



**FORESIGHT**

Tackling Obesities:  
Future Choices –  
Future Trends in Technology  
& Their Impact on Obesity

**Government Office for Science**

# *Foresight*

## Tackling Obesities: Future Choices – Future trends in technology and their impact on Obesity

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The purpose of this report is to explore the future impact of new technologies on obesity, health and maintenance of energy balance over the next 20 years in the context of the project's systems modelling and scenarios, by:

- identifying future opportunities where new technologies could help manage health and weight/energy balance more successfully
- analysing the future impact of new technologies on lifestyle, dietary habits, and activity levels – both positive and negative (e.g. increased inactivity due to labour-saving devices)
- exploring how different parts of society may adopt/reject these solutions.

The scope of this report does not include pharmacology, genetics, or food science as such, but instead looks at the surrounding societal technologies, particularly those concerned with information and communications technology (ICT) and the built environment.

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# Overview

‘For all bar a few hermits, our lifestyles are constructed within social parameters. What we consume and how active we are is governed by influences from our families, communities, schools and workplaces, from the Government and the media and from messages and products of the many companies selling us products.’

## Trends and drivers of obesity, foresight tackling obesities project

The Foresight Tackling Obesities: Future Choices project is interested in aspects of technology use over the next 20 years that will have population-wide effects on our lifestyles and which might influence what we eat and how active we are. Freezers, microwave ovens, cars, television and computer games are examples of technologies that we can see have had such effects in recent decades and indicate the scale of the effects that we are interested in.

As the project research reviews show, we now live in an ‘obesogenic’ environment, created by a complex interaction between technology and social parameters that has led to our current obesity crisis. It’s not possible, however, to infer a direct relationship between obesity and any one technology because patterns of use are so bound up with social parameters and with lifestyle that teasing out the part played by the technology itself is extremely difficult. Similarly, looking ahead, while there are many ways that technology will interact with the broader environment of nutrition and health, we can’t pinpoint any developments that will clearly drive us towards particular outcomes. Overall, however, we reach three broad conclusions:

- 1 Within the scope of this report, which is not considering direct pharmacological, surgical or food science interventions, there is no technology ‘fix’ (at least in the foreseeable future) that is going to solve the obesity problem.
- 2 As we have seen in the past, technology use is conditioned by society and we foresee radically different outcomes, depending on the individual and societal values that prevail. For example, for people who want to be healthier and who want to change their lifestyle, technology will make it easier as measurement and feedback systems become more refined and personalised. These systems can be linked into a wide range of lifestyle support services through community, public and private providers. However, for those who don’t want to tackle their weight, or don’t see it as an issue, there is no technology development that will overcome the broader societal drivers of the obesogenic environment. Technology will create new options – for some, it will form part of their efforts to make effective changes to their lifestyle; for others, it will play a part in temporary fixes that fail in the long term.



- 3 Generally speaking, the advancement of technology has tended to engineer physical effort out of the environment, both on the broad scale, with, for example, fewer manual jobs and a built environment that decreases the need to walk; and, at the household scale, more home appliances and increased internet use for shopping. There is no reason to suppose that the direction of this trend will change in response to new technologies. However, the design of the urban environment offers significant opportunities simultaneously to pursue goals of environmental sustainability and healthy lifestyle. The technologies of lifestyle support can interact positively with such initiatives.

This report has three parts. In the first, we describe the three time horizons in which we have framed the diffusion of technologies into society over the next 20 years. In the second, a technology overview, we describe the major dimensions of technology that we consider will emerge into mainstream use. Concept scenarios form the last part of the report, in which we illustrate how these technologies might have an impact by putting them in the context of imagined individuals to see how these individuals might be approaching issues of activity and nutrition in the future.

This review complements the [Tackling Obesities: Future Choices - Visualising the Future: Scenarios to 2050<sup>34</sup> report](#) in which the impact of technology is brought together with all the other factors that will shape future outcomes. In this report therefore we are looking at technologies that have the potential for going mainstream in society, but leaving to the scenarios the analysis of population-level effects on obesity.

# Three horizons

The Foresight Tackling Obesities: Future Choices Project is interested in aspects of technology use that will have population-wide effects over the next 20 years. The rate at which new uses of technology are adopted is therefore key. Even the most dramatically successful technologies take a decade or more to become widely used and to have mainstream societal effects. This analysis therefore uses a three-horizon approach in which to frame considerations of which technologies might have widespread effects.

## Horizon 1

This is concerned with the coming decade. In this period, we are interested in the effects of developments in technology that have already emerged and are becoming increasingly pervasive in society. For example, mobile phones are now available to anyone, young or old, potentially providing an 'always on' connection to the world wide web. Many organisations in the public and private sectors are now exploring their use as an application platform for tele-medicine. If successful, these applications could easily move into pervasive use in the next decade.

## Horizon 2

This looks at the second decade and how developments that are already visible will play out. For this period, we can look at two things: (a) Horizon 1 technologies as a second generation of applications embed them further into society; and (b) early experimental applications of maturing technologies. The latter will be ideas that may or may not turn out in ways we expect, but in any case will take a decade to reach the status of mainstream societal technologies. For example, might innovative personal transport products, some designed for the disabled, result in healthy people using even less energy to move around, thus working in the opposite direction to urban design approaches that promote walking? The Segway (a self-balancing human transporter invented by Dean Kamen) might have had this effect if it had fulfilled its inventor's expectations.

## Horizon 3

In this horizon, looking beyond the main focus of the Foresight project, we include more speculative areas of science and technology. While these may turn out to be important in the long term, we judge them unlikely to have made a major societal impact in the 20-year period except as 'wild cards'. Typically, neither the science nor the technology is fully established yet, making future prospects radically uncertain. Some of the more ambitious claims made for nanotechnology fall into this category.



The use of technology varies widely across generations – what will be mainstream for the next generation of children who will never remember the first time they used a computer or a mobile phone might still not be widely used by an older cohort or those displaced from another culture. The analysis here will be biased towards identifying applications of technology that are likely to be carried into mainstream use by current and future generations. We must therefore recognise that some of these developments might not be harnessed equally effectively during the coming two decades by all sectors of society, and that issues of access and equality may therefore be key to policy making.

The criterion for inclusion of an area of science and technology in this review is that some evidence of it can be found in research and development activities around the world. Some of this evidence will be in peer reviewed literature, but much of it is what in futures work is known as ‘pockets of future in the present’, people pioneering or promoting a technology or application with or without reference to broad societal aims. In Horizon 1 we are mostly concerned with established science and technology unfolding along predictable paths, as we move towards Horizon three these pockets of the future are the main evidence available to us.



## Technology overview

### The ubiquitous Web: a new environment

In the last decade, the World Wide Web has moved into widespread use across all aspects of business and society. The initial period of the web's evolution has been about people using personal computers to connect, first, to services such as email, then, more recently, to devices such as phones, music players, and so on, that use the PC. We are now at the start of a shift to a new era, variously called 'pervasive computing', 'ubiquitous computing', or 'ambient intelligence', built around developments in two areas:

- New web applications will be built by combining and layering other services. Many people are already becoming familiar with this through the idea of 'mashups', in which popular mapping services are used to create new niche applications, such as showing where all the scenes of a film were made. This will lead to another dramatic acceleration in the rate that new web applications appear, and the level of specialisation at which it is economical for them to be produced. With the barriers to creating and combining applications reducing, and the variety increasing, a positive feedback loop will operate, allowing completely new types of application to be introduced that will spread rapidly through society. Looking at how quickly blogging has become a major use of the web for all sorts of different purposes, and how it is now combining with other web technologies such as news feeds, we can see that, in the next 20 years, we're likely to go through many more generations of inventions as society finds new uses for online media. There is a huge potential abundance of applications here, which it will be possible to harness at all levels, from the individual to Government.
- The personal computer, and the notion of computing embodied by it, is losing its central role in the evolution of our global ICT infrastructure. The core computing and communications components are rapidly becoming cheap enough for 'anything' to connect to the web – if it makes sense for my coffee cup or dinner plate to be online, it will be. This is sometimes called the 'internet of things' or 'ambient intelligence'. The core idea is that the web will increasingly function like an 'information utility', delivering computational power and information to all the everyday things around us. We're already familiar with the idea of a simple, specialised device being used for a particular service, through such things as ATMs and the recent popularity of GPS 'sat nav' navigation aids. In the future, anything will be able to access the full power of the web. Building on the availability of web services and mobile communications, it will be possible for applications to be delivered wherever and however they're needed. This is sometimes summarised as the notion that in the future 'the world is the interface'. Again, we can think of this as a new sort of abundance – the ability to endow interactions with the world around us with a growing degree of intelligence and responsiveness.



These two transitions are already well underway and will emerge fully in Horizon 1. There is no accepted single label for this new environment; the title of the 'ubiquitous web' is used here to convey the idea that the web will become a resource throughout our physical environment. It will be all around us. For an example of the research in this area across leading UK institutions, see the Equator Project.<sup>1</sup>

Since much of the problem of obesity has been laid at the door of the 'obesogenic environment', the most important technology trend to recognise is that the foundations of a new merged physical and digital environment will be laid down over the next decade. Choices we make in this coming decade may persist for a very long time. The 'ubiquitous web' is the context for all the analysis that follows.

### **The personal digital environment: wearable technology and connected people**

Until recently, the size and cost of computing technologies has meant that personal electronic gadgets, for example, phones and handheld computers, have tended to bundle together as many functions as possible in order to share expensive components like radio transmitters and receivers. This is changing rapidly as it becomes feasible to apportion single functions to individual devices, such as earphones and music players, and use personal network technologies to link them together as needed. This is our 'personal digital environment', which is already beginning to evolve. If you think about how many things we carry and wear already, from credit cards to watches, and then imagine the computing power that such small things will have in the future, we can see another huge field of innovation opening up.

Underpinning this technology shift is the very rapid development of consumer technologies in smart textiles, sensors and body networks, all coming together in the technology community under the general heading of 'wearable computing'.<sup>2</sup> Smart textiles combine the properties we normally expect of clothing with the ability to embed electronics, so our clothes can be part of an intelligent environment that responds to our activity and gives us information on many different aspects of our bodies. The commercial interests in fashion, entertainment, health and sports are all eagerly exploring these possibilities.<sup>3,4</sup> The evidence of mobile phones and music players suggests that, where there is a clear value, adoption will be widespread and rapid. People will be able to participate in online worlds continuously if they choose. The absorption of people today in their personal entertainment and communication devices suggests that this might significantly change the way people go about their daily lives, with people learning to divide their time between the world in front of them and participation in many online worlds simultaneously. Just as people sometimes text a person sitting next to them, we may find quite new patterns of communication opening up as the virtual world overlays the real one throughout everyday life.

Concerns over privacy, surveillance and security, however, are likely to become even more significant in people's decisions around adoption of these technologies. Individuals could take many different paths through the possibilities this opens up, from eager adoption to total rejection of the 'wired world'. The Foresight project on [Cybertrust and Crime Prevention](#) explored these issues.<sup>5</sup>

### **Personalised lifecare: personal support for health and well-being**

The emergence of personal digital environments is particularly significant for the management of health and well-being. Today, we have very limited ability to deploy personal monitoring and online connectivity technology for medical purposes due to the cost of developing specialised equipment and applications. This barrier will completely disappear, and we will be able to have personal information about our levels of activity, and personal biology available in real time, connected to all sorts of online environments and services. The recent launch by Nike and Apple of sports shoes with sensors that let you see your workout data on your iPod is a harbinger of things to come.

The first steps along this path of using these possibilities for healthcare are underway with the use of mobile phone technology to link people to online monitoring and support services, and there is evidence to suggest that this can lead to improvements in people's involvement in managing their health.<sup>6</sup> Given the problems of non-compliance with treatment regimes even when people are suffering quite specific problems, the possibilities that more active, continuous services might help them could become very significant. The technology opens up ways for patients to be engaged in motivational environments just as they are when they go to the gym, but with a combination of real human help and artificial avatars – see more on this in Online 24/7 below.

The new levels of personal monitoring created by these developments will transform the possibilities for obesity-related research and healthcare. One major problem in obesity research is that of building up accurate information on people's activity levels. People are very poor at judging their level of activity, and current technology solutions generally only record quite gross measures and have difficulty recording energy expenditure connected with specific activities. Sensors embedded in clothing will be able to measure not just overall levels of movement by individual limbs, but will be able to combine this with monitoring a wide range of vital signs.

Research into the other half of the energy equation – input of food – will also benefit hugely from new technology. The development of 'lab on a chip' technologies offers the promise of highly sophisticated monitoring available at low cost that could be particularly significant for driving our understanding of nutrition, energy and weight management. This is particularly so since the current inability to cheaply and accurately measure food intake is a major barrier to obesity



research. Because people are so notoriously unreliable in reporting what they eat, researchers are obliged to supervise the diets of those involved in studies, which limits numbers and makes this sort of research very expensive. We can anticipate that, with focused development, technologies that people can ingest to monitor food intake and internal processes will be possible. In the first instance, we would expect such technology to be used only in a research context, but it could then evolve and reach a wider audience.

The emerging field of nutrigenomics suggests that successful strategies for tackling obesity will vary in significant ways between individuals. The new technology will allow detailed individual-level research to be carried out with significant numbers of people over long periods of time, thus developing the evidence base needed for individualised interventions. We may also be able to use biomarkers to monitor the potential risk of the health consequences of obesity. This new level of research accuracy could be particularly significant in driving our understanding of how nutrition, energy and weight management interact at the individual level. If there is an understanding of the types of intervention that are most likely to be effective, a more sophisticated targeting policy for individuals at risk could be developed. This much more precise level of understanding would also allow the development of better predictors of health risks with regard to weight than body mass index (BMI), which is understood to be a crude measure as far as individuals are concerned.

The technologies for monitoring activity and basic life signs are already going mainstream, driven by sports and healthcare. The prospects for improving healthcare are driving interest in implantable *in vivo* monitoring and intervention devices such as drug delivery. Prototypes are already under investigation for managing conditions such as diabetes and epilepsy and for monitoring patients with chronic cardiac conditions.

Personal healthcare profiles can be built up, allowing individuals to have detailed personalised advice relating to their own particular patterns of activity. As knowledge is gained of the personal factors influencing successful weight management, it will be possible to deliver this back through the same personalised environments. As the devices become cheap and commonplace, health and fitness businesses will be quick to seize on these possibilities, offering deals linking club membership, recreational activities and other promotions to personal monitoring and consultation. A major issue is likely to be that some of these commercial interests will exploit the technologies before all the science is 'ready', subjecting individuals to a confusing barrage of possibilities, not all of which will be evidence-based.<sup>7</sup>

There are many technological challenges in realising the more advanced nutritional monitoring systems possibilities, but we confidently expect that some forms of these will come into widespread clinical use in Horizon 1, and perhaps much wider everyday societal use in Horizon 2.

As we reach Horizon 2, and the technologies of body sensor networks are maturing, the possibilities for personal medical environments will rapidly expand and may drive more medicalised approaches to obesity. In this period, there will be a growing knowledge base of nutrigenomics and brain science that may suggest ways that individuals can manage appetite and response to food in real time through *in vivo* monitoring and direct brain interventions. Such prospects are purely speculative at this point, but, given that such procedures are already the subject of active research in other areas, we should expect that the possibilities will be explored. The readiness of some people to adopt surgical approaches to tackling obesity and the rapidly growing market in cosmetic surgery mean that there may be a surprising uptake of such solutions if they are offered by the commercial medical world.

There are many examples<sup>8-15</sup> of research programmes, networks and commercial activities in this area.

### **Online 24/7: interactive, immersive, affective, addictive**

*'I'm pretty much on the computer 24/7, when one is available ... I take the usual breaks, for sleep and school and other such necessities (and I don't believe that computer use really encroaches or takes away from those activities), but otherwise I'm most always on the computer.'*

US high-school student<sup>16, 17</sup>

Interaction with online environments can be a powerful and compelling experience. This has many different flavours: the use of texting and instant messaging to keep in touch and carry on conversations or checking in to blogs and contributing to them, through to long and deep immersion over many hours in computer games. Television has shown its power to keep people engaged and physically inactive for many hours a week, and the new interactive media are taking this to a new level. For the generation growing up now, the technology is widely available and they are becoming accustomed to using it all the time, often deploying several forms at once.<sup>17</sup> As these technologies become more powerful, mobile and pervasive, new opportunities will be developing all the time that will weave online experiences into the flow of life from dawn 'til dusk. This is a powerful cultural shaping of the environment that's unfolding now and will have spread throughout the younger end of society in Horizon 1 and in segments of the older population as well.

People have a natural tendency to attribute human 'personality' to things. The explicit design of such characteristics is now mainstream in games, interactive media and in the broader field known as 'affective computing', which pays particular attention to the emotional form and content of communication. This approach to making artificial experiences more 'life-like' will bring technology into a rich variety of everyday situations and will vastly expand the ways in which we might find ourselves spending time relating to technology rather than to people.



These new capabilities might also be harnessed to create patient and responsive artificial systems that support us in the complexity and stress of life. For example, there are experiments in creating 'virtual fitness trainers', which help people in their exercise regimes by monitoring their activity level and providing appropriate encouragement.<sup>18</sup> Today, you can get this sort of support by going to a gym where a human trainer will guide an individual or group by providing motivation and feedback through the session. In the future, there may also be digital trainers that share this role when someone is taking exercise alone. There could be very interesting combinations of the human and the artificial as a human advisor helps someone interpret their data, set goals and configure a digital advisor to support them through the day, and perhaps know when to prompt the user to call on human support. Artificial systems of this sort today tend to become very repetitive and irritating after a while, but the research field of affective computing is still quite new, and we can expect significant progress in the coming years. The extent to which this will be useful in health management is at present unknown.

In addition, the same capabilities might reinforce aspects of the obesogenic environment directly or indirectly. There are many interests, commercial and others, that have an interest in influencing our behaviour, and they will be harnessing the new technologies of emotional engagement. As commercial concerns play an ever bigger role in delivering the experiences that make up everyday life for many people, there will be many issues of how 'normal' human responses are being influenced for commercial gain, especially in respect of nutrition. Advertisers will be increasingly sophisticated in the way they harness online environments to put over their messages and will have many more opportunities to do so.<sup>19, 20</sup> The indirect effect comes from the sheer amount of time that some people will devote to being physically inactive while interacting intensely with games, betting or other online environments, which are specifically geared to sustaining the user's involvement.

### **Augmented worlds: online in the real world**

Although more compelling virtual experiences can keep people deeply engaged for longer, the emergence of the ubiquitous web – the blending of physical and online worlds – means that there is no longer a reason that interaction with virtual environments must necessarily keep us physically passive. The same intensity of interaction that keeps people in front of a personal computer can now be experienced in new media that turn the physical world into a digitally enhanced experience. These are location- and context-based media, more generally known as 'augmented reality'. Imagine that as you walk around you can tap into sounds, sights and interactions that relate to where you are, what you're looking at and what you're doing, and which augment your experience of the world around you. This is enabled by using GPS or any other location technology and a personal digital environment that can respond to context and play media. Today, this is being used to provide us with maps and directions on our in-car and handheld devices. In the future, there will be completely new forms of augmented reality experiences.



For example, in a project called Savannah,<sup>21</sup> this has been explored as a tool for learning by allowing children to play at 'being a pride of lions' on a school playing field, which the digital mediascape transformed into a simulated savannah. The children's personal digital environment included a handheld computer, headphones and GPS sensors through which they could receive sights, sounds and imagined 'smells' of other animals, along with features in the environment that together built up an immersive experience as they moved around the field. The children's challenge as 'a pride of lions' was to survive in the savannah while encountering threats (elephants, bush fires and human threats) and challenges (finding food, protecting young). The simulation built on real-world knowledge provided by the BBC Natural History Unit and was made as accurate as possible within the constraints of the technology.

Of particular interest is the way that rich physical interaction could be woven into the interactive experience. Sound, sight and movement created high levels of enthusiasm and engagement, enabling a complex experience to be built up. When the children were running away from an elephant, they were really running, and if they wanted to collaborate they had to move together as one – it wasn't just a matter of moving avatars around on a screen. Physical movement is enjoyable in itself, and initial results of this and similar projects suggest that this blending of a cognitive challenge with physical experience will be very fruitful in enhancing learning. This at least suggests that future educational environments may be able to put physical movement at the heart of many more aspects of learning, thus enhancing activity levels.

Wearable sensors can monitor the wearer as well as the environment and can direct the user's learning towards their own activity and physiology and how they relate to their environment. Sensors monitoring your movement can tell how fast your heart is beating, and how hard you are 'really' working. Another research project in augmented reality games, called 'Ere be Dragons',<sup>22</sup> explored these possibilities. In this game, the player's heart rate plays a role in determining what the player sees, and the world that unfolds depends on how their physical response compares to a target heart rate. This enables the player to build up a game world particular to them, and is used to engage them with learning about their response to exercise. We noted above, in Online 24/7, that we can expect online environments such as games to become even more immersive and compelling in coming years, and we can already see an outline of how these could become a major driver of childhood activity.

These possibilities show that we have a rich set of opportunities opening up in front of us to reinsert physical activity into learning. This can be to augment general learning and can also be directly associated with coaching children in their own daily activity and how it relates to their health, an approach being taken forward by the 'serious games movement'.<sup>23, 24</sup>



## Connected communities and participative media

Podcast, blog, wikimedia ..., the growing lexicon reflects the arrival of a web that is built by all of us in a torrent of sharing and do-it-yourself activity. Each wave of pervasive digital technology drives a significant advance in our ability to create and communicate, as well as to consume, media. The first generation brought us desktop publishing and email. We're now well into the second generation enabled by the web. And we're beginning to experiment with the impact of the third – the ambient web.

What we see in the current generation of the web is that people are finding an ever-growing repertoire of ways to connect conversations together as shared media. At one end of the spectrum, there are well-structured examples like Wikipedia, the free encyclopaedia. At the other end are sites such as Flickr, where people post photos and create all sorts of strange collections of them by assigning them descriptive tags. In between, there is every sort of variation between formality or informality of content, and personal and shared control, as people explore ways to express themselves and share their interests.

All major media organisations are now moving to embrace this trend, and are looking for ways to put their own professionally produced content into a much bigger user-created conversation. In the UK, the BBC is playing a major role in this trend with many parts of its website now involving the public in contributing, commenting on, and re-using content. Time spent interacting online with friends and communities of interest is now a major part of daily life for many people, and for some it's already more important than using traditional and 'official' channels of information flow, such as television news or newspapers.

This trend will create many new resources and approaches for engaging people in managing their own health and well-being through the use of resources that are matched to their own interests and the communities they engage with. Many people already invest significant time in acquiring information from the web about their own medical condition. This is set to continue and will be continually amplified by the combined effects of participatory communities and the growth in personalisation of the web. While this creates major opportunities in the management of public health, it may also mean that people become much more reliant on communities that lie completely outside the 'official' channels. Their lifestyles with regard to health-related activity and consumption may therefore be governed even more strongly, for good or ill, by many competing interests.

Continuing innovation in the technology of interactive media means that we should expect new forms of communication to keep appearing in the coming years – the young are particularly quick to adopt new communication types. Communication programmes aiming to get public messages across will therefore have to keep evolving and adapting to the changes.



The UK Design Council's recent Open Health reports illustrate many of these possibilities with concepts such as 'ActiveMobs', which support community initiatives to promote active lifestyles.<sup>25</sup>

### **The networked home: food and health environment**

Our kitchens are already full of gadgets, and appliance manufacturers are looking for new ways to harness digital technologies and create smarter, more interactive products. The fridge, freezer and microwave play a key part in the convenience food chain that's so central to much of our food culture. To date, research on smarter appliances has been concerned with such things as appliances that know what they are cooking, or fridges that can tell you how long food has been in them, and so on, and hasn't yet resulted in any major new innovation. Similarly, a few years ago the early market experiments in 'internet appliances' that offered stripped-down web-browsing computers for the kitchen didn't take off.

However, the home technology environment will be evolving significantly during the current decade as two trends begin to intersect. On one hand, our need for home computing and entertainment equipment is rapidly filling our homes with fully networked media appliances that will allow access to all sorts of media all over the home and which treat the web as a utility for all types of content. On the other hand, more pragmatic drivers such as device control, energy management and online maintenance will all play a role in increasing the networking of many other household appliances. The technologies and standards across these two worlds are still changing and haven't yet all come into play, but it's reasonable to expect that in the coming decade the fully networked home will be a reality for many people. As ever, the adoption of common interface standards and platforms is what will unlock innovation and allow the emergence of successful new appliances and applications throughout the home. In particular, we can expect digital technology and online media to become part of the everyday kitchen and bathroom environment.

There is no obvious new equivalent of the freezer and microwave combination waiting in the wings to drive a major change in our food habits, but we will be able to link the home environment fully into the trends explored above in personal health management and online media. The monitoring and control of food preparation and intake in the kitchen and personal health monitoring in the bathroom will both form part of the revolution in online healthcare driven simultaneously by consumer, commercial and public interests.<sup>26-29</sup>

### **The urban environment and transport**

The general trend of technology in society has been, and is likely to be, to engineer physical effort out of our everyday environment. This means that we must choose to exercise for leisure and health rather than physical activity being



an inevitable by-product of our daily routine. While we can consider the possibilities of dramatic changes that lead to a lack of fuel for these labour-saving devices, such possibilities belong outside this forward look. No technology wild card has emerged in the preparation of this forward look that reverses this overall trend or acts as a 'technology fix' to overcome it. However, urban design and transport are different because there are strong drivers for change already operating in these areas that interact with the obesogenic environment.

There is a growing recognition that current patterns of transport growth are not sustainable because of a wide range of environmental and social impacts. Over many decades, we've allowed our built environment to be shaped by car use to an unsustainable degree, and one of the responses that is gaining momentum is to recover approaches to urban design that promote pedestrian and bike transport in combination with new possibilities for personal rapid transit systems. While these are, of course, long term in their impact and by no means a solution to the obesity problem, they would at least be working in the right direction and would offer possibilities for some joined-up policy. There is a strong convergence of interests here between environmental sustainability and means of enhancing activity levels in people's daily lives. These issues have been covered extensively from the perspective of transport in the Foresight [Intelligent Infrastructure Systems](#) project.<sup>30</sup> A detailed study of how the design of the environment can support activity has been carried out by Sport England and shows that there are many ways to promote daily activity and participation in sports, which they bring together under the heading of ['Active Design'](#).<sup>31</sup>

While the technology drivers we have explored in previous sections are largely independent of the design of the built environment, there are possibilities for strong and positive relationships between the two. Active design will generally bring together many community-oriented facilities such as schools, sports and healthcare, into cultural hubs with high levels of accessibility to shops and workplaces. This may mean that it will become much easier for people, if they wish, to become engaged with active programmes that support them in pursuing healthy and active lifestyles. The concepts outlined above for monitoring, feedback and support can all fit in with, enhance and extend these possibilities.

Potentially working in the opposite direction, however, is the possibility that we might see a completely new generation of personal transport. A few years ago, the [Segway](#)<sup>32</sup> technology was introduced with much fanfare and expectations that it would lead to a reshaping of the urban environment. This didn't happen. Meanwhile, personal electric vehicles have quietly been developed, principally to serve the needs of the elderly and infirm. There is no particular reason why, as these develop, especially under the pressure for more sustainable forms of urban transport and if they are given mass market design values and performance characteristics, widespread adoption by the young and well won't occur. Some manufacturers are already developing such concepts.<sup>33</sup> Perversely, the very

changes that we might undertake to make the urban environment suitable for pedestrian and bike use, together with actions to make the existing environment suitable for the disabled, will create the conditions for just such a new cross-over category to emerge. During the two-horizon period, we should be prepared for this possibility, with the consequent downward impact on individual activity levels.

### Wild cards

As noted in the introduction, this overview is concerned mainly with developments that could take known or emerging science and technology into mainstream application over the earlier decades of the project time horizon. We referred to developments beyond this as 'third horizon', where the science and technology is less established and the outlook is therefore more speculative. Given that several of these areas are advancing very rapidly we might see several 'wild cards' coming from these possibilities. For example, consider the following becoming strong trends:

- Wearable and embeddable technology takes off, accelerated by broad progress in nano-technology, enabling real time, closed loop monitoring of bio-signs and controlled drug delivery
- Nutri-genomics creates strong individual models of relationship between energy, activity and weight management systems
- Rapid progress is made in brain mapping, and understanding how motivation and behaviour 'works'
- Rapid uptake of cognitive technologies that interface directly to neural systems, driven by need to provide neural interfaces to prostheses for disabled, and treatments for cognitive impairments
- Broad uptake of tele-medicine for a wide variety of chronic conditions, resulting in intense and rapid progress in systems for online monitoring and control linked to highly individualized therapies.

If these are seen as mutually reinforcing, then many of the trends already explored in this overview could go much further, much faster, and create quite new and unfamiliar 'Horizon 3' relationships between people, technology, and our notions of choice and treatment.

## Concept scenarios

In this section, we set out a range of concepts to illustrate the uses of emerging technology. Given the complexity of the issue, and that there is as yet no overall ‘solution’, we have tried to put the technologies into some plausible story of surrounding attitudes and approaches to health, activity and weight management without taking any particular position on whether these will actually be successful in a particular instance. Where we do envisage outcomes, this rests only lightly on conventional wisdom – if we are more active and manage our diets sensibly, we can also manage our weight. These examples are intended to make the potential of technology visible while leaving it to the rest of the project to consider actual obesity outcomes. In particular, the project scenarios are used to explore how technology will combine with all the other societal factors to influence community and population-level outcomes.

In developing these concepts, we have used the Obesity Scenario axes from the [Tackling Obesities: Future Choices - Visualising the Future: Scenarios to 2050<sup>34</sup>](#) report to create a design space in which different values are dominant and influence the main way technology is used. However, the mapping of these onto the project scenarios is only loose – they were used as an inspiration rather than a constraint.

The concepts are organised around three imagined individuals and how they live in 2020 in the four worlds derived from the scenarios.

### The young mum

Chantelle is 27 and has two children, Red (7) and Danny (5). She was brought up on a housing estate in north-west London and, because Danny is autistic, she obtained local authority housing. She hated school and left without any qualifications. She met Red’s dad through myface.com and when she got pregnant, he left. She doesn’t see much of Danny’s dad either. She’s glad to have got away from her mum, although she misses her company. She does some cleaning part-time but would really like a job looking after children and is studying for a childcare qualification online. Chantelle comes from a family who are all, in her words, ‘big boned’ and struggles with her weight, especially since she had Danny.

### The successful businessman

Rohit Prakash is 40. A successful entrepreneur, he made his first fortune from an online gaming business. Now he has a thriving business in memory shape fabrics, sold principally to sports outlets. He lives in a house – filled with every conceivable gadget – in the Midlands, along with his wife, Shalra, their teenage children – Imran, 17, and Parveen, 15 – and his mother, who came to Britain in the 1980s from India. Imran is following in his dad’s footsteps, and is already making money

selling branded avatars online. The family are sports mad. Rohit used to be a keen cricketer but knows his fitness level is slipping with all the socialising the family does. His kids take the mickey out of him all the time because of his pot belly. He has a strong family history of diabetes.

### The retired woman

Annie is 58 and lives alone in Wonford, Devon. She's a retired accounts clerk. Her children live many miles away and she is recently widowed. She has a small works pension. She has many interests, including ballroom dancing – she and her late husband Jim were regional champions – but dancing was the first thing to go when she developed arthritis in her hips and knees in her early 50s. She had to retire early because of it. Her socialising would be very restricted if not for her car, which she now depends on to get about. Ever since her arthritis got bad, Annie has watched the weight pile on.

### Scenario 1

This is a world of individual abundance. It's a highly competitive, market-based world, where individuals focus on maximising long-term personal benefit. The consumer is powerful and vocal and companies that succeed are those that adapt in response to consumer demand. Corporate success is most likely to be achieved through maximisation of factors other than the profit motive, whether it is flexibility to change or sustainability.

### Chantelle







Red and Danny are jumping up and down as the First Foods delivery arrives. They've earned enough points to get a new game. Chantelle could have gone with Supreme or Fresh Choice, but First Foods offers lots of extras for the kids like games, on top of the standard family health packages. She'd signed up with them for a Family Health First deal when Danny was born. 'When they set it up, it was so neat – they just swiped my loyalty card once and instantly knew we all hated avocados.' Every Monday, a set of ready meals arrives. 'They sort everything. For breakfast, lunch and dinner, there's a meal for each of us. All I have to do is pop them in the microwave.' The boxes are individually prepared and labelled – no nuts for Red – he's allergic to them. Danny's are supplemented with Omega 3 and other essential fatty acids to help his autism, and, of course, no avocados. Every year, the boys get new motion monitors from the store, which means they can sign up to the location-based *Games Club* aired every day after school on the First Foods interactive digital TV channel. The games link up home and store, and have different levels that can only be passed if the kids have done enough vigorous activity. The longer they play, and the more they exercise, the more points they earn for sweets and treats like ice cream. 'But only so many, mind. I set the points limit quite low, unlike some other parents I could tell you about,' says Chantelle.

Chantelle does her bit to earn points by joining in the routines that First Foods create for her, but her efforts are a bit half-hearted. She can't resist snacking when she's out. There's a huge choice. But what does it matter about her so long as her boys are healthy? 'I can't help the shape I am, can I?' she sighs.

She sometimes still goes to the First Foods store nearby just to check it out. The aisles are colour-coded, you have to really search for the high-fat and high-sugar items and at the checkouts are loads of little fun snack items for kids – like dinobabies – which are tofu shapes with top trump cards in the back. Danny earned these through getting extra points on his First Foods motion monitor. And there's a place for kids to play where they put on special activity jackets and jump around to earn even more points.

First Foods were going to take away the activity corners and slash the activity points reward scheme, but Chantelle and a group of other mums picketed the store and sent hundreds of emails and texts to First Foods. Their slogan was 'health before profits'. First Foods caved in quite quickly when they saw that the group, Activ8, was serious. They were thinking of tackling Supreme next.

## Rohit



Rohit is peering into the mirror. Bad news. His LDL cholesterol is up again. Never mind, his health provider is onto it. Nothing to worry about ... And, sure enough, the mirror flashes 'increased dose' at him as it dispenses his daily dose of statins. He's very proud of the smart mirror – he doesn't know anyone else who has one yet, except his mum – come to think of it, he bought that too. It was an optional



extra with the Windsor Healthcare insurance package and cost an arm and a leg, but he can afford it. When he first took out the policy, he was only 31 and fit as a flea – or so he thought – but they said that one particular biomarker was raised, which indicated early-stage diabetes. The health insurer provided a series of wearable devices to monitor his activity and vital signs. ‘They gave me a watch, but I traded up – I’ve got an adapted Rolex.’ Normally, the company links the data with mobiles which then gets sent response text messages. ‘But this mirror is something else,’ says Rohit. ‘It’s linked to the internet as well as to all the appliances. My toothbrush. The scales, of course. My Rolex – even the toilet, for Heaven’s sake – all synchronised with the mirror. Astonishing really.’ The mirror provides daily readouts for Rohit, but it also downloads the data to a central server that’s linked to a research database, as well as being macro-monitored by Windsor’s doctors.

Rohit feels secure about his health, knowing that he has such a high-tech safety net, and feels it allows him to do what he wants without worry – like eat the food his mum cooks and go out every night with his mates. His wife wants to know what his readings are, but he’s set a password so neither she nor his mum can get hold of the data. ‘All they’d do is nag me,’ Rohit explains. ‘A man as busy as me doesn’t need grief like that.’ And when he gets the monthly call from the insurers, he dismisses it. ‘More nagging,’ he says. But he knows very well that he now wears his trousers two sizes bigger than he used to and that he puffs when he walks upstairs. Maybe technology doesn’t provide as secure a safety net as he thinks.

## Annie





Points Counter is the key organisation in Annie's life. She knows that any extra weight will only make her arthritis even more painful, but she finds chocolate very hard to resist and, now she's no longer active, it seems to go straight to her hips. So Points Counter was a must. She'd signed up to their Auto ID package. It lets her use her mobile (luckily it was already RFID-enabled) to read the individual RFIDs on food. Originally, these smart tags were used by supermarkets as 'farm-to-fork' tracking devices. Now companies like Points Counter use them to give their members complete information, from calories to amount of vitamins, for individual items – even down to one particular sausage or an apple. The bigger stores offer 'readers' with their store loyalty cards and some of her friends now do all their shopping in their shops. 'But,' says Annie, 'what good is that when you want to shop in other stores too – not just theirs?'

All her details and activity levels are pre-programmed in Auto ID. When she picks up chocolate, she has to be careful to turn her face away from the screen. The programme can 'read' her facial expressions. If she's not quick about it, a lady pops up on the screen to tell her to put the chocolate down again. 'She's so nice about it, that I usually do put it back,' admits Annie.

When her arthritis got too much, she decided to use an online home delivery service for her groceries, but still with Points Counter. She got a smart fleece jacket from them. It has an activity monitor within the fleecy fabric, which links up with her mobile and her individual Points Counter programme. It works out, day by day, how many calories she can have based on her activity. But as her activity levels have fallen, so have the number of calories she is 'allowed'. 'It wouldn't feed a sparrow,' she complains. Her friend Eric told her that if you put the fleece in the tumble dryer on cool, the monitor gives you 6,000 calories a day! Annie's problem is motivation – she is no more, and no less, successful in maintaining her weight than her mother was with Points Counter in 2006.

## Scenario 2

In this world, society prepares and adapts to challenges to the resource system through a focus on social responsibility. With the potential for a resource crisis on the horizon, society sometimes acts with or without the full and conclusive evidence of the need to act. Shared community knowledge is valued and medicine works with the grain of this, prompting societal change despite individual resistance.



## Chantelle



Chantelle is getting ready to go out for lunch. Red is playing outside. His gran bought him some augmented-reality goggles for his birthday and he and his mates are charging about, completely immersed in some mobile gaming. The mobile gaming they do at school is serious, of course – this is just for fun. Chantelle and her family live in Bluewater Gardens, an eco village run by Kent County Council. When the Bluewater Shopping Centre began to founder because of all the energy restrictions, the Council stepped in and reconfigured much of it as a social housing development, engineered for sustainability. ‘I was very lucky to get a home here. The kids love it.’ There are no cars, so the children have all the space previously devoted to cars as a play area. Red is desperate to be 8, when he’s big enough to use the junior version of the Bluewater Zegs – a kind of personal transport system – that can be picked up for hire all over the village and just dropped at the next point.

Bluewater has a combined heat and power plant, supplemented by on-site wind turbines. All the properties are ‘smarthomes’, which means they fully comply with the recent Smart Act legislation for new build. They’re super insulated and energy bills are minimal. All the properties are completely networked, and this includes the security. It’s another reason Chantelle feels confident about Red being outside,

although she might change her mind if she knew that he and some older boys had found a way of using their mobiles to hack into the security system so that it doesn't pick them up. The older boys are already drinking heavily.

Everything is within walking distance, shops, schools and healthcare. Chantelle is registered with the Bluewater Well-being system, which constantly monitors the boys' and her weight. The centre involves Chantelle in caring for her own health, showing her what she and the boys need in order to stay healthy. Red already knows that if he gets into the next weight zone, he won't be able to use the Zegs but will have to walk everywhere. 'They're very supportive and helpful,' says Chantelle.

Today, Chantelle and the boys are going to have lunch at the Big Blue – like they do almost every day. It's the community kitchen. 'The place where stuff happens,' explains Chantelle, 'and the food's really good too.' There are three choices of meals, all cooked freshly by community volunteers using produce sourced from within a 25km radius, as the bylaws stipulate. 'It's very friendly, everyone eats together but you can do takeaway too. There's not much point cooking for yourself ... If I food shop, I do it on the way home. The shops are all in one place – it's very convenient at the Blue.' The Blue might be good but it's built a community at the expense of family. Chantelle sees less and less of Red when she's there because he prefers eating with his friends. She's quite shocked by some of the language he's picked up.



Rohit



Rohit is gloomy. Attached to his fridge, for everyone to see is the family health tree his mum ordered from the NHS. It estimates his probability of a heart attack. It's 97%. If that isn't bad enough, Rohit feels that the whole world has ganged up against him – led by his mother. Of course, when his father had died (of a heart attack), his mother came to live with him. The first inkling of things going badly wrong for him was when his mother commandeered his den and his telepresence equipment. Since then she's spent hours talking to her extended family back in the Punjab, and her friends here, and his wife's friends, and doctors and Sierra, his health insurers, and the British Heart Foundation. There can be no one on the planet who doesn't talk to his mother. Having seen his father and so many of his colleagues die of heart disease, she'd got heavily involved in Biopunjab – a databank that shares personal genomics for the benefit of Punjabis all over the world. There was a bit of a craze for these databanks, with one for every possible combination of ethnicity and genetic code, and Rohit has his doubts about them. But she keeps telling him that all the information they collect will build up new information that will save him from heart disease. If only they would save him from his mother.

So now it's nag, nag, nag. Left to his own devices, Rohit would rely on his health insurer's technology and the drugs they offer him. But no, that's not good enough for him, according to his mother. She and his wife (recruiting her was the first thing his mother had done) have rewritten many of the traditional recipes so that they're heart-healthy and, above all, keep his weight down. He grumbles, but he has to admit that they still taste pretty good. He even finds himself amazed that people used to use all that ghee in the past. And now his family is begging him to take up sport again, but he's dug his heels in on that one and claims he has a dodgy knee. He's managed to keep his weight down. Who knows, he might even live longer just to spite his mother.





## Annie



Annie is disturbed by a flash display on her wallscreen. 'Carrots in two hours. Batten's Farm'. During the past few years, there has been huge investment in high-tech agriculture by local communities that are proud of their ability to deliver fresh produce to the community hub within hours of harvesting. Monitoring systems continually assess crops and alert the local hub when produce is at its peak. Annie pressed the 'Harvest' option and '40', the number of portions she thought she needed – but decided she'd better check the number.

Annie helps in the community hub kitchen. She'd cooked all her life for her family and now, in her retirement, suddenly finds herself valued for the skills she's always taken for granted but which few younger people these days seem to possess. Part of her role is teaching the youngsters who come in every evening how to cook. She loves it, and so do they – and not just because 10–16-year-olds don't get to eat in the Community Kitchen (CK) unless they help prepare and serve food at least once a week.

She peers at her screen, scrolling through the CK homepage. 'Not far out,' she thinks, '37'. As people log in, their dietary needs, including their ideal calorie count,

are automatically displayed. One nut allergy, two vegetarian, and John, who claims he has an allergy to fish but actually just hates it. Sally is also online. She's their resident nutritionist and is fighting hard for fresh fruit salad, rather than the ice cream Annie has suggested. 'Sally's such an interfering killjoy,' thinks Annie, and orders ice cream anyway. 'Where's the harm in a bit of ice cream, for Heaven's sake?'

Their community kitchen has been awarded a coveted 'Food for Health' two-star logo and Annie is very proud of the quality of meals served in the Wonford CK. It's made a big difference to older folk like her and the youngsters, who now get a decent breakfast and main meal every day. It's done wonders for Annie's confidence – but not a lot for her weight.

### Scenario 3

In this scenario, resources are constrained and the focus is on short term solutions or treatment rather than prevention. Social programmes have made full use of the social networking potential of new technology to create new ways for communities to come together and create new self-help initiatives.

### Chantelle





Chantelle is waiting for the bus. Her mobile tells her she has an 11-minute wait. She's nervous – this is a terrible area, despite the signs proclaiming: 'This is a digital neighbourhood.' She scans the digiboard at the bus stop. Miracle of miracles, it still seems to be working. She's looking for a dog to walk. Her kids, Red and Danny, would love a dog but they can't have one on this estate. But walk a dog for someone else through the digital neighbourhood scheme and the kids get a dog to lark around with in the park and they all get exercise points. The more she gets, the more she can trade. The estate's e-currency is called Olivers (it's the Oliver Cromwell estate) and if she can get 20 points, she'll have enough for a babysitter so she can go out clubbing. She's already been chatting to her mates on her iMob about where they'll go – somewhere up West for sure.

Her iMob is her lifeline. She's linked in to the three most important e-trading hubs as well as to the local scheme. The iMob keeps track of her points and flashes up what she can spend them on. And it's how she keeps in contact with Suzie, her life coach. 'She's great. She's not like a parent or anything – she never tells me what to do, she makes me come up with my own solutions. She's been fantastic about the kids, especially with Danny's autism, and she's helped me loads with cooking and food for them. I didn't have a clue before. She's found me this website for Danny. It's teaching him to recognise emotions on faces.' Affective computing, which recognises human emotions, is getting more and more sophisticated. Chantelle – with Suzie's involvement – is now embarking on distance learning for a childcare qualification. You can choose your own avatar and the style of teaching that suits your personality. The system recognises when Chantelle is frustrated or fed up and modifies the delivery of the course accordingly. 'Not a bit like school at all.'

Thanks to Suzie, she now knows what to do with the veg from the City Farm that she can get with her Olivers. She'd never seen some of them before, let alone know what to do with them. Now she's quite an adventurous cook and the kids are loving it. And the bartering is brilliant. She never knew the lady next door was a professional seamstress. She worked for all the big fashion names and now here she is, making something for her, just because she traded activity points for someone to repair Red's ripped trousers and found the lady next door on her doorstep. Soon she's going to have to get her to do something about her dress. Way too tight. Oh well. As long as her dress can be let out, who cares?



## Rohit



Rohit glances at the RunMate on his wrist. What a man! And what a bit of kit. He loves his RunMate. It's connected wirelessly to his running shoes and gives him every bit of information he could want – step rate, calories burned, pulse, heart rate, all in real time. And when he presses send, his run stats are transmitted to his virtual personal trainer. His is branded by his all-time cricketing hero, Wasif Khan, whose personality, he thinks, is remarkably similar to his own. He's thinking of getting the new footie add-on for RunMate that's just been launched. It records all his moves around the pitch and plays them back. So cool. But before he manages to hit the send button, there's a bleep. Incoming stats from his running buddy, Asif, who's running in a park near his home in Istanbul. He's catching him up fast – there's be no resting on laurels for Rohit. But that's no bad thing. 'I reckon I'm fitter now in my 40s than I've ever been,' he thinks. Not bad, seeing as he'd been a class cricketer in his 20s.

Today has been a good day altogether. He'd run past the new community hub and seen his name on the sponsor's board outside. As a leader in his community, he'd been recruited to try and bridge the social divide between rich and poor in his neighbourhood and help promote regeneration. At first, he was sceptical, but the hub was already creating a new range of initiatives for sustainability and learning. He's been amazed what involvement in the hub board had done for him – a whole new set of relationships, and helping to devise schemes to get people more active. The phrase of the moment is 'open health'. People with bad health spend a



tiny amount of time with doctors compared to the time they spend managing their condition themselves. Open health means developing all sorts of self-help methods – blogs and agenda cards, as well as Me2 life coaches. Because Rohit is a diabetic, he'd felt able to mentor two diabetics – one had stopped having to inject insulin, thanks to him. What a man!

Meanwhile, he'd gone a bit overboard on the sports front. He'd set himself the goal of running the half-marathon with a group of his friends. They've all got RunMates and their times are automatically listed on their website. To be honest, it's got a bit competitive and Rohit has found himself having to train very hard to keep up. But it has a plus side. Thanks to his running buddies, his health insurance has gone down, along with his weight and his cholesterol. And he's not one of those who cheats their stats in order to get the best financial deal. In any case, the insurers have got wise to that one and they now insist on testing a whole range of biomarkers to check the stats are real. And his are. But the best thing of all is that his mother no longer nags him, even though he's sure she knows he eats egg and chips when she's out.

## Annie



Annie sets out in her buggy – only a short trip – but she’s happy to zip along the pavements. She feels safe and secure. And famous. She’s in Annie Jam Land – well. Wonford really. It all started with the BBC’s ‘grow local’ campaign, which was partly a reaction against companies that fly food thousands of miles to Britain, partly the cost of transport that makes good food expensive and partly people wanting to be in touch with the earth. She’d got in touch with her friend Dick, who grows rhubarb, and she’d made some rhubarb and ginger jam, using an old recipe of her gran’s. People seemed to love it. In no time, she’d been interviewed on the Wonford channel of the BBC. Then they set up something they called located media. She doesn’t really understand it, but now, when you go to Wonford, you get film of Annie, of Dick’s rhubarb patch, the recipe she used, and all sorts of other information, transmitted like magic to your mobile – just by walking around Wonford! You can get it on the web too. And she’s not just famous in Wonford. Jam enthusiasts from all over are getting in touch and asking what other jam recipes she’s got. She’s had emails from America, Australia, even the Arctic. She never knew there were so many communities of jam enthusiasts around the world!

But Annie’s sure all the hubbub will be over soon. There seem to be fads like this. Last year, it was all carved walking sticks. But her jam labels are now printed with the URL of the digital Wonford content and Dick keeps filming her so that there’s more for people to see. He’s already made her do a daily diary and her top tips. People seem far more interested in good food – ‘slow food’ she calls it – these days. It’s not doing much for her waistline though. ‘Jam just cries out for a scone and a bit of cream, doesn’t it?’

‘The Wonford experience’, as they call it, has meant that, locally, people have taken a real interest in what produce grows naturally around them. They use a mosaic system on the web and a GPS locator to pinpoint all the best spots for what they now call ‘wild food’. They’re quite proprietorial too. Nobody from outside would dare pick blackberries from the bushes at the edge of the green. They’re looked after by the Joseph family. Annie’s happy, if a bit bemused, to be famous, but she wishes she was a bit slimmer too. It might be good food these days, but it wasn’t exactly slimming food, was it?

## Scenario 4

Here, society reacts to and mitigates changes in the resource system with a focus on individual responsibility. In this fast-paced world, entrepreneurialism and strong competition are relied on to fine-tune reactions to challenges as they occur. Society doesn’t invest in long-term benefits that come at the expense of immediate reward. Market competition is expected to deliver any checks and balances to the resource system.





## Chantelle



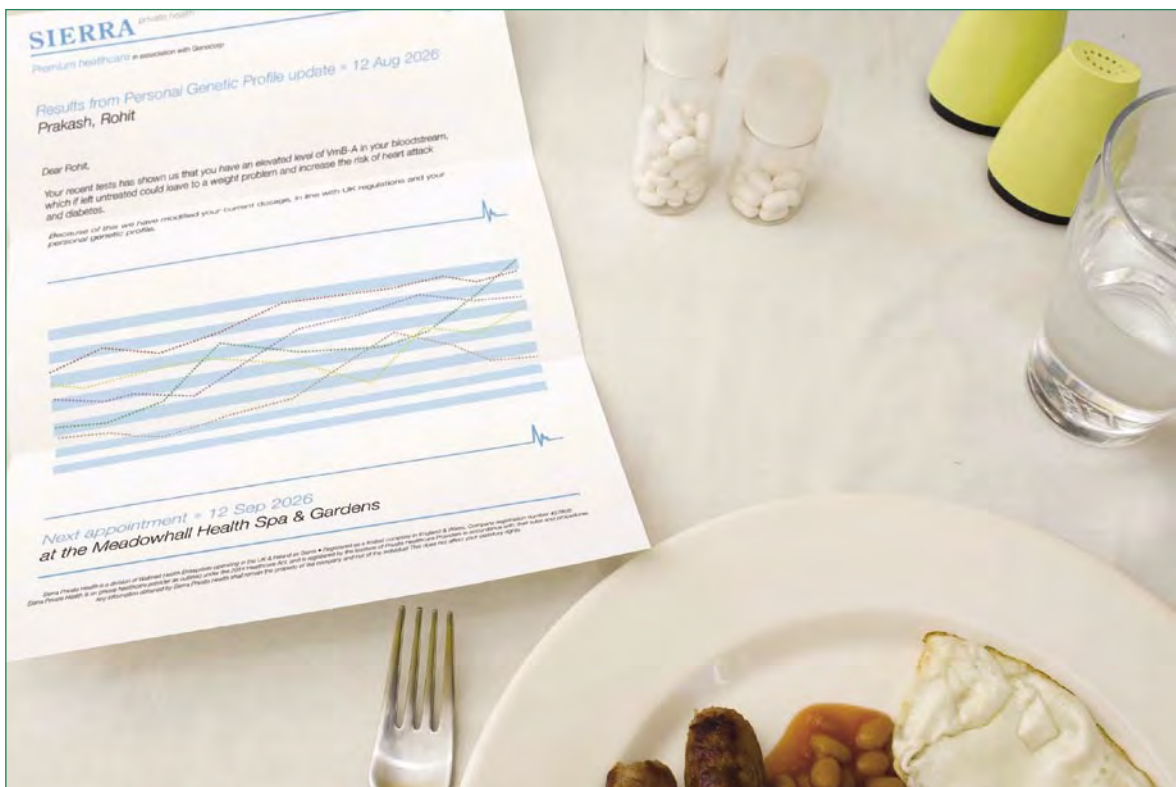
Chantelle tears open the package. Two weeks ago, she scraped up enough money for the genetic horoscope offer on the Arhaus shopping channel. She snatches a piece of paper from it: 'Sweet tooth gene', check; 'Hunger gene', check. According to them, of the five genes that make you obese, she has four. For a moment, she feels downcast, but then she reads: 'Our supplements are individually tailored to support the correct function of *your* genes. No diets. No sweaty gyms. Weight loss guaranteed.' She sees four dark bottles filled with tablets. She takes two from each immediately. She puts them carefully in her bathroom, where they join a dozen other pill bottles. The bathroom mirror unfairly captures her in a moment when she wasn't pulling her stomach in. Oh dear.

Only last week, one of these gene-scan companies was convicted of fraud – but this lot seem OK. A genuine professor of genetics does their adverts – he appears on her mobile screen every time she walks past Plus Plus Fashion on her way home. There are hundreds of diet products all based on the latest science, they say. Chantelle has tried most of them but she's still heavy. She'd nearly gone for one of the neuro – 'think yourself thin' – diet offers in the magazine she'd picked up. The cover was Suri and Maddox who'd got together, if you believe it, because of a new genetic dating agency.

Red was playing the Olympics game on his Megabox. He spent way too long on that thing. It wasn't good for him. He was big like her and was already pre-diabetic – at 7. He'd seen an advert for a skipping rope attachment and his gran had bought

it for him hoping it might help, but he'd quickly lost interest. If Chantelle thought *she* was bombarded with advertising, it was worse for kids. Morning, noon and night they're on at kids for this, that and the other on the kids' channels and on their mobiles. As soon as the Government blocked one form of advertising (like junk foods), there was something else in its place.

## Rohit



Rohit is on his own in the house having a second helping of fries, secure in the knowledge that his mother will never know. He's just got his monthly update from Sierra, his private healthcare provider. 'Why should I worry about my weight or what I eat when Sierra have it all sorted? Anyway,' he thought, seeing a reflection of his well-rounded figure in the fridge door, 'I'm slim compared to some people.'

Going to Sierra was the best thing he'd ever done. There are dozens of companies offering individually tailored healthcare based on personalised genomics. Sierra is by far the most expensive, but acknowledged to be the best – and he's worth it ... He'd had a whole day of testing and another whole day of personal consultations with their highly trained doctors – that's the thing they stress in their advertising, along with their use of the latest technology. Indeed, they'd taken a flattering amount of interest in him and had even identified a defect in his mitochondrial metabolism.



They send him a pill once a month which he has to take, then he has to put on a special Sierra watch for a couple of days. The pill contains a device that uses 'lab on a chip' technology to measure various biomarkers, and the results are transmitted to the watch and downloaded by Sierra, who adjust the meds they send him each month.

Sierra seem convinced that if he takes a daily supplement drink and his personalised tablets and eats the functional foods they suggest, he'll avoid any problems. Even if he does get some symptoms, they assure him that there are plenty of medical options these days. He's had his drink this morning, before his fries. He takes his meds and supplement religiously. 'I can't understand people who don't take the medicines that are prescribed. That's madness these days when they can do so much.' Anyway, they cost a fortune.

He's invested quite a bit of money himself in a couple of interesting medical-profile start-ups. He's seen how small genomic database miners based in India or China, with access to extensive data, can strike gold. The trick is to spot the successful ones and put in some equity before they get bought up by the multinational health providers. Last year, he'd made a small fortune on a company he'd discovered in Beijing, and now he's looking for another. The potential market for personalised treatments is huge and, now the Chinese have come on board, it seems limitless. He's switched all his investments from leisure fitness (yesterday's stock) to healthcare.

## Annie





'I had to give up my car' says Annie. 'My pension stayed the same but, what with fuel prices soaring and road tolls, I couldn't afford to keep it any longer.' The car was Annie's lifeline. With the arthritis making walking so difficult, it was the only way she could get out of the house. 'My friend Irene takes me to the shops once a week, which is very good of her, but it's not the same, is it?'

Annie has become much more reliant on her virtual community than her local one. She has so many friends now – not just the old ballroom dancing ones that she'd managed to contact again through the internet – but new ones all over the world. She checks her messages. Good, there's one from Sergei in Russia. She smiles. The new friends she's made online are wonderful – and she can chat to them any time of the day or night. She no longer needs her car because she doesn't need to go out any longer. Sitting in front of a screen half the day isn't helping her get any slimmer – but who cares, when no one can see what she looks like? And to her new friends, she might as well be 28 as 58.

Most of her messages are spam from eastern Europe offering arthritis treatments. She'd made the mistake of trying one once. It was useless of course, but then what she gets from the doctor's at her monthly appointments is useless too. She gets an email almost every day from NHS Prevent telling her what she needs to do 'to beat arthritis', as they put it. It's a big thing these days. Data mining, they called it. Personal profiling based on all the information held about you. It's worse than the junk mail you used to get. Everyone seems to know everything about you, yet you still get sent rubbish – and so much of it.

'Lose weight' is always top of the NHS Prevent list, but how? Worse, she'd been told that she couldn't have surgery until she was 'target weight'. She's miles off that. In fact, if anything, she's been getting bigger. NHS Prevent have given her details of her local ActiveMobs scheme. It sounds good – where local people support you to become more active. When you sign up, you get a free sweatband with a built-in GSR sensor – 'galvanic skin response' – to monitor your activity. But what's the good of that when you can't get to the health centre to join up or you've had two days in bed in pain after one of their sessions?



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