Government
Office for Science

Foresight

Future of health and healthcare provision in cities

Future of Cities: Working Paper

Foresight, Government Office for Science

Future of health and healthcare provision in cities

Professor Nick Dunn
Lancaster University

Dr Claire Coulton
Lancaster University

August 2016

This review has been commissioned as part of the UK government's Foresight Future of Cities project. The views expressed do not represent policy of any government or organisation.

Contents

Executive summary

This paper is concerned with the future of health and healthcare provision in cities in the UK. The primary data was collected at a facilitated workshop held at the Academy of Medical Sciences in September 2015. The workshop was designed to guide participants through a series of exercises in order to explore what the current, near future and far future trends in health and healthcare provision are likely to be for cities.

The paper is organised into six sections. First, we describe the importance of understanding health and healthcare provision within cities and the intrinsic relationship between people and their built environment with regard both of these topics. Second, we examine the significant transformations within the sector of health and healthcare provision over the last fifty years. Third, we explore potential worst case scenarios for the future of such provision in cities. Fourth, we identify four possible future cities for healthy cities and effective healthcare provision. Fifth, we establish which policy developments would need to be designed and prioritised to facilitate delivery of these future cities. In conclusion, we establish a synthesis of the prevalent patterns and emergent relationships of themes raised during the workshop in order to draw together our findings and further understand how health and healthcare provision may impact the future of cities.

Introduction

Cities are growing both in terms of their populations and formation. As we move towards the third decade of the 21st century, half of the world's population live in urban areas and this number is increasing. The World Health Organisation (WHO) (2010, xi) estimates that by 2050, seven out of every ten people will live in cities with the number of urban residents increasing by 60 million per year. Primarily, this urban growth will take place in developing countries, but cities in wealthy countries, like the UK, will also grow. The move from rural to urban living can be attributed to a number of factors including: better employment opportunities, housing, education, access to healthcare and transport. In the UK, city centres saw a decrease in residential numbers during the 1970s and 1980s but over recent decades this trend has reversed with city centres becoming increasingly populated by young people and students, with older people more likely to be living in the suburbs and hinterland (Thomas et al., 2015). While urban populations are usually healthier than their rural living neighbours, this is not a holistic picture and extremes of disparity and high levels of deprivation also exist within cities. Living in a city can have a number of benefits for its residents, for example, it affords better access to healthcare and emergency healthcare services and city dwellers are less likely to be obese, commit suicide or die in an accident (Urry et al., 2014). However, these benefits are not evenly distributed, and the urban poor typically experience more health disadvantages (WHO, 2007):

> The urban setting itself is a social determinant of health. The living and working conditions (e.g. unsafe water, unsanitary conditions, poor housing, overcrowding, hazardous locations and exposure to extremes of temperature) create health vulnerability especially among the urban poor and vulnerable sub-groups e.g. women, infants and very young children, the elderly, the disabled.

Alongside these issues, there is a number of more general trends in the health of the population. On a global level the WHO (Ibid.) estimates that by 2030, 'the top five burdens of disease globally will be depressive disorders, ischemic heart disease, road traffic accidents, cerebrovascular disease and chronic pulmonary disease', while The King's Fund (www.kingsfund.org.uk/time-to-think-differently/trends) argue further that current lifestyles present a serious threat to health; inactivity, sedentary lifestyles, poor diet, obesity, smoking and over consumption of alcohol are all factors, with those from disadvantaged groups being most affected. Furthermore, as the population ages, so we will find that non- communicable Diseases (NCDs) such as arthritis, cancer and Alzheimer's disease will also increase. Bearing this in mind, what we do know is that many of these health factors and NCDs are preventable and that with careful design, decision making and planning, the problems can be lessened. For example, Cooper, Boyko and Cooper (2011) detail the relationship between NCDs, lifestyle and design of the urban environment and argue that thoughtful, holistic design can help to reduce NCDs. A practical example can be seen in the Health on the High Street project, which recognises the High Street's role in promoting public health in the community. Produced by the Royal Society for Public Health (2015, 1) they argue:

> a healthy high street environment is one in which there is clean air, less noise, more connected neighbourhoods, things to see and do, and a place where people feel relaxed. The architecture of the high street would foster active urban design principles including pavements, seating, shade and shelter. Above all the high street would provide a safe environment where the public don't live in fear of crime, violence, harassment, or accidents.

This points toward a symbiotic relationship between the built environment and health. Intrinsic to this interdependency is also the connection between cities and healthcare provision factors such as: access to services, range of facilities available and the demand upon them. Furthermore, the foreseeable implications of additional factors such as an ageing population (Champion, 2014), rising levels of obesity and potential pandemics on national public health are part of ongoing research by the Academy of Medical Sciences via their Health of the Public project[1] whilst the wider, global situation and the effects of climate change and their potential impact on health are the focus of various organisations' initiatives and research including The Global Climate and Health Alliance[2]. Current futures for public health and healthcare provision range from collaborative and people-led healthcare initiatives with greater focus on user control[3], to wearable and ingestible healthcare technologies, many of which will be driven by data[4].

However, in order to identify which trajectories are likely to evolve and also understand alternative directions and emerging factors, this paper draws upon a workshop held at the Academy of Medical Sciences in September 2015. The invited participants are all experts in various sectors of health and healthcare provision in the UK. An appendix of the list of participants is provided at the end of this paper. The workshop was specifically designed to guide participants through a series of exercises through which they could explore what the current, near future and far future trends in health and healthcare provision could be for cities. The following sections of the paper describe these exercises and their findings.

[1] www.acmedsci.ac.uk/policy/ policy-projects/health-of-the-public-in-2040/
[2] www.climateandhealthalliance.org/ipcc
[3] www.topmastersinhealthcare.com/hospital-room/
[4] www.nesta.org.uk/event/data-health-and-me-future-people-powered-healthcare#sthash.cZ0X6tMG.dpuf

1. How has the sector changed in the last 50 years?

We asked the participants to tell us how they understood the healthcare sector had changed over the last fifty years. In order for cumulative knowledge of the situation to be developed we also requested that the participants abided by a simple rule i.e. that once an answer had been given it was not to be repeated by another participant. Their answers related to the four following categories: patient experience, healthcare provision, technology and personnel.

Changes in Patient Experience and Expectation

- People are more easily able to access information on specialised topics giving them more choice.
- People demand more high quality care; also, they are better informed than in previous times, one implication has been that they may trust GPs less.
- Patient participation in health.
- Patients have more choice.
- Not much change in terms of systems but a change in levels of trust (there is less now).

Changing Focus of Healthcare Provision

- Specialisation of services.
- Hospitals are not only for health provision but more 'life' services such as gardens and shops.
- Focussing on the impact on communities of specific diseases such as dementia.
- Enabling people in poor health to live a richer life.
- Personalised therapy, instead of relying on statistics.
- Recognition and treatment for mental health.
- Health care will be increasing challenged by an ageing population and low birth rate.
- Diseases that affect us have changed, for example, the rise of non-communicable diseases, such as obesity, Alzheimer's and cancers.
- Globalisation and corporate invested interest in health.
- Attitude towards long-term conditions – living well with them.

Technology

- Scope and breadth of diagnostic imaging.
- People have more control over their own health through mobile devices.
- Technology is also part of the problem, not only the solution.

Healthcare Personnel

- Understanding how to treat the whole person/process.
- GPs are increasingly honest about their ignorance – what is the role of the GP? GPs using search engines (e.g. Google) to inform diagnoses.
- Rise in medical error.
- Change in required skillset for personalised care.

2. Worst case scenarios for the future of health and healthcare provision in cities

In order to come up with innovative designs for the future, we first needed to consider worst case scenarios. We asked the participants to work in small groups of two or three and to discuss what the worst case scenarios for public health and healthcare provision in cities could be in the future. The rationale for this activity is to draw out the negative aspects of foreseeable developments in order that the subsequent future-focused exercises are able to better concentrate participants toward more constructive themes and concepts.

Increasing Demands on the system

Foremost in the exercise, the participants' answers centred on demand for healthcare and included scenarios related to both causes of increased demand and the effects that this could have upon the healthcare system. Within this broader topic, the ageing population was the most frequently raised area of concern. Two groups suggested, "An ageing population causes a workforce deficit in the NHS and a deficit in taxation, (all of this) coupled with growing demand" while other groups felt that it was likely we could see "increasingly elderly people caring for even more elderly people" and an elderly population who had a poor quality of life. This latter point was echoed by another group who imagined a future wherein, "the system becomes clogged up with the living dead, prolonging life at all costs." Increasing demand on the system in the future was also imagined in other contexts, for example, one group suggested there could be a "massive increase in health and behaviour related long term illnesses" while another outlined a future where the, "obesity crisis could worsen fuelled by aggressive marketing of junk food companies."

Two groups highlighted climate change as a significant factor that could impact on the healthcare system when coupled with "global patterns of migration and the fragility of the supply chain." Whilst climate change was described as having a negative impact on the future, this was not fully developed into more specific difficulties or scenarios linked to the impact on individual health or the infrastructure of the healthcare system. For example, one area relating to resilience and which was not discussed by the participants was the physical impact of climate change on the fabric of the healthcare system. Currently, sixteen hospitals in London are on the Environment Agency's 'At Risk' list (www.theguardian.com/cities/2015/feb/19/thames-barrier-how-safe-london-major-flood-at-risk) despite the long-term planning for flood defences for the capital such as the Thames Estuary 2100 (TE2100) Project. Instead, wider situations likely to be relevant at global scales rather than national ones were raised such as there might be "energy and food source scarcity," "blackouts in hospitals" and one scenario where the "expansion of the Western diet, consumption patterns and food production and the negative impact that this will have on health, CO_2."

In terms of the city itself, only one group mentioned that increasing density could render cities "unliveable." Worst case future scenarios relating to the resilience of the healthcare system were imagined in terms of "global pandemic" and "the failure to crack the problem of anti-microbial resistance." Several groups mentioned these with the general consensus that "we are not prepared" for these scenarios.

Increasing Demand, Increasing Costs

With many scenarios envisaging increased demand for healthcare provision, several groups envisaged scenarios based around financing this demand and how this could ultimately affect healthcare provision. The "NHS runs out of money and staff," "funding shortfalls," and "financing a public system with an ageing population, (it's) difficult to maintain standards or even keep things at the level as now," were futures suggested by three groups. Additional input from other groups further reflected on the nature of funding for public healthcare and how or what could be funded in the future, asking whether "society will be willing to sustain the NHS as costs rise." More specific areas of healthcare provision were also questioned, for example, "evidence based healthcare; can we carry on with that in terms of finance and resources," and lastly that in order to survive, we will have to "challenge the sacred cows of the NHS, like GPs, rural hospitals (as) they cannot survive currently." These concerns are given full rein in two dystopian scenarios where we see "the rise of eugenics." This group imagined a future where, "we only keep certain people alive. Others are killed at the earliest opportunity so they don't drain resources," although; this contrasts with the earlier scenario where people were kept alive at all costs and the "system becomes clogged up with the living dead." The second scenario sees alternative funding models such as "betting shop insurance companies that will take bets on what diseases you will develop and what your age at death will be. This is one way we may finance healthcare," or "incentivised assisted dying after a certain age as a more financially viable option."

Equality of Provision

The effect of increased demand on the healthcare system, in terms of need and funding, also raised a number of concerns for the future in terms of equality of access to provision. Participants imagined a future society where there was, "inequality of health outcomes between rich and poor," a "creation of a health underclass" and, "a two-tier health service based on extreme inequalities between rich and poor," with one future scenario extending this idea further to posit the notion of "organ harvesting for the few and wealthy." Across all the groups, considerable concern was raised about the inability for the healthcare system to be able to provide parity of access to facilities and services across what was perceived as an increasingly uneven landscape of wealth and health distribution within the UK.

Health and the healthcare system

Future trends in healthcare, or the continuation of negative current trends, were also raised as potential future scenarios. For example, two groups emphasised the continuation of a "focus on treatment rather than prevention," and the health service prolonging life but "ignoring quality of life." Other groups discussed the, "expectation that individuals will be responsible for their health (while) social and behavioural aspects are ignored." For example, one social factor that could affect health was attributed to economic demands meaning people work for much longer hours. Ultimately, this was understood to impact upon their health and also prevent them accessing healthcare.

Policy and regulation was another area where the participants saw a continuation of current policies and practices as a worst case scenario for the future. One group highlighted that "increasing regulation kills innovation," while another group added to this idea by suggesting "regulation and bureaucracy strangles innovation but also legitimises the status quo." "Short-termism," "healthcare being used as a political tool" and "policy being dictated by the popular

media," were also seen as something that could negatively impact future scenarios for healthcare.

A final worst case scenario mentioned by three groups was a breakdown in trust or a loss of faith in the healthcare system. One group suggested that public health messages could no longer be believed while another group suggested that there could be a steep "rise in self-diagnosis," presumably as a response to a breakdown in trust. Finally, one group suggested a future scenario that could witness a, "complete collapse in altruism and a steep rise in individualism. These impacts on the number of people signing up to train in the medical profession so there are less doctors and nurses."

Data and technology

Several groups discussed both the rise of data and technology in the healthcare system. In terms of data, one group said, "Data! Too much of it! Who owns it, who controls it and how is it used to control us?" Another group spoke of an "obsession with data and the quantified self (that) stops rational decision making and human judgement." Privacy was also an important area of concern with two groups discussing how data could potentially be used against individuals and imagining a future where, "insurance companies access genetic and behavioural data leading to companies refusing insurance or bringing about different treatment plans based on individual risk."

Technology was also a driver for various worst case future scenarios. One group expressed that technology could lead to less contact between humans if remote services were accessed in the home. Another group imagined that "Artificial Intelligence rises and takes over." More commonly, however, participants displayed a disillusionment with technology in the healthcare systems and imagined the worst case scenarios as being the, "belief in technology as a fix all will continue" and the, "unwarranted dependence on and belief in technology innovation; leading to cost escalation and rationing."

3. Designing the future city of healthcare

We asked the participants to form larger groups around four tables and we asked them to design their ideal future city of health and healthcare provision. We asked them to consider where people would live, work and access healthcare provision. We also asked them to consider how people would move around in their proposed city and what relationships green and blue infrastructures might play. This is how they described their designs:

High Rise High Density City

This group's design was based upon an existing city, which had been augmented and added to. They emphasised it was important to retain the original heritage of the city, and original buildings remained, although these were smaller than those recently built. The new buildings were much higher and the city was very dense in terms of population. The new high-rises were supported by green space on the ground and also up the sides where it was proposed that vertical, urban gardening would take place. This group emphasised that ground space in the city would primarily be used as green space and water space.

In terms of transport and mobility, the city was designed primarily for walking and cycling and the group projected a significant decrease in the use of privately owned cars. They also imagined that there would be an increase in the use of driverless cars and drones as this was envisaged as a way to help deliver health services, to get people to health services or to deliver goods and services. With ground level space being designated as green space, blue space or for walking and cycling, the group also envisaged that underground space would be used for

travel, such as high-speed rail, and also for storage. To promote healthy activities such as walking and cycling, they felt that the city would need "enabling infrastructure" such as showers, lockers and bikes. This would also help people to use the green and blue space more, and for these activities to fit more seamlessly into people's everyday routines.

The provision of healthcare in the city was envisaged to consist of two large hospitals providing different specialist care; one would provide acute care, whilst the other would provide care for chronic conditions. The two hospitals would be supported by a structure of de-centralised services in pharmacies, such as those on the high-street. This group imagined a connected city and referred to the Internet of Things. They said there would be, "sensors everywhere that allows for more flexible health provisioning." With the urban landscape being primarily dedicated to green and blue space for the use of citizens, other significant elements of the future city including large-scale farms and manufacturing facilities would exist beyond the city limits. This group imagined that energy would come from a mix of renewable resources: heavily driven by solar energy but there would also be some from bio-fuels and wind power. This city was designed as a large, high-density city. In terms of scale, it was proposed that the city centre area would be walked across in approximately an hour.

Low Rise Urban Villages

By contrast to the previous example, this group's design was conceived to be a medium density city of approximately 500,000 people. This group explained that the city would be formed of a string of urban villages as they believed that it was important for residents to feel part of a community. They envisaged ribbons of interconnecting green space throughout the city, so that people would feel there was more of it and "not just big lumps of it like the royal parks." This city

was not high-rise; rather, they imagined a city of horizontal density, much like the current practice of turning large Victorian terraces into multiple flats and with shared gardens in the middle.

In terms of healthcare there would be an acute treatment centre, but other health related treatments and needs would be localised. For example, there would be what they described as, “mixed community assets” such as mixed-use buildings to include health facilities, education and housing. In this scenario, the elderly would live in warden maintained type facilities in the centre of communities. The role of ICT and technology was understood to be enabling infrastructures that would bind the elements and services of the city and connect it all together.

Back to Basics Approach

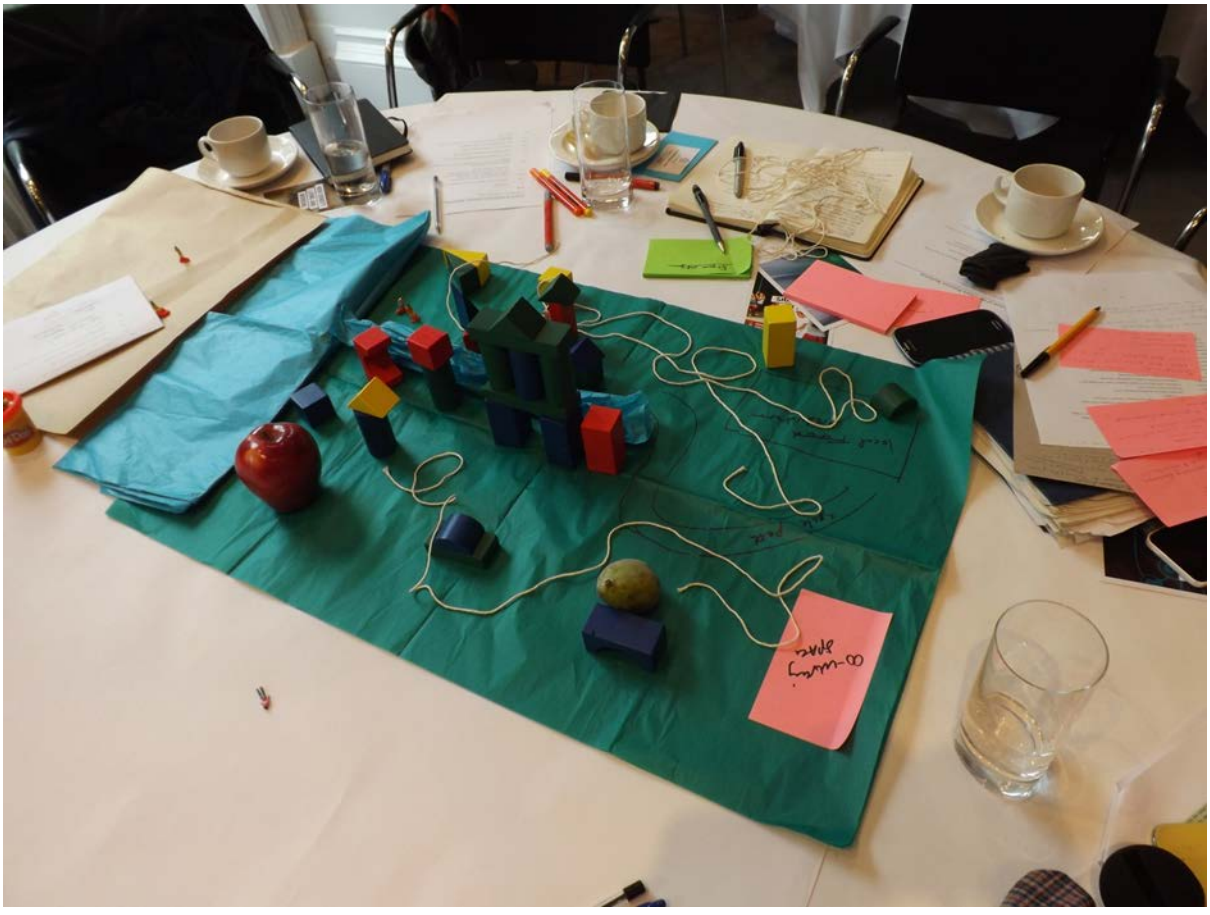
In a similar manner to the second proposed future city, this group also imagined the city as a series of small urban developments or villages. They envisaged its connections as ribbons, rather than large, expansive zones. This group explained that their city was expressly designed around the basics of life: shelter, social interaction with local food and healthcare access. The primary concern for their future city was housing. The group argued strongly for a plurality of tenures and designs so that housing could be more adaptable and flexible for the evolving needs of residents over time. They emphasised that as a society, we must move away from owner occupation and that employment should be linked to living accommodation. However, they also stressed that in the future remote working was likely to increase so where a person lives and where they worked would likely be the same.

Beyond housing and working, the group also highlighted the importance of access to local, affordable food, rather than driving to out-of-town supermarkets. They further imagined that home shopping and home delivery would increasingly become the norm and that this would open up opportunities for smaller, independent local shops to flourish. Eventually, they believed that you would no longer have to go to the supermarket. In terms of healthcare provision, this group felt that remote care or connected care would become the norm for everybody. They suggested that visits to the doctor and the hospital would diminish over time and that GPs would no longer be needed as the population used consumer based apps for self-diagnosis.

The health infrastructure that did exist would consist of local, multi-functional health centres where some treatments could be carried out and where wellbeing services and information, sports facilities, health education and good, cheap local food were also provided. They also envisaged a hospital, but said that it would be smaller than many contemporary facilities.

In terms or mobility and transport, this city was designed to be a place where walking and cycling took place and where public transport would be cheap and affordable. This group wanted to encourage engagement between people and a sense of community. They felt the best way to do this was by providing an environment which would incentivise people to walk around more, building neighbourhood facilities, like plazas with fountains and information kiosks etc, which would encourage people to engage with each other more.

Garden City without the Sprawl



This group designed a garden city from first principles since they wanted to design a health-promoting environment for residents from birth onwards, learning from the development of

previous garden cities. This city comprised of high-density, multi-functional housing, but also had less dense areas within its scheme. As befitting a garden city, urban gardening would be encouraged and the need for allotments was included in the design along with man-made water features, such as canals.

This group wanted the city to look appealing, trendy and welcoming. It would be easy to navigate around and they imagined there would be cycle paths and lots of walking: it would be a safe place for people to use roller blades or skateboards. Valuable ground space in the city would not be wasted on surface car parks, since cars would be parked underground, giving priority to other amenities including green and blue infrastructures and recreational facilities.

In terms of healthcare provision, this group imagined primarily remote healthcare but with automated transport for patients, possibly using drones or driverless cars, to take them to appointments if required. Social care was imagined in multi-functional buildings. One aspect in particular that this group focused upon was the lack of children and children's facilities in the centre of many UK cities. In this city, they wanted children and young people's services available in the centre of the city. For example, there would be childcare and schools so that people don't need to travel so far to them.

Equality was an important issue and this group suggested that there needed to be some degree of homogeneity in the built environment (housing) so people do not feel unequal and to reduce health inequalities. In terms of scale, the group imagined it would take one hour to walk across the city and that all the residents would be able to reach everything they need by walking. They imagined a city centre where there were no cars, where things were going on around it, and the city was interlinked digitally.

4. Policy Design

Our final exercise of the workshop was to ask the groups to design policies that would move us towards the realisation of the future city designs they had proposed in the previous activity. In this task, the groups were asked to devise a 'big idea' and to decide who would be involved and what would change as a result. As a means to develop tangible connections with current cities and the contemporary policy landscape in the UK, we also asked the participants to tell us what they would 'amplify', 'create' or 'destroy' in order to bring about their policy initiative.

Housing and Urban Development Planning

This group designed policy for housing and urban planning; in particular, this relates to a set of incentives and penalties for new developments such as housing, businesses and shops and is based upon their contribution to the health economy. For example, the group proposed that penalties would be levied for developments that have a negative impact upon health including fast food restaurants and developments that do not include any green space. By contrast, incentives would be created for developments that include green spaces or where health activities are designed in, such as a community gym. Another example would be requirements for employers to take more responsibility for the health of their employees. Any penalties levied would then be used as funding for healthcare and health infrastructure. Central to this initiative, would be information for health promotion, and sharing of this information more easily. One example used to illustrate this was an idea was for an app that helps people to navigate shorter walking routes between tube stations.

Stakeholders involved in this policy would be city governments to implement initiatives based upon legislation driven by government departments, such as BIS, DCLG, DH and the Cabinet Office. Private businesses, developers and other enterprises would also be involved, especially in respect of the group's commitment to innovation to address local problems and find solutions. They suggested a series of local challenges and competitions similar to that of the Barcelona Open Challenge[5] and the Philadelphia FastFWD Program[6] where local businesses and entrepreneurs have driven innovative solutions.

Stimulating the Public Sector

The second group explored the potential development of a holistic and interconnected policy for education, housing, health, planning and transport. In order to implement this, they wanted to stimulate the public sector and public leadership and to encourage "locally driven centralised planning." This group described their overarching concept around doing things for the public good. This was to be developed through a proposed new government ministry – the Ministry of Public Good. The formation and development of this ministry and its various strategic initiatives was intended to be a parallel process, running alongside the cutting back of, or completely destroying, private interests and private funding. In a similar manner to the other groups, they also wanted to destroy short-termism in exchange for a longer-term vision, and to remove government funding silos and private finance.

[5] (http://bcnopenchallenge.org/)
[6] (http://fast-fwd.org/)

Readily Available Resources

The third group's policy design discussion was concerned with the creation and enabling of decision making at the right level with access to the right resources to enable delivery. Of greatest importance to this proposal, this group wanted to destroy ring-fenced government funding silos, short-termism, inspections and private finance. Wherever possible, they wanted to remove the differentials between local, regional and national governance. Overall, the group emphasised the importance of a new joined-up system of governance and funding.

This is predicated on a wider concept of creating a new way of doing things, where there is enhanced local democracy, diagonal accounting and where success is measured in terms of overall wellbeing. The group advocated the need for agility, i.e. for things to be able to be done quicker and faster, and for decisions to be made locally. Finally, they would seek to end what they termed the "health market" in order to release funds more readily.

Transport for Health

The final group presented an argument for a specific transport policy related directly to improving the health of city dwellers. They reasoned that the current transport system does nothing to stimulate health and its users are not encouraged to move around. Added to that, journeys are often inefficient, for example many people struggle to access healthcare due to difficulties with the transport system. As such, they proposed a radical policy to enable total revision of the transport system by pricing cars out of the city centre, limiting road miles driven to stimulate public transport, and developing an automated and personalised transport system coupled with environmentally friendly public transport that is low carbon and produces low emissions.

Involved in this policy would be the Department for Transport, private transport providers, and local authorities and local citizens so that their needs can be mapped to understand the requirements of the new system. The policy would require extensive mapping and surveying of the current system to remove redundant or inefficient sectors. Some health centres, hospitals and other healthcare institutions would be re-sited to make them easier to reach by public transport.

Conclusion

In this paper we have collected the findings of a bespoke workshop, which engaged with experts in health and healthcare provision in the UK. This has been done to better understand what the current, near future and far future trends in healthcare provision could be for cities. Whilst it is evident that the future of health and healthcare provision is complex, there are a number of points to be synthesised from the material generated during the workshop.

In the first instance we consider the future city designs. A common characteristic in all the designs proposed was in relation to green space: both through increasing the quality of it and enabling access to it for city residents. In several of the groups the green space was envisioned as ribbons, providing ecosystem services in tandem with the health benefits of being in the space. Rather than pockets or enclosed areas of green space, one of the primary motivations behind implementing ribbons of it was to facilitate access for a greater number of the city's population and also as a way to connect neighbourhoods and communities. This is a key point since access to green space, public parks and recreational facilities has been shown to reduce levels of obesity and other long-term conditions, such as heart disease and cancer, as well as promoting wellbeing and mental capital (Cooper et al., 2008).

As part of a holistic strategy to provide a healthy city, several of the designs referred to high quality public spaces and the urban realm. Intrinsic to this were integrated modes of moving around the city including walking, cycling and public transport to make living in the city a high quality and healthy experience. Two of the future city designs focused on urban villages rather than city zones, with a view to exploring alternatives to large, homogenous cities.

The relationship with technology appeared more complicated. Whilst a narrative of technology to enable efficiency was included in some of the future city designs since it was perceived to connect people and elements of the built environment, services etc., this conflicts with the worst case scenarios involving technology drawn out in the earlier exercise, which described technological determinism and an over-reliance on data to find solutions. Evident omissions in the future city designs developed were in relation to climate change and energy production. The former, which had been identified as having potential impact on health and healthcare provision, was not returned to as a theme and as a result there was no discussion of resilience in healthcare in cities.

Secondly, we considered the implications for policy design for the healthcare provision of cities of the future. A universal factor across all the groups was the joined-up nature of policy to enable it to interconnect the fundamentals of living i.e. health, housing, transport and employment. At its core, this policy is concerned with local autonomy and working out whether a place has the capacity and capability to deliver, along with long term assessment of it against health agendas and making policy for the long term; it rests upon local accountability for the community. An important area discussed was housing, and making sure the right sort of healthy housing was being built in the right places. The groups questioned ideas around who owned land in cities i.e. whether it is government or privately owned, or owned by the community, and how this can be released for housing to be built. This suggests that the compartmentalisation of current mechanisms and lack of agility and power at a local level inhibits potential long-term advantages for health and healthcare provision in cities. As such the role of future visions and policy design interventions may enable a more comprehensive and integrative understanding and response to the ongoing issues concerning health and health provision in cities.

References

Champion, T. (2014) *People in Cities: the numbers.* London: BIS Foresight Paper, Future of Cities.

Cooper R., Boyko, C. and Codinhoto, R. (2008) *The Effect of the Physical Environment on Mental Wellbeing*. London: BIS Foresight Paper, Mental Capital and Wellbeing.

Cooper, R., Boyko, C. and Cooper, C. (2011) Design for Health: The Relationship Between Design and Noncommunicable Diseases*, Journal of Health Communication*, 16:sup2, pp. 134-157.

Royal Society for Public Health (2015) *Health on the High Street*. London: Royal Society for Public Health.

Thomas, E., Serwicka, I., and Swinney, P. (2015) *Urban Demographics: Why people live where they do*. London: Centre for Cities.

Urry J, Birtchnell T., Caletrio J. and Pollastri, S. (2014) *Living in the City*. London: BIS Foresight Paper, Future of Cities.

WHO (2007) *Our cities, our health, our future: Acting on social determinants for health equity in urban settings*. Report to the WHO Commission on Social Determinants of Health from the Knowledge Network on Urban Settings. Kobe: WHO Press.

WHO (2010) *Hidden Cities: unmasking and overcoming health inequities in urban settings*. Geneva: WHO Press.

Appendix: List of Participants

Nike Arowobusoye	Public Health England
James Barlow	Professor of Technology and Innovation Management, Imperial College
Tony Barnett	Professor Social Sciences of Infectious Diseases, London School of Hygiene and Tropical Medicine
Richard Beale	Professor of intensive care medicine and consultant, Guy's and St Thomas'
Jo Bibby	Director of Strategy and Innovation, Health Foundation
Alison Black	Professor, Reading University
Victoria Charlton	Academy of Medical Sciences
Ricardo Codinhoto	Senior Lecturer, Department of Architecture and Design, University of Bath
Shaun Danielli	NHS England
Jessie Eerens	Learning technology, Imperial College
Kirsty Ewing	Viadynamics
Tim Jones	Executive Director of Delivery, University Hospitals Birmingham
Mark Limmer	Lecturer in Public Health, Lancaster University
Cecilia Mascolo	Professor of Mobile Systems, Cambridge University
Takashi Matsuura	Director, Kyoto University European Centre, London Office
Mirco Musolesi	Reader in Data Science, University College London
Jeremy Myerson	Helen Hamlyn Chair of Design, The Helen Hamlyn Centre for Design, Royal College of Art
Duane Passman	Director of 3Ts, Brighton & Sussex University Hospitals NHS Trust
Dianne Rekow	Executive Dean of the Dental Institute, King’s College London
Marc Samson	Director SALUS Global Knowledge Exchange
Tom Symons	Policy and Research team, Nesta
Emmanuel Tsekleves	Senior Lecturer in Design Interactions, Lancaster University
Rob Turpin	Market Development Manager – Healthcare, BSI Standards

This publication available from www.gov.uk/go-science

Contacts us if you have any enquiries about this publication, including requests for alternative formats, at:

Government Office for Science
1 Victoria Street
London SW1H 0ET
Tel: 020 7215 5000
Email: contact@go-science.gsi.gov.uk

GS/16/15