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Country	Gross Domestic Product per person (\$)	Births per 1000 women aged 15–19	Percentage of Lower Secondary age children out of school	
			Females	Males
A	640	98.2	32.0	29.4
B	898	100.8	40.2	32.0
C	1791	103.0	36.8	32.4
D	37793	19.8	2.8	3.1
E	46297	15.3	1.8	2.1
F	54630	24.1	0.2	1.5

How reliably can the following inferences be drawn from this table? Briefly explain your answers.

- (a) Girls begin having babies at a younger age in poorer countries than in richer countries. [3]
- (b) A significant reason why girls are not educated at lower secondary level is because they are having babies and caring for them. [2]

Questions 2, 3 and 4 refer to Documents 1 to 5.

- 2 Briefly analyse Methuselah's argument in Document 1: *Living for Longer*, by identifying its main conclusion, intermediate conclusions and any counter-assertions. [6]
- 3 Give a critical evaluation of the strength of Methuselah's argument in Document 1: *Living for Longer*, by identifying and explaining any flaws, implicit assumptions and other weaknesses. [9]
- 4 'Extending life expectancy would do more harm than good.'

Construct a reasoned argument to support **or** challenge this claim, commenting critically on some or all of Documents 1 to 5, and introducing ideas of your own. [30]

DOCUMENT 1

Living for longer

The world is about to experience a vast increase in the number of elderly people. Life expectancy at birth has risen about three months per year since 1840, largely because of the decline in infant mortality. At the beginning of the 20th century, life expectancy at birth in the USA was 47 years, but it has now increased to 79 years; it is predicted to reach 88 in the middle of this century, and 100 by the year 2100.

Because medicine has already achieved such great increases in life expectancy, we can be sure it will go further still. Some existing medicines, such as metformin, used in the treatment of diabetes, have been found to delay aspects of ageing. Rapamycin, a medicine normally used in organ transplants and to treat some kinds of cancer, has been shown to extend the life of mice by 25%, and to protect them against diseases of ageing. High doses of a compound found in red wine have been shown to extend the healthy lives of yeast cells and to have favourable effects in mice.

The stories of vampires are generally considered to be fantastic legends, but they may reveal the secret of eternal youth. Blood plasma from young mice has already restored some mental capabilities in old mice. A human trial is currently investigating whether patients with Alzheimer's disease experience a similar effect when given blood transfusions from young people.

Even more impressive extensions to the human lifespan may be achievable by other means. If scientists succeed in identifying genes associated with long life, and maximising them by means of selection or gene therapy, they will be able to take control of evolution. If fundamental biological research discovers how to reverse the ageing process of cells, it will become possible to extend life indefinitely.

It may become possible to turn a digital copy of a person's brain into a low-cost, lifelike avatar, which will not age. In this way, digital technology will offer an entirely different mode of prolonging life. Dmitry Itskov, a Russian internet billionaire, has claimed that by 2045 he will be able to "create technologies enabling the transfer of an individual's personality to a more advanced non-biological carrier, and extending life, including to the point of immortality."

Governments and other institutions must therefore plan for a future in which human lifespan is considerably extended. At the World Economic Forum in Davos in January 2016, researchers and entrepreneurs discussed the future of work. They based their discussions on the hypothesis that, by the year 2100, everyone could be living to the age of 200. This major change will render current ideas of working ages, careers and pensions completely unrealistic.

Increases in life expectancy will also question the institution of traditional marriage. This concept originated in a bygone age, when people's experience of everyday life was very different. So new patterns of intimate relationships and family life will have to develop.

Methuselah

DOCUMENT 2

We could live for a thousand years

US hedge fund manager Joon Yun has sponsored a \$1m prize, which aims to push human lifespan beyond its apparent maximum of about 120 years. The Palo Alto Longevity Prize, which 15 scientific teams have so far entered, will be awarded in the first instance for restoring vitality and extending lifespan in mice by 50%. But once this has been achieved, Yun plans to offer more money for even greater achievements.

Yun claims that, according to US social security data, the probability of a 25-year-old dying before their 26th birthday is 0.1%. If we could keep that risk constant throughout life instead of it rising due to age-related disease, the average person would – statistically speaking – live for 1,000 years. Yun believes this to be a realistic prospect.

Yun has an impressive list of nearly 50 advisers, including scientists from some of America's top universities. One of these advisers is Aubrey de Grey, whose PhD degree was awarded by the University of Cambridge in recognition of his published work in molecular biology. He characterises ageing as a "medical problem" that science should be able to solve. Describing human persons as "biological machines", de Grey uses the analogy of a vintage car. Just as the car can be kept in good condition indefinitely with regular maintenance, so there is no reason why, in principle, the same cannot be true of the human body, he argues.

De Grey has said the first person who will live to 1,000 years is probably already alive. Claims like this, and some unconventional and unproven ideas about the science behind ageing, have made him unpopular with mainstream academics studying ageing. But he says, "An increasing number of people realise that anti-ageing medicine which actually works is going to be the biggest industry that ever existed by some huge margin and that it just might be foreseeable."

DOCUMENT 3

In the most developed countries, the proportion of the population aged 65 and over is expected to rise from 16% to 26% over the next 40 years, and the developing world is not far behind. These changes will pose great challenges to labour markets and social protection structures.

For most people, living longer will inevitably mean more time spent working. Retirement ages will have to be delayed, to enable individuals to support themselves without overburdening a nation's social security system.

This is not entirely bad news. With skilled workers remaining in the workforce longer, economic productivity will go up. And if people become bored with their jobs, they can change careers. But if you have people staying in their jobs for 100 years, that is going to make it really difficult for young people to move into a career and make progress within it.

People who continue paid work beyond the normal retirement age generate additional income which helps to finance pensions. Most young people now realise that they will have to work longer than their parents. However, some employers are reluctant to keep older workers on their payroll.

A large proportion of government budgets consists of public expenditure on health. According to a recent report, the over-65 age group accounts for 40–50% of spending on healthcare. It appears likely that public expenditure will rise in line with an increase in life expectancy. Access to medical assistance and adequate social services are essential aspects of social security, and healthy ageing is impossible without them.

There can be no doubt that, in the future, beneficiaries of pension schemes will claim benefits over a much longer period than at present. Many countries have failed to respond to this challenge, and have not raised the statutory age of retirement. Furthermore, many people take advantage of schemes for early retirement, which make the problems even worse. One of the biggest challenges will be to guarantee adequate income for old people without creating an unbearable load for the younger age groups.

DOCUMENT 4**Welcome release**

“I’m tired, and I’m ready to go home.” Anyone who has spent much time with elderly people has heard these words on many occasions. Sometimes they refer to an outing or social event, but often they have a more universal significance. The old person is tired of life and will welcome death as a release.

For many centuries, the age of 70 was recognised as the natural end of life. The minority who lived on for another decade expected to be increasingly limited by weakness of both body and mind. In some periods and locations, most people in practice lived for much less than this, because of disease, hunger and war, but 70 remained the target, and those who reached it were considered to have “had a good innings” (as cricketing nations tend to express it).

Aiming to extend life beyond its natural endpoint is contrary to the wisdom of ages as expressed in various religious and non-religious spiritual traditions. Although these traditions are united in regarding life as desirable and in condemning attempts to end it prematurely, they also agree that focusing one’s attention on the preservation of the self or “ego” causes one to miss the whole purpose of life.

The most significant human experiences are those which can be described as “transcendent”, in which consciousness is concentrated on something other than oneself. Many people find these experiences of transcendence through religion, but music, literature, drama and the visual arts can all act as doorways into the eternal, in which the self becomes insignificant. Such experiences are more important and more fulfilling than the mere prolongation of physical existence.

Most scientists and philosophers believe that awareness of mortality is one of the most significant defining characteristics of humans, which other species do not share. Rather than frantically trying to postpone the inevitable, we should prepare ourselves for death and when the time comes embrace it.

DOCUMENT 5**Life satisfaction survey**

Respondents between the ages of 16 and 96 in a European country were asked,

“How satisfied or dissatisfied are you with your life overall?”

Responses were given on a scale from 1 (“not satisfied at all”) to 7 (“completely satisfied”).



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