



## Healthcare Costs

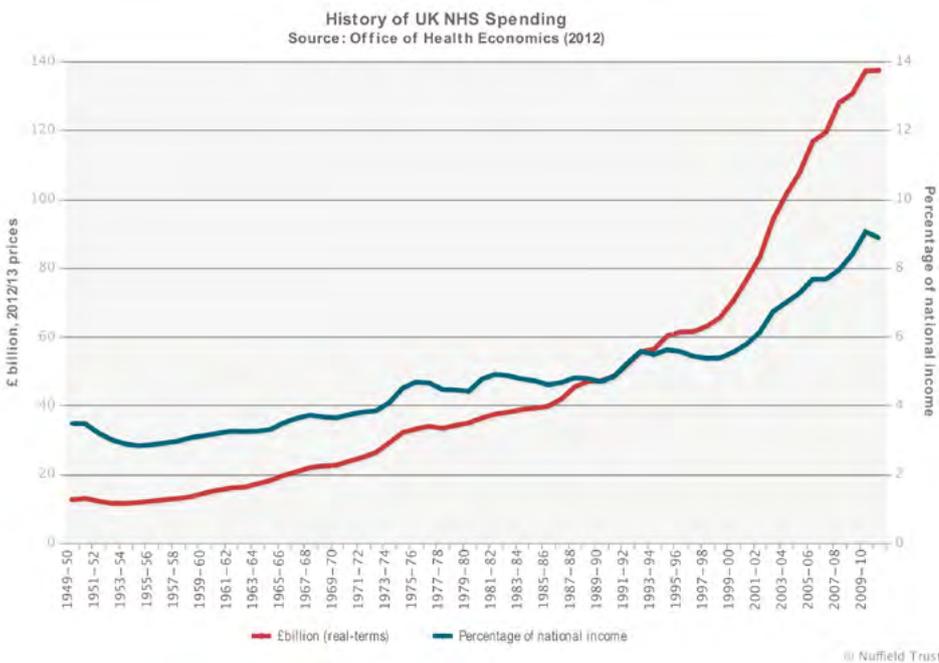
Arnoud Groen

Over the past decade, health expenditure has increased year on year as a proportion of national income (Figure). This unsustainable increase in healthcare expenditure has consistently outstripped inflation and is expected to increase even further. Healthcare inflation is driven by many factors. First, the ageing population; second, therapeutic advances over recent years have rendered many previously fatal diseases survivable, turning them into chronic, manageable diseases; and third, increasing requirements for scientific rigour and the growing regulation of clinical trials have greatly increased the cost to industry of bringing novel interventions to the clinic. Industry is in turn dependent on considerable revenue to underpin a sustainable development pipeline.

technology from within the company can be out-licensed or spun out by other (start-up) companies. Open innovation harnesses networks to expand the number of talented people contributing ideas and working on the same problems.

Below, some options for the cost-efficient improvement of healthcare that might also create opportunities for the UK's life science sector are explored.

1) Scientific advances over recent years have enabled in-depth characterisation of disease never before possible. Genomics, metabolomics and proteomics are able to map the complexity of systems in biology



Solutions to improve healthcare do not have to be costly and even high-tech solutions might eventually lead to a reduction of costs. It will, however, require close collaboration between all stakeholders, including governmental bodies, academia, industry and entrepreneurs among others, in combination with a creative open-minded approach to future challenges. Open innovation is an example of an approach that offers huge potential to address these healthcare challenges. In contrast to a closed innovation model, where the technology is developed within the company and the market is the only outcome, in an open innovation model, technology can be insourced from elsewhere, and developed

A systems approach has the potential not only to link genes or proteins to diseases, but also to understand their cause more fully. Already these approaches have yielded new therapeutic targets and pathophysiological insights, and have started to drive a change of focus from treatment to prevention and early detection of disease. These technologies also pave the way for stratified or personalised medicine, where diseases are managed in relation to the characteristics of each individual patient, in contrast to the conventional model of population level treatments. By convention, all patients with a disease receive a particular treatment. Some would respond in full, some in part, but some would show no response

or may suffer complications from the intervention without any therapeutic benefit. Stratified medicine seeks to identify these groups a priori and to tailor treatment accordingly. The huge expansion in, and integration of scientific, medical, epidemiological and public health data could also uncover to clinicians and researchers off-target effects of established treatments. These may be of therapeutic benefit, may pertain to previously unrecognised side effects, or may relate to psychosocial factors. This opens up many opportunities for the pharmaceutical industry, as the relative efficacy of drugs improves with more precise patient targeting.

For healthcare providers, the decision to utilise novel innovations depends increasingly on their affordability. It is therefore important that innovations are directed at the areas of greatest need, and at diagnoses or interventions where their application is most likely to result in patient benefit and cost savings. As an example, the cost of dialysis for kidney failure in the UK is estimated at £35,000 per year [1]. Interventions that prevent or delay the onset of kidney failure may therefore result in considerable savings.

2) A myriad of low technology or technology-free solutions exist that have the potential to improve healthcare. For example, lifestyle interventions are perhaps not all new but can have a dramatic impact on health outcomes and thereby reduce costs. Exercise, diet and smoking cessation can all dramatically impact on cardiovascular risk.

3) Another area of focus, recently emphasised by the Medical Research Council, is the development of new uses for existing interventions. One example of this is the drug thalidomide, withdrawn after its use for pregnancy-related vomiting resulted in catastrophic limb deformities in newborns. Recently, thalidomide has re-entered clinical practice as a treatment for the blood disorder myeloma.

4) Much can be gained by re-analysing existing healthcare processes and developing creative solutions in combination with existing technology. This approach has been successfully used to promote screening for bowel cancer in the United States. "Gutcheck" is a communication toolkit that supports shared decision-making conversations about colon cancer screening [2, 3]. Indeed there is a rapid expansion of digital solutions that combine the use of computational technologies, communication media, and smart devices to manage healthcare. One interesting aspect of digital healthcare is the change in emphasis to a model of patient self-management, which reduces the burden of care on providers. In the United Kingdom, approximately 44% of the healthcare budget is spent on salaries [4]. Any approaches that reduce the time demands on healthcare staff are therefore particularly attractive to commissioners.

Finally, enhancing the logistics of where and by whom healthcare is provided is a key priority to relieve the increasing pressure on healthcare in an environment where increasing financial constraints and an ever-expanding patient population co-exist. The pooling of resources and expertise in specialised clinics for relatively common conditions can increase the quality of care, increase efficiency of specialist services, and relieve pressure on general hospitals. Furthermore,

active patient participation, specifically in the field of rare diseases, could greatly add value by encouraging patients to provide feedback on their treatments and symptoms, effectively using the patient as a biosensor to monitor and improve patient care. One example that incorporates many of these aspects is the recently opened Alexander Monro Hospital in The Netherlands, which focuses solely on the treatment of breast cancer [5].

Understanding and implementing innovations for healthcare need not necessarily drive up costs but could have the inverse effect while also improving healthcare quality. Current healthcare challenges are very varied and the solutions to these challenges are likely to be equally diverse. Government has a very important role to play; smart investments and rigorous yet flexible regulation will prove crucial to meeting the challenges of providing sustainable, high quality healthcare for the future.

## References

- [1] The cost of renal dialysis in a UK setting--a multicentre study. Baboolal K, McEwan P, Sondhi S, Spiewanowski P, Wechowski J, Wilson K. *Nephrol Dial Transplant*. 2008 Jun;23(6):1982-9
- [2] <http://www.gutcheck.nci.nih.gov>
- [3] <http://www.ideo.com/work/gutcheck/>
- [4] Charlesworth A, Jones NM. The anatomy of health spending 2011/12: a review of NHS expenditure and labour productivity. Nuffield Trust Research Report, London 2013
- [5] <http://www.alexandermonro.nl/>

Many thanks to Thomas Hiemstra for his important contributions to this article. Thomas Hiemstra is a nephrologist and clinical lecturer in translational medicine and therapeutics in the department of medicine, University of Cambridge (<http://tmat.medschl.cam.ac.uk/hiemstra.html>).