is on the Cusp of a Revolution in Terms of our Understanding of Human Biology, and our Approach to Health and Well-Being.

## Why Focus on Health Care Now?

- If we were to condense the relatively short 200,000-year history of homo sapiens into a single year, then most of the medical progress would have occurred in the past four hours. However, over the final hour, innovation is happening faster than ever. We are witnessing an unprecedented level of convergence among various fields of science and technology <sup>1</sup>.
- An ageing demographics: The US is currently on course for one-fifth of their population to enter the 65 years+ bracket by the end of this decade. For every year that goes by, the population in the US gets 1 month older. In China, the population gets 6 months older with every year that goes by. In fact, China recently released a report that its population has shrunk for the first time since 1949. By 2070, it is reckoned China's population will have halved. An ageing population augurs for more investment in health care.
- Although the ageing population has been around for quite some time now but we have recently reached the point where there are now more people aged 65 or over than there are children under 5, worldwide (see graph below). An ageing population on this scale will affect nearly every aspect of society, but some sectors will be more impacted than others, such as healthcare.

Figure 1. Globally, more people are aged over 65 than under 5



Source: UN World Population Prospects 2019.

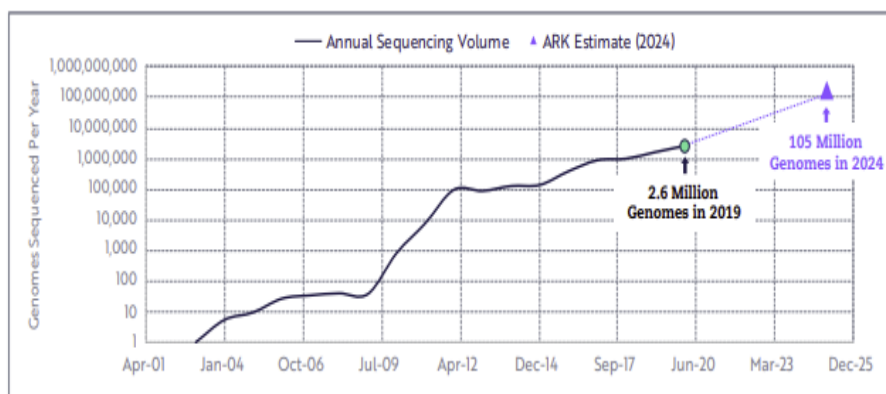
<sup>1</sup>Baillie Gifford: "It's time to rethink what the word healthcare means"

## Genomic Innovation

Each one of us comprises around three billion DNA base pairs, is home to thousands of proteins, and hosts trillions of bacteria – all of which play a crucial role in our health. Until now, we simply have not had the means to collect and process these complex and sizeable data sets that pertain to our health.

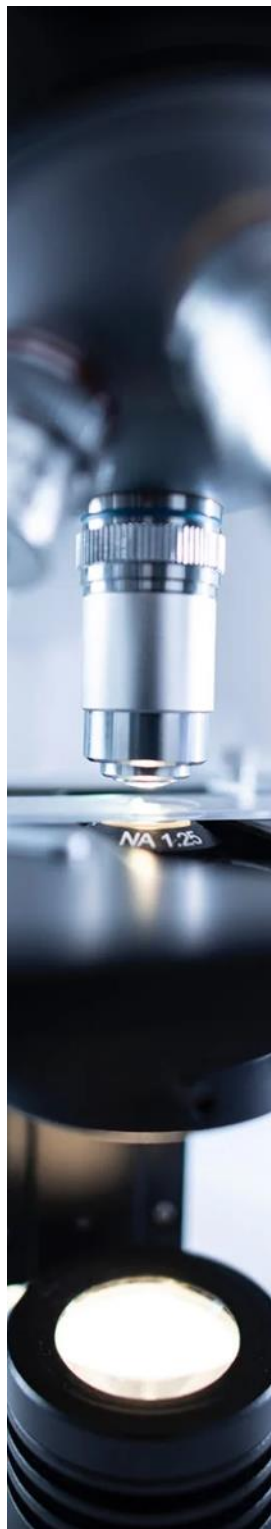
Costs of genome sequencing have fallen from over \$2 billion in 2003 to around \$1,000 today. Illumina is working hard to lower costs even further to just \$100 per genome. We believe there is significant elasticity of demand as sequencing costs decline and as new clinical sequencing applications become viable. ARK Invest forecasts that clinical adoption of next generation DNA sequencing (NGS) will drive volumes from ~2.6 million in 2019 to more than 100 million in 2024, as shown below.

Figure 1: The Growth of Genomic Sequencing  
(Log Scale)



Source: ARK Investment Management LLC, 2020 | Sequence volume is measured in whole human genome data equivalents, which is defined as 96 giga-bases of genomic data (3.2 GB genome at an average coverage of 30X).

In 2007, there were 2,000 human genes associated with rare diseases, when the cost to sequence a genome was US\$10 million. In the next seven years to 2014, as the sequencing costs came down, the number of genes discovered associated with rare diseases doubled to more than 4,000. In other words, more genes were discovered in seven years than in the previous century.



## Genomic Innovation (cont'd)

Importantly, this process takes time to transition to real-world treatments. For example, the development of a revolutionary treatment for a rare eye disease took two decades from gene identification in 1997 to a new drug approval in 2017. Fortunately, we are now seeing this process from discovery to trial to potential approval accelerating massively. The US Food and Drug Administration (FDA) expects progress in trials related to this innovation to culminate in 10 to 25 new gene therapy approvals annually by 2025 and we believe that number will continue to grow over time.

We believe opportunities is rampant in the health care sector. Healthcare is 13% of S&P500 market cap but makes up 19% of net income. There is a disconnect between the sector's earnings power and its performance. We are also expecting a wave of innovation from research and development pipelines as well as numerous technology-facilitated transformations that will provide further evidence for interventions and will bring about measurable improvements in health care.



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