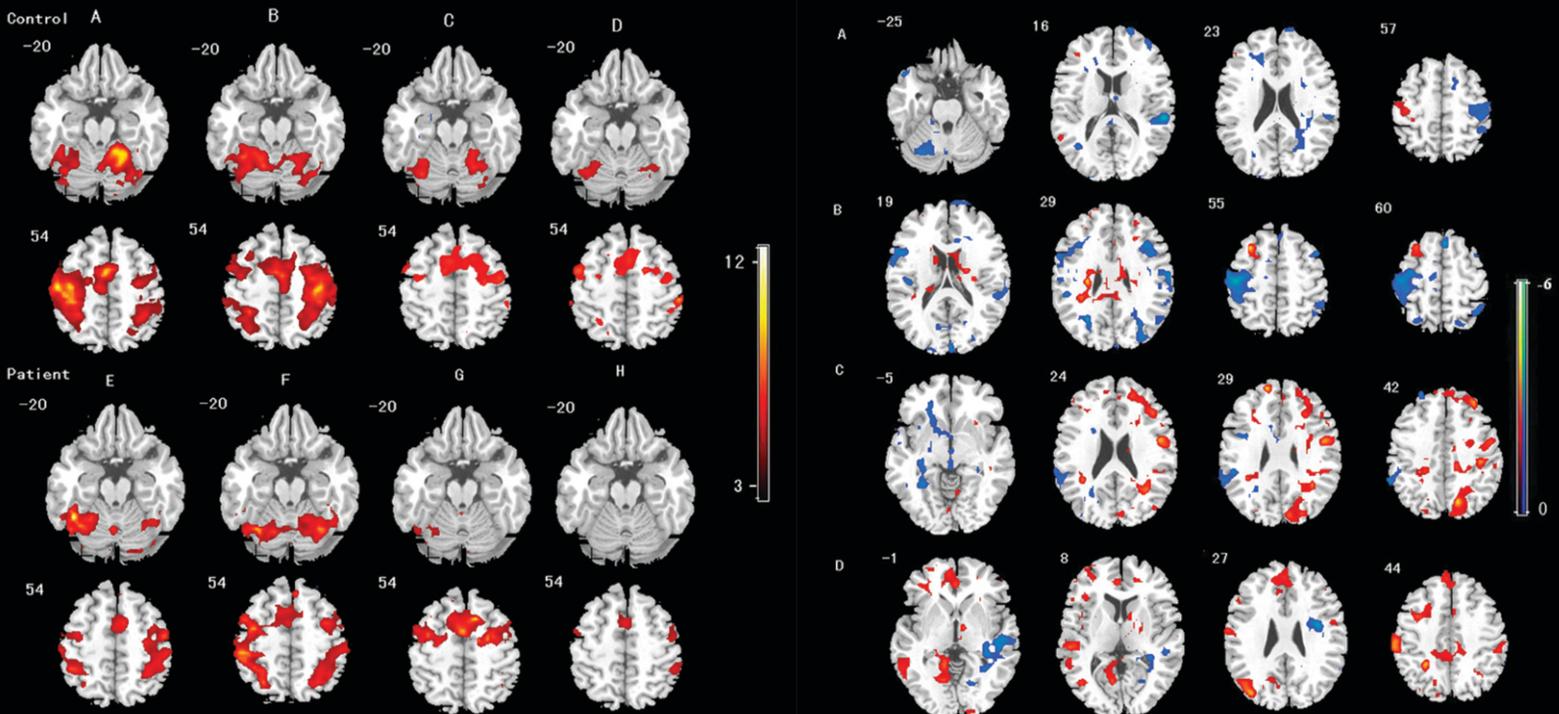


# Digital Medicine

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# The future of digital medicine in the aging society

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David Wortley is CEO and Founder of Gamification and Enabling Technologies Strategic Solutions ([www.gaetss.com](http://www.gaetss.com)), a consultancy on the strategic use of Gamification and Enabling Technologies for the transformation of business and society. He is a recognized authority on the practical application of Gamification and Enabling Technologies to address global challenges in areas such as health, environment, and education. He is a serial technology innovator and has been a pioneer of emerging technologies for over 30 years. He is an expert advisor to the European Union and an accredited business mentor. His specialist expertise is in the commercialization of disruptive digital technologies. David is also a Founding Council Member of the International Society of Digital Medicine (ISDM).

David was the Founding Director of the Serious Games Institute (SGI) [www.seriousgamesinstitute.co.uk](http://www.seriousgamesinstitute.co.uk) at Coventry University and he was responsible for the development of the institute as a global thought leader on the application of immersive technologies (which include video games, virtual worlds, and social networking) to serious social and economic issues such as education, simulation, health, commerce, and climate change. Working with academics, regional development agencies, and leading computer games companies, David made the SGI a focal point for games-based learning, simulation, and immersive three-dimensional (3D) virtual environments and an engine for innovation and social and economic regeneration. David is a respected (see <http://davidwortley.com/testimonials.html>) and sought-after international conference speaker and writer for global publications on Learning Technologies, Defence and Health applications. He has written numerous papers on technology and society (see <http://www.davidwortley.com/articles.html>), and he is a regular conference presenter (see <http://www.davidwortley.com/conferences.html>).

## INTRODUCTION AND BACKGROUND

Global Health and sustainable improvements in the well-being of humans are seriously threatened by two societal phenomena.

### The aging society

Across the globe, falling birth rates and increased life expectancies have led to significant increases in the percentage of citizens aged over 65 years compared to the younger working population. The increased life expectancies have, at least in part, been a result of improvements in health care, and the diagnosis and treatment of diseases and medical conditions that have traditionally caused premature death.

One of the results of this demographic shift is that the financial resources to support societal development

and sustainability which largely come from taxation and other income generated by the activities of the working population will be in decline, i.e. a smaller number of workers will be supporting a larger number of citizens who are either retired or not working. This presents a challenge to the sustainability of public health care [Figure 1].

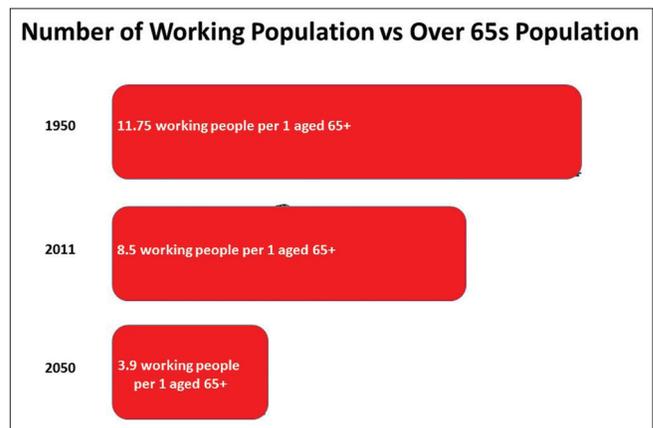


Figure 1: Aging Society Trends - A Global Village Journal Issue 10<sup>[1]</sup>

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The second impact of the aging society is the annual cost of health care per capita of older people being significantly greater than the cost per capita of younger people [Figure 2]. This increased cost is a direct result of greater life expectancy linked to increased vulnerability to conditions such as dementia and physical and mental frailty.

This phenomenon is exacerbated in the developed world by the disintegration of the family unit and local communities as increased citizen mobility has led to family members being placed in the care of public and private sector health-care providers rather than the traditional model of the caring family unit.

**Impact of lifestyle and medical advances on causes of death**

The above graph [Figure 3] illustrates the top 10 causes of death in the USA in 1900 v 2010 and shows that medical advances have all but eradicated many of the traditional causes of death from communicable diseases with a consequent growth in morbidity resulting from lifestyle choices and behaviors.

The issue with lifestyle-related conditions is the behaviors such as sedentary lifestyles and poor diets adopted early in life have a major and cumulative effect in later life resulting in diabetes and cardiovascular problems which require often expensive interventions and high levels of cost to public health services.

**The role of digital technologies in medicine, health, and well-being**

Digital technologies have undoubtedly had a major impact on medicine both in diagnostics and treatment. Modern digital scanning, artificial intelligence, big data analytics, human-computer interfaces, robotics, and 3D visualization technologies have all helped to not only increase our understanding of the physiology of the human body and enabled early detection of medical conditions but also they have contributed to increasingly more targeted and personalized interventions.

However, set against these positive benefits of digital medicine and health technologies is the impact of technologies which reduce the daily physical and cognitive challenges that have throughout history constantly exercised our bodies and minds and in the process, given us the active lifestyles needed to maintain health and well-being. Sedentary lifestyles at home and work coupled with the instant gratification of fast foods are leading to

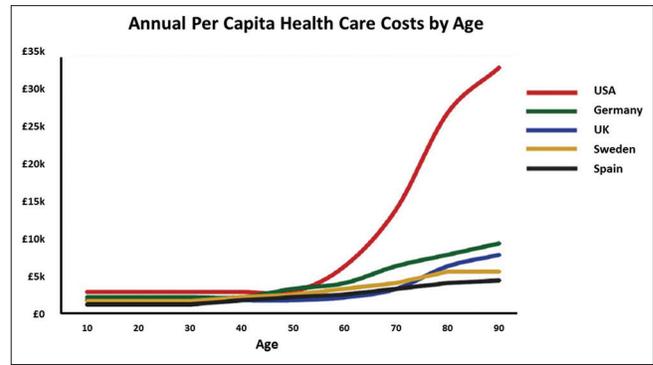


Figure 2: The annual cost of health care per capita<sup>[2]</sup>

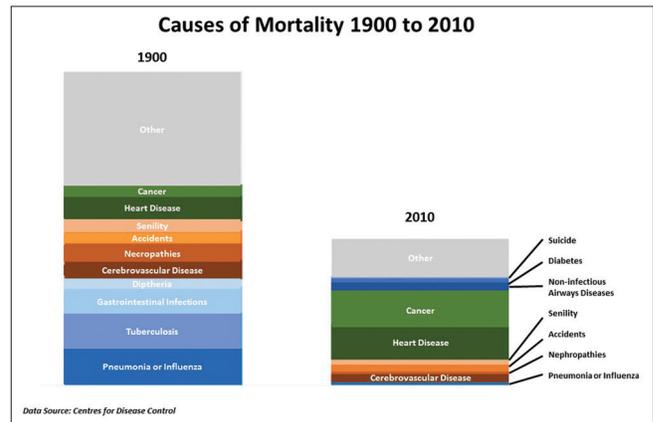


Figure 3: The top 10 causes of death in the USA in 1900 versus 2010<sup>[3]</sup>

The Aging Society and Health

Obesity is a 'slow motion car crash' that may bankrupt the NHS, says its chief executive

- Simon Stevens said obesity is causing millions to suffer life-long illness
- Also revealed the NHS is spending far more on drastic weight loss surgery than trying to prevent the problem in the first place
- A quarter of adults and a fifth of children are now considered obese
- Next month, Mr. Stevens will publish a set of plans to tackle the problem
- Will see NHS and private firms urged to do more to help staff lose weight

Lifestyle Related Conditions require serious intervention to change Behaviour

Figure 4: NHS Chief Executive Simon Stevens warning on obesity - UK Daily Mail 2015<sup>[4]</sup>

obesity epidemics in many different parts of the globe [Figure 4].

In these circumstances, I contend that it is important to leverage the power of technology to influence sustainable active and healthy lifestyles in which the citizen and communities are not only empowered but also accept more responsibility for personal health management through the use of consumer health and well-being technologies enabled by “gamification” (games

psychology and mechanics) and a new form of citizen health charter.

If future citizens are to have access to sustainable, effective, and ubiquitous healthcare, there needs to be a realization and understanding between citizens and health-care providers around personal responsibility for health management.

**The digital technologies enabling preventative health care and personal health management**

The future focus of digital technologies to address the dual challenges of the aging society and lifestyle behaviors will be based on the increasing consumerization, availability, connectedness, and functionality of disruptive and ubiquitous technologies such as wearable devices, sensors, artificial intelligence, cloud computing, big data analytics, and mobile devices that will monitor and in the case of chronic conditions, help to automatically moderate citizen health. The devices and the technology infrastructure to support them will be leveraged by the application of games psychology and mechanics to motivate, incentivize, and educate citizens to not only better manage lifestyle choices but also to share data anonymously with clinicians to contribute to a better understanding of optimal lifestyle choices and their impact on health.

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