

The Academy of Medical Sciences
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14 May 2015

From the Biological Secretary and Vice-President Sir John Skehel FRS

Dear Sir/Madam,

I am pleased to respond to your call for evidence to inform your 'Health of the public in 2040' project. Below I highlight past, and current Royal Society policy work that provides evidence about the different drivers and factors influencing health that were identified by your working group. I would be happy to discuss further appropriate opportunities for the Royal Society's Fellowship to contribute to the project as it progresses.

Wider external forces

Future agricultural developments will influence global health. Given the current demographic trends, by 2040 the world could face major shortages in food supplies. In [Reaping the benefits](#) (2009), our experts, including Health 2040 working group member Professor Jules Pretty, explore the role of sustainable intensification in meeting the needs of the global population. There is no technological panacea for the global challenge of sustainable and secure global food production. There will always be trade-offs and local complexities. This report considers both new crop varieties (including genetically modified crops) and appropriate agroecological crop and soil management practices and adopts an inclusive approach. Different solutions will apply to different contexts. Given the scale of the food supply issues, no technology should be ruled out. We agree that the availability and sustainability of food, as well as agricultural practice, will have significant consequences on public health in 2040.

Changes in global climate will have an impact on people around the world. The Society's Fellowship includes experts in climate science and the Society recently published a summary of climate science, working with the US National Academy of Science *Climate Change: Evidence and Causes*.

The Society has also undertaken work to better understand how conditions now and in the future may impact on people around the world. Our [Resilience to Extreme Weather report \(2014\)](#), chaired by Professor Georgina Mace FRS, maps global extreme weather patterns and their likely future impact on people around the world. It finds that Europe and the UK will be impacted. For example, in 2003, the European heatwave was a period of abnormally hot weather that lasted for 20 days, causing over 52,000 deaths in Europe. Temperatures exceeded 40 °C. The report recommends action to reduce the impact on people. It highlights that developed economies and emerging economies have a responsibility to develop and resource strategies to support the resilience of their populations and infrastructure. This will require a better understanding of the vulnerability of their populations and the development and implementation of policies and plans that are evidence-based.



President Sir Paul Nurse
Executive Director Dr Julie Maxton

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The incorporation of networks of sensors and other technology may help better monitor and regulate environmental changes that may impact on people. In June 2015, the Society will release a report on [Environmental Observation](#), commissioned by the Government Office for Science, which summarises the current and potential future use of technologies to observe the environment and explores how these may inform the management of air, oceans, land, climate change and natural hazards.

Technological change

The first module of the Society's [Brain Waves](#) report (2010) reviews the state of development of neuroscience and neurotechnology and discusses the translation of this knowledge into useful applications. The authors discussed their own views on how developments might impact on society, examining some of the opportunities and risks, as well as the ethical questions and governance issues. Brain imaging techniques will improve our understanding of the brain and help diagnosis of mental illnesses. Increasing knowledge about the effect of drugs on the brain, as well as the discovery of new drugs, may be applied to mental health care or to enhance/alter cognitive capabilities. The use of neural interface systems will likely expand, to connect therapeutic prosthetics as well as to optimise the human-machine interface.

Technology might be used to improve human performance and counteract, for instance, the effects of ageing. The joint Academy of Medical Sciences, British Academy, Royal Academy of Engineering and Royal Society workshop report on [Human enhancement and the future of work](#) was published in 2012, providing an overview of a range of potential enhancements arising from advances in science and engineering that are likely to impact on the future of work.

Technologies are more likely to develop in beneficial ways when the wider public has been able to contribute and inform the direction of development. An example of the Society's work to support such engagement is a Q&A on genetic modification of crops that is currently being prepared to equip people with scientific evidence.

Politics, economics, health systems and government

In [People and the Planet](#) (2012), the Society explored the interplay between demographic change, societal choices, economic development and well-being. With world population expected to reach between 8 and 11 billion by 2050, current models of economic growth are proving unsustainable. Political and societal choices will be essential to find sustainable solutions and ensure well-being. Technology is of the greatest importance in increasing the sustainability of consumption, through efficiency savings, reducing pollution from consumption, elimination of waste, recycling and reuse, and exploitation of alternative resources. Examples are presented in [People and the Planet](#) and many practical proposals are put forward in a report from the Institution of Mechanical Engineers (*Population: one planet, too many people?*, 2010).

Better health is central to human happiness and wellbeing ([People and the Planet](#), 2012). It also makes an important contribution to economic progress, as healthy populations live longer, are more productive and save more. The increasing prevalence of obesity in the population may have a sufficiently large impact on mortality to halt present upward trends in life expectancy.

Education provides economic benefits, builds strong societies and policies ([People and the Planet](#), 2012). It improves health and is associated with empowerment of women and smaller families. Improving education and skill levels can increase the productivity of an economy and its ability to

compensate for a decline in the share of the working age population. In general, well educated people live longer, healthier lives, and are more resilient to change. Education has the potential to contribute to sustainable development efforts in many ways. Aside from the benefits that it can directly bring to a person, it can increase knowledge of sustainable consumption, of healthy and safe living, including reproductive health, and about the importance of the environment.

[People and the Planet](#) highlights vital issues which have yet to be resolved. In order to monitor sustainable development more broadly, the measurement of national wealth must move beyond just Gross Domestic Product to comprehensive wealth measures which include natural assets (recommendation 8 in [People and the Planet](#)). This is an important issue in considering how sustainability can be achieved in an interconnected world. The report also flags a need for more comprehensive measures of well-being.

Research evidence, capacity, infrastructure and translation into policy and practice

Our [Science as an Open Enterprise report \(2012\)](#) highlights the importance of open science and open data in speeding up scientific progress. Exploring massive amounts of data using modern digital technologies has enormous potential for science and its application in public policy. For example, the analysis of large databases of patient genomes allows a better understanding of the diversity of cancers, and of their responses to treatments. The report highlights the tension between open data and privacy – intelligent openness is a response to the varying demands on different sorts of data from diverse research communities and interest groups.

Outstanding research and innovation advance our economic, social and cultural well-being as well as our health, and will be central to developing a sustainable future. As both our academies agree in [Building a stronger future](#) (February 2015), the UK is lagging behind other leading economies in terms of percentage of GDP that goes to funding research and innovation. The UK will need to step up its spending on research to achieve the progress in science and medicine necessary to meet the health challenges of 2040.

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Yours sincerely,



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Biological Secretary and Vice-President of the Royal Society