

The ageing population crisis:
should ageing be treated as a disease?



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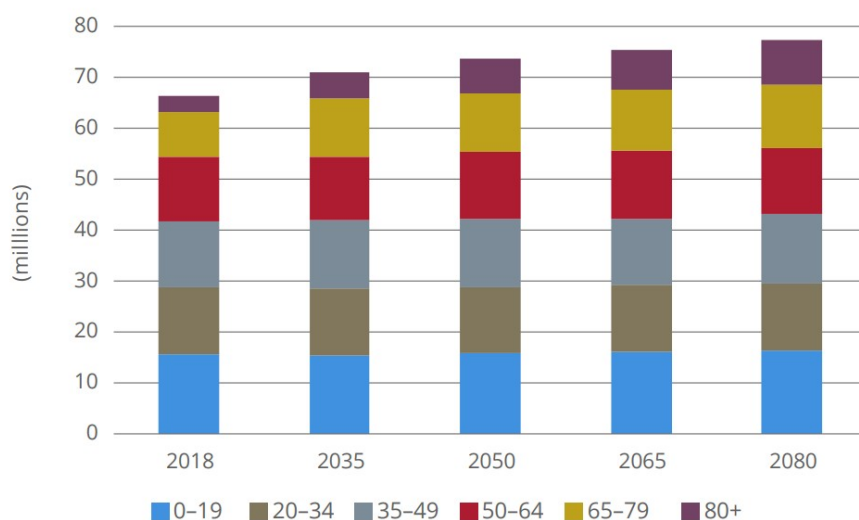
The ageing population crisis

Storyline

People worldwide are living longer and every country across the globe is experiencing an expansion in the proportion of the older population. However, this expansion in lifespan has not been matched by an increase in healthy life expectancy, so the proportion of life spent in good health has decreased, placing a substantial burden on health and social care services. As a result, there is a growing need to identify novel interventions that improve health in old age. The human gut microbiota has a huge impact on whole-body health and contributes to a healthy heart, brain health, a strong immune system and improved mood and sleep. Thus, an increasingly attractive target for the development of new anti-ageing therapies is microbiome-based interventions. In addition, research indicates that leading an active life and eating a healthy balanced high fibre diet are key to microbiome balance and prevention of chronic disease.

The ageing population crisis

1. We are an ageing population. The challenge of population ageing is increasing dramatically. Between 2015 and 2050, the proportion of the world's population over 60 years will nearly double from 12% to 22%. By 2035, it is projected that there will be around 16 million people over the age of 65 living in the UK, an increase of around 4 million from 2018, and nearly 5 million people over the age of 80, a 51% increase from 2018. By 2030, 1 in 6 people in the world will be aged 60 years or over. At this time the share of the population aged 60 years and over will increase from 1 billion in 2020 to 1.4 billion. By 2050, the world's population of people aged 60 years and older will double (2.1 billion).



Source: Office for National Statistics (2019) Principal projection—UK population in age groups <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/tablea21principalprojectionukpopulationinagegroups>

A child-centric microbiology education framework

Changes to the age profile of the population are due to a combination of lower birth rates and increases in life expectancy over the past century. All countries face major challenges to ensure that their health and social systems are ready to make the most of this demographic shift.

2. *Why is the expansion of the ageing population a crisis?* There is no doubt that the increased improved life expectancy (average number of years a person has before death) has been one of the greatest triumphs of the *last* century. However, this is set to be one of the greatest challenges of *this* century, particularly because this expansion in lifespan has not been matched by an increase in healthy life expectancy (the number of years a person is expected to live in good health, without disability). As per the latest House of Lords report on ageing published in 2021, over the 7-year period from 2009-11 to 2016-18, healthy life expectancy for males increased by 0.4 years, while life expectancy increased by 0.8 years. For females, healthy life expectancy increased by only 0.2 years over the same period, while life expectancy increased by 0.6 years. This means that the proportion of life spent in good health has decreased, and that associated with a loss of independence in old age increased, placing a substantial burden on health and social care services. It's no surprise that the government has set the target of adults gaining five more years of independent living by 2035.

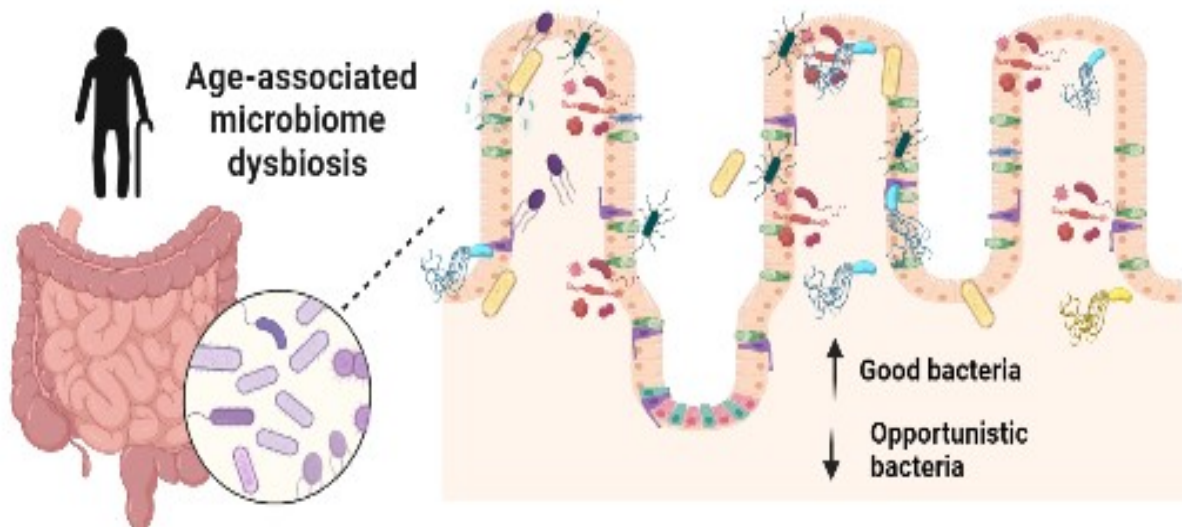
3. *How does ageing impact the health of older adults?* Ageing can be defined as the loss of functional reserve capacity – a result of the accumulation of a wide variety of molecular and cellular damage over time – leading to a gradual decrease in physical capacity (loss of muscle mass and strength), cognitive function and increased risk of neurodegenerative diseases, increased risk of chronic illnesses (cardiovascular disease, cancer, arthritis) and death. Together, these changes make older adults a vulnerable population.

Alongside an enhanced prevalence of age-related diseases, older people are more likely to experience frailty, which has been described as “an increased vulnerability to poor outcomes in individuals exposed to an apparently innocuous stressor, such as a minor infection.” According to the British Geriatrics Society in 2014, around 10% of people over the age of 65 had frailty, increasing to between a quarter and a half of people aged 85 or over. Importantly, frailty predicts the risk of falls, delirium, disability, hospital readmission and care home admission in older adults.

Multimorbidity is the state of having two or more long-term health conditions, which is more common in older age groups. There is evidence that the rate of multimorbidity is increasing, so it will become an increasing challenge for health systems. With this rise in the prevalence of multimorbidity, particularly among older people, a major challenge is the coordination of care and treatment for people who have multiple conditions. The treatment of multiple health issues via appointments with different clinicians has led to increased polypharmacy (the prescription of multiple drugs), which in turn creates several problems, such as confusion, and heightens the risk of adverse drug reactions.

4. *Why is the microbiome important?* The gut microbiota consists of a highly diverse community of bacteria, fungi, protists, and viruses, collectively termed the microbiome. These exist in a homeostatic balance and have been shown to regulate multiple aspects of health. The gut microbiome impacts a range of host functions ranging from supplying us with various nutrients, to the development of the central nervous system and immune system.

5. *What happens to the gut microbiome when we get older?* Ageing doesn't just happen to the human body; unfortunately, it impacts the gut microbiome too. The bacteria themselves do not become old. Instead, there is a shift in the microbial composition profile, driven by a loss of beneficial (good) and expansion of opportunist (pathogen) microbial communities, that can cause an infection when given the opportunity, resulting in a state of microbial dysbiosis. These changes can be driven by many factors, including our genes, eating habits and lifestyle choices.



6. *How can the advancing age microbiome impact the health of older adults?* The age-associated alterations in gut microbiota could exert profound effects on human of older adults and have been linked with several chronic diseases, including

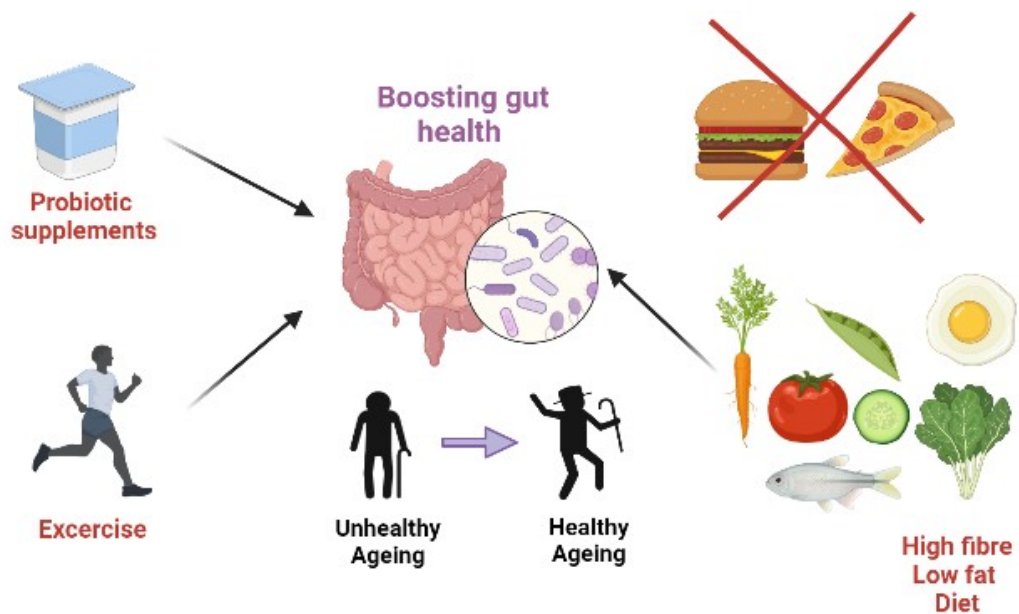
- Alzheimer's disease is the most common cause of cognitive impairment in older adults. Some studies have shown that restoring the gut microbiome balance can help improve cognitive function, learning, and memory in patients with this disease, hinting at the microbiome's role in it.
- As we get older, our immune system doesn't work as well and that's why older people are more at risk of serious complications from common infections. Age-associated immune changes have been linked with the changes in the gut microbiome.
- As people get older, they tend to lose muscle mass, strength, and endurance. Skeletal muscle decline and increased frailty have been linked with changes in the gut microbiome composition in older adults.
- Aging gut microbiome may be responsible for the degradation in cardiovascular health as we grow older.

7. *Does the secret to successful ageing lie in maintaining a healthy gut?* We are only just at the beginning of trying to understand how to manipulate our microbiome but the restoration of gut microbiome balance in older adults may hold the key to healthy ageing. So, what can we do to keep our gut healthy?

- Modern diets rich in salty, sugary, or fatty processed foods damage the gut, while higher fibre nutritious foods like fruits, vegetables, seeds, beans, and nuts help protect a healthy gut microbiome balance as we age.

A child-centric microbiology education framework

- Exercise can be used to maintain the balance of the microbiome species. But physical activity levels tend to decline in later years. In the future, we can approach exercise to rebalance this altered microbiota for improving health status and possibly treating age-associated diseases.
- Adding a probiotic (live good bacteria) supplement to your diet may be a great way to improve your gut health. Not all probiotic supplements are high quality or will actually provide benefit, which is important to keep in mind while choosing a probiotic supplement to ensure the best health benefit.
- Medications and hospital stay can speed up age-related microbiome imbalance, so should be avoided where possible.



The Evidence Base, Further Reading and Teaching Aids

House of Lords, Ageing Report: [Ageing: Science, Technology and Healthy Living \(parliament.uk\)](https://www.parliament.uk)

[Ageing And The Microbiome: What Happens When You Get Older? \(atlasbiomed.com\)](https://atlasbiomed.com)

Videos

Why does understanding Ageing matter? <https://youtu.be/2v34Dt6wBkE>

Human Gut microbiota <https://youtu.be/4-dk24-XRH8>