

PERSONAL HEALTH SYSTEMS

Scenario Workshop Report

PERSONAL
HEALTH
SYSTEMS
FORESIGHT



PHS Scenario Workshop 1

Manchester, June 2013

Project

The PHS Project is co-funded by the European Commission within the Seventh Framework Programme (2007–2013)

Grant Agreement No: 305801

Acronym: PHS Foresight

Full title: Personal Health Systems Foresight

Project type: Support action

Start date of the project: 1st of September, 2012

Duration: 24 Months

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Report

Report: PHS Scenario Workshop Report

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CONTENT

1. Introduction 1

2. The Scenarios 2

2.1 Scenario Alpha: Alternative title given by the group: “The Dream Scenario” 3

2.2 Scenario Beta: Alternative title given by the group: “Transitional scenario” 5

2.2 Scenario Gamma: Alternative title given by the group: “Shared responsibility for a healthy society” 7

2.3 Scenarios: Moving On 10

3. The Pathways 11

3.1 “Diabetes + alcoholism” group..... 11

3.2 “Pregnancy and hypertension” group..... 13

3.3 “Heart disease and obesity” group 14

4. Implications 16

4.1 Implications for public policy 17

4.2 Implications for society 19

4.3 Implications for economy and markets..... 19

5. Conclusions 20

Annexe 1 - Background Notes sent to participants before the Workshop 22

Annexe 2 - Workshop Timetable 35

Annexe 3 - Participant Notes for Workshop 37

Annexe 4 - List of participants in the workshop 1

1. INTRODUCTION

The Personal Health Systems Foresight project, funded under the European Commission's Framework Programme, is being undertaken by a consortium of three partners: the Austrian Institute of Technology, the University of Manchester and Impetu Solutions (Spain). Personal Health Systems (PHS) assist in the provision of continuous, quality controlled and personalised health services to empowered individuals regardless of location. Applying across a wide spectrum of patients, clinical specialties, technology fields and health services, the development of PHS implies the emergence of novel cross - disciplinary and - sectorial innovation partnerships. What the future ecology of health systems will be is hard to predict, and our foresight¹ project explores possibilities up to 2030. We aim: (1) to achieve a deeper understanding of mismatches between the potential of PHS and current policy and innovation initiatives and framework conditions; (2) to support more mobilized and networked innovation communities, promoting PHS around jointly formulated issues which support pooling resources and streamlining diverse innovation initiatives; (3) to tackle future opportunities and alternative trajectories, aligning actor perspectives for the development of a joint strategic action plan, including recommendations for a possible new European Innovation Partnership (EIP); (4) to achieve a transparent, open and inclusive engagement of stakeholders, and targeted dissemination of results in society.²

Following a comprehensive stocktaking study undertaken with the analysis of key challenges and policy responses in the first phase, and an inclusive process on future innovations and stakeholder networking in the second phase, the aim of the workshop reported here, as part of the third phase, was to use scenario analysis to deepen our understanding of how PHS might be configured and applied to specific health/wellbeing conditions over the coming decades. (The time horizon was 2030). In particular, we sought to deal with the challenging questions of system organisation – what sorts of business model might be pursued, what is the organisational ecology of service provision?

The scenarios are not intended to be predictions of what will happen, but to provide some idea of the range of plausible developments that might characterise the PHS field. Reality is liable to be a complicated and diverse mixture of different elements of these scenarios, varying over time, place, organisation, even medical conditions. The purpose of scenarios is to provide us with insight into the circumstances under which different developments might unfold, and the relations between different issues.

There were several steps in the process, involving alternation between plenary and break-out group (BOG) discussions. The workshop participants brought together individuals with knowledge and expertise of the operation of health pathways, of the potential of new PHS systems, or of both; it discussed ways in which these might evolve together over the next decade and beyond combining different perspectives (from academia, policy, industry, and society).³

¹ Foresight is a systematic, participatory, future intelligence gathering and medium-to-long-term vision- building process aimed at present-day decisions and mobilising joint action.

² For more on the present project, and our initial report 'Personal Health Systems: State of the Art', see the material at <http://www.phsforesight.eu/>.

³ The list of participants is attached in Annexe 4.

2. THE SCENARIOS

The approach taken in this workshop was to develop scenarios based on those established in an earlier study of PHS (Personal Health Systems), and originally published in the [PHS2020 Scenarios report D3.1](#), in 2008.⁴ This earlier study reviewed a large range of drivers of change in the PHS context, before elaborating four scenarios. We selected three scenarios – from the four in the earlier study – that are described in Annexe 1 using the material published by the earlier study. It is not uncommon for “starter scenarios” to be employed in scenario workshops, where it is possible to re-use scenarios generated in earlier studies as the Launchpad for further scenario development.

The workshop went through a process intended to flesh these starter scenarios out in terms of how PHS are deployed. We call this the scenarios’ PHS configuration, or service ecosystem, taking into account what different stakeholders are doing in the process of producing services. In this process, each BOG is assigned a scenario. Accounts of the three starter scenarios were provided to the groups, as part of a pack of instructions and supporting material (Annexe 3).

In reporting the results of this step of the workshop, it will be apparent that the starter scenarios were not readily appropriated by the BOGs. The feedback from each group about its scenario was quite critical. There was no sense that the scenarios were outdated, rendered less relevant by the passage of time. But there was some sense that the two key organising dimensions were not really appropriate; the demarcation between a world of high state control versus that of a high measure of privatisation was simply too stark, and a wide constellation of different public-private mixtures was probable (also varying across countries). Equally importantly, the timescale of the earlier scenario study was rather short; in the longer term – to 2030 – some of the starter scenarios were seen as being unsustainable, a different model would have been inevitably introduced. Thus each BOG reformulated the account of the starter scenario with which they had been presented, quite considerably. The upshot was that the three groups each produced an account of a involving more incremental change in the health system while allowing for a major introduction of PHS.

Each BOG had been asked to consider, for their scenario, such topics as: what will be the dominant business models at play, and how will these differ from today’s? Who will be the key actors in organising the PHS configurations? What will be the roles of various parties in this (including Health and Social Care – HSC - staff)? Where is this scenario more likely, and how might the ecosystems vary across regions/societies)? The BOGs made extensive use of posters on which they posted notes dealing with main issues. We proposed that they considered variations that may occur across regions and across social groups (see Annexe 3). For discussing social inequality, we proposed that BOGs should contract two parts of the population – not the absolute extremes, but the Relatively Advantaged (RADs) and Disadvantaged (REDs).

The starter scenarios were labelled alpha, beta and gamma, and the BOGs encouraged to propose their own names for these. The results from each group are described below. Note that there are some “rough edges” to these accounts, because we have relied as far as possible on formulations produced during the workshop.

⁴ A convenient way to access this is from the book of the earlier project, “Reconstructing the Whole: Present

and Future of Personal Health Systems” prepared by Cristiano Codagnone (whose work we draw on extensively in Annexe 1), and available at http://www.evia.imasdtic.es/cli_aetic/ftportalweb/documentos/phs2020-book-rev16082009.pdf.

2.1 SCENARIO ALPHA: ALTERNATIVE TITLE GIVEN BY THE GROUP: “THE DREAM SCENARIO”

The government has moved to a steering role, overseeing outcomes and stimulating compliance through soft methods. Its direct intervention in and financing of healthcare has been substantially reduced, except for acute problems. HSC has been opened up to a variety of players, who compete for public but decentralised reimbursements (provided through an outcome-based model) and/or for consumer out of pocket expenditure. These players provide **integrated** PHS services at competitive prices to consumers/patients who take most health matters into their own hands, and are at ease with remote technology-driven services entailing little intervention from healthcare professionals. However, social gaps persist with respect to such health consumerism and access to, and confidence in, technologies; digital inclusion and spending power are far from equally distributed. The most advanced health consumers (RADs) have excellent PHS, and this permits some gains and savings in HSC services that can be used to provide other segments of consumers/patients both with traditional treatment and specific PHS services with sophisticated interfaces and with the support of professional intermediaries.⁵

- **Overall remarks**

The group thought that the Alpha scenario becomes most likely when values fundamentally change compared to now: If well-being becomes an overarching objective and life style management a serious personal concern, then there is a business case for preventive health care which is an underlying assumption of the scenario. The underlying assumption of the scenario is that well-being is the accepted objective in life, achieving well-being supplants health and treatment of disease as the organising principle for health services.

However, several inconsistencies and debatable assumptions in the scenario were noted. The scenario sounds unrealistic because of its heavy assumption of deregulated health care which is in total contrast to the heavy regulated sector of today. Signs that this may change in the immediate future are not visible. Secondly, there is a strong focus on technology and what solutions can be offered. However, the financing issue is not adequately covered. Another point is that social insurance still exists but no adequate reasoning is provided why this is only for 20% of the population. Related to this is the point that an assumption of the scenario is that health care costs stabilize and are gradually reversed. This was heavily criticized - treatment costs, costs of drugs, and also the number of illnesses treated are all likely to rise. At the same time, if GDP rises there is no reason why governments would spend a smaller proportion on health care.

Other debatable assumptions about the scenario include for example:

1. People are left on their own except for the 20 per cent who have serious and acute problems.
2. Technology is the solution.
3. Social insurance is merely for revenue collection, which is then distributed to private insurance and third parties.
4. There can be a transparent steering mechanism to govern the system.
5. Quality control exists, patients pay for it somehow.

⁵ This is a short introduction to the scenario and part of the text given to the workshop part about the scenario main features. For more details please refer to Annexe 3 (Participant Notes for Workshop).

In addition there was a discussion about how much health care can be seen as a consumer product. Cancer treatment was compared to a Mercedes - even if the price was the same, who would invest in cancer treatment to increase personal status? Furthermore, patients know less about the viable options of cancer treatment, compared to the viable options when they buy a car. This pinpoints some of the debate between health economics and institutional economics of health care: 1) preferences versus needs in consumption of health care, and 2) the inherent asymmetry of information between health professionals and patients. Quality of services and consumer protection were also noted as important elements of the specific scenario that need to be safeguarded.

- **Who is receiving what services and where?**

According to the group the recipients of services would be what were described as “California style people” – people with interests in quantifying and assessing their life styles, using trackers and health score calculators. Healthy elderly would be receiving “life style management” services while chronic patients would be subject to provision of constant assistance. The location of service delivery is not important since ubiquitous PHS can overcome place specifications. At the same time it would be possible to integrate health care into other systems such as smart houses.

- **What PHS and medical or other facilities and infrastructure?**

The group noted that we are moving from considering care as a product and a service to co-producing ‘health’. Devices and services of the future may include personalized PHS based on genomics, care robots or PHS devices including “extended” smart phones - and offering not only sensing, but also medication. The emphasis will be on smaller and more affordable and accessible devices.

- **What roles of HSC staff?**

Health professionals will continue to be important as experts since whatever the advancements of technology, patients cannot be expected to know the viable options of their treatment.

At the same time education will play a central role in teaching patient groups the use of PHS, while entertainment and games will also be deployment to promote health and well-being. Technology developers may support the HSC staff here.

Other professionals will increasingly be relevant for the specific scenario like consultants to give advice for the technological choices available or specialists in consumer protection ensuring the quality and suitability of PHS services provided.

- **How are PHS services financed and the system governed?**

The BOG sees a mixed group of sources financing PHS services compiled by government, private insurance, and patients. While government will still have a major role in financing the basic PHS package, employers will also provide insurance benefits to employees. In this regard private insurance will increase its role. Overall it was also noted that future trends of costs will depend on the nature of services and diseases these address, although the costs of PHS will be decreasing in general. At the same time the focus on prevention may constitute a separate business case for PHS which should enjoy the respective attention.

The scenario implies a strong role for government in relation to regulation. The inherent move towards distributed health care systems will require “certification”, “assessment”, and “quality control” measures. Research and technology management should be directed towards specific areas and purposes also enabling systemic development of technologies. The role of government also extends to public procurement and niche management policies.

2.2 SCENARIO BETA: ALTERNATIVE TITLE GIVEN BY THE GROUP: “TRANSITIONAL SCENARIO”

Social gaps between RADs and REDs with respect to key dimensions (health consumerism, access to, and confidence in, technologies) have persisted (constraining take up and mainstreaming of PHS and other eHealth innovations), the role of government related healthcare institutions and basic financing mechanisms have not changed but rising costs are de facto eroding the full public coverage of the population, with PHS services consolidated into a niche consumer electronics market and paid for by out of pocket outlays, thus sharpening social divide between those who can and those who afford them, although acute resources shortages have led to increasing deployment of a few PHS systems especially for long term care of the elderly being financed out of the public budget.⁶

- **Overall remarks**

The group considered that scenario Beta reflects a projection of the current situation of many European countries in the future, although a strong “totalitarian” government model implied by the scenario is difficult to envision in Europe. The dominant role of government extends to developing PHS but on the other hand is hindered by shrinking public budgets due to the ageing of the population and difficult financial conditions. As a result public healthcare services are deteriorating (through large waiting lists for example). Thus the private sector takes the lead in filling the gaps between the services in demand and in supply.

The group acknowledged the great potential of PHS to improve the economic performance of and access to the healthcare system. PHS can also play a vital role in promoting prevention instead of cure. However, they also noted the need to take into consideration cultural factors in the spread and use of PHS as well as the need to provide the appropriate training. The role of the third sector (charities and NGOs) was also highlighted by the discussants which are already important in elderly care and rare diseases.

- **Who receives what services and where?**

The PHS services provided depend on the recipients. The more advantaged segments of society (RADs) may receive monitoring services and analytics as well as private coaching, while in case of emergencies or acute conditions they will be able to enjoy more advanced and sophisticated help than the average population. The less advantaged shares of the population (REDs) will receive certain services as in relation to identification of emergent situations but these will be accompanied by limited support and may lead to a lower quality of life.

PHS services will be customized towards the different needs and abilities of individuals. There will be more expensive, sophisticated PHS services addressed to RADs that will be better than standard quality care and will be based on private funding. At the same time PHS services will pursue burden of diseases by focusing on prevention, and early diagnosis. PHS will also be promoted in rural areas, namely telemedicine and remote patient monitoring. Three user groups will access PHS services: i) Patients/users who really need and benefit the most from it, for whom it transforms their life circumstances; ii) Those for whom there is no other alternative, who would not otherwise have access to the health care they need; and iii) Those for whom it is the best alternative, even though more traditional forms of health service delivery area available.

⁶ This is a short introduction to the scenario and part of the text given to the workshop part about the scenario main features. For more details please refer to Annexe 3 (Participant Notes for Workshop).

The place of delivery can be everywhere, i.e. services in centres of excellence, at home, at school, at work and public places, services provided by ubiquitous technology.

- **What PHS and medical or other facilities and infrastructure?**

Today PHS uses a variety of devices like mobile phones, tablets, chips or smart bands. In the future there will be more use of technology including also more sophisticated, injectable and implantable devices. Future PHS devices may enable monitoring of specific patients' features. This is accompanied by privacy issues though as much closer monitoring and control may also be possible.

The required Infrastructure may include environments like smart houses or info-structures, i.e. mostly wireless information systems and dedicated open repositories enabling data collection, processing, interpretation, and decision making. Infrastructure should be the common denominator for all public, private and non-profit PHS services and should be maintained on public funds, while the use of it should be charged for private use but made free for non-profit PHS services.

- **What roles of HSC staff?**

Health care professionals will endure more specialization as well as more diversification in their tasks. They will be taking up additional roles as trainers and educators of PHS use, while at the same time they will be called to specialize their services more towards each specific individual and also their knowledge towards more technological knowledge and towards additional activities related to personalized data analysis and interpretation. The production of a high volume of PHS data also calls for a stronger role of those defined as gatekeepers in the system. But who will these be? Perhaps some IT experts will be involved here; they will include graduates from universities' new PHS departments, which have been established with interdisciplinary programmes of information technologies, electronics and medicine.

Additionally, the third sector can be important for bridging the gap in public health care services supply and demand. Non-profit institutions can organize communities of people with similar conditions and train and support them in using PHS. Alongside the third sector the role of family is also important in stimulating the use of modern health monitoring technology. Technology developers will keep being the major actors in the area alongside however social scientists dealing with social acceptance of technologies and any emerging ethical, legal or societal issues.

- **How are PHS services financed and the system governed?**

In terms of financing PHS services, the group noted three major sources, i.e. i) private sources based on wealth of individuals, ii) public sources based on public insurance earnings and savings on healthcare provision due to technological advancements for example, and iii) non-profit sources which will be a mix of the previous two. Public sources can depend on taxation, sales of natural resources (oil and gas), or state-governed healthcare innovation projects. Non-profit sources can attract donations and free-labour from family helpers.

The specific scenario does not require any special type of PHS governance that is different to the management of medical records. Governance depends on the legal treatment of ethical concerns that may arise from technological advance; different countries may have different concerns and solutions, though a mixture of government and private systems is likely.

2.2 SCENARIO GAMMA: ALTERNATIVE TITLE GIVEN BY THE GROUP: “SHARED RESPONSIBILITY FOR A HEALTHY SOCIETY”

Although pervasive health consumerist attitudes and behaviours became dominant, the outbreak of acute crisis management have led the government to retain and increase control and direct financing and production of all healthcare services including PHS. This helped reach high levels of public financing of healthcare expenditure with little, if any, reliance on private players. Additionally, the state enforce, through hard incentives as social responsibility, healthy lifestyle and monitoring onto consumers/patients and aims to leverage and shape consumerist attitudes by fully controlling some prioritised PHS, placing high emphasis on compliance with treatment and lifestyles prescribed by healthcare professionals.⁷

- **Overall remarks**

The Gamma scenario group noted that the specific scenario might indicate a possible way out of the current problematic situation in the public healthcare sector (mainly due to shrinking budgets and demographic issues). However, the participants also pointed out that the scenario suffered some internal inconsistencies. The anticipation that the public healthcare costs will be retained at some point in the future seems rather unrealistic. There are several reasons for this. First in 20-year time the working population able to take up taxation will be much smaller and their income relatively retained due to financial crises, while the burden will be much higher due to increased share of the elderly. This undermines the success of the scenario which according to the participants lies in the fact that the healthcare costs do not go beyond taxation earnings.

Secondly, participants noted that by 2030 most patients will be equipped with technology applications, thus making PHS a significant market rather than a niche as the scenario implies. Affluent baby boomers will drive innovation along with peer-to-peer activity including sharing their experiences and gadgets.

Another element of discussion was the reference to non-compliance and penalization within the scenario. The discussants noted that this would be very difficult to operationalise, since it would be difficult to define what non-compliance would mean in such a pluralistic healthcare system.

Furthermore, the scenario implies a path towards a more liberalized health system where the burden of healthcare costs are shared among various sources, i.e. the individual, the state, the private sector, etc. This does not fit with the notion of full control by the state suggested by the scenario. However, the strengthened role of the state can be crucial in directing investments in certain health areas and driving innovation leading to some early cost efficiency through support of (high-) technology applications. This in turn could become the basis for a wellness shift within society.

Success of the scenario also requires a broader conception of the notion of ‘shared responsibility’. This would entail health as a collective good with shared contributions from different parties, and with the privileged segments of society (either in terms of knowledge, expertise or resources) serving the non-privileged

⁷ This is a short introduction to the scenario and part of the text given to the workshop part about the scenario main features. For more details please refer to Annexe 3 (Participant Notes for Workshop).

segments. The scenario implies a patient-centred healthcare system, with the professionals keeping the role of gatekeepers, but gradually losing authority to motivators, good health advocates and so on. The patient on the other hand has a strengthened role being informed, concerned and well-educated. Overall the notion of shared responsibility should spread different elements of society, i.e.

- collective community of knowledgeable individuals
- local clinics and chronic interfaces
- State retains single payer and is able to modify services dynamically and provides innovation incentives for public management & use of info to adjust services and fairness regulation.

Important issues arising in the scenario is how we will be able to act on all collected/produced information; how to enable different experiences/knowledge to come into play in decision-making; what would non-compliance mean and what penalties it should bear; what is the best balance between normativity and flexibility so that we are not creating a 'wellness' fascism.

- **Who receives what services and where?**

All people receive healthcare services for a variety of purposes such as wellness – prevention, functional decline (aging, limited activity, cognition, senses, malnutrition) or chronic conditions (obesity, COPD, CHF, diabetes). Services are mainly provided to the RADs at home, or in the community. The majority of services are paid by private money (by RADs) and directed to monitoring diseases. The REDs segment of society receives services from the third sector combined with volunteers and some healthcare professionals.

The place where the services are provided could be anywhere in the future. As remote monitoring would be the norm, a new location of health care would be the 'home' as well as school, work and public places.

- **What PHS and medical or other facilities and infrastructure?**

A variety of services and technologies were mentioned. The role of ICT was prominent in this discussion as the role of information infrastructure and the related issues of data security, privacy, and interoperability of systems.

While PHS devices will mainly be for monitoring the diseases with supported by online intelligent alarming management, there can be a variety of applications enabled by games mechanics to motivate healthy lifestyle and adherence to treatment. ICTs will enable a variety of activities and services like personal avatars with real-time personal data analytics, automatic alerts, intelligent agents as interface with gatekeepers, algorithmic genomics, personal predictive profiles, potential useful for personal health budgets and lifestyles regulations, or system management of resources by ICT e.g. adjusting waiting times for surgeries. Cheap, commoditized "invisible" sensors will collect basic health monitoring data.

The importance of the information infrastructure or so-called 'info-structure' will be paramount. Info-structure may refer to a variety of areas like

- Medical data/public database: for public health analysis and better care
- Network infrastructure for integrated care within all HC organisations – enabling sharing of information and collaboration
- Some large public investment to orchestrate or
- Innovation/integration of new citizen demands

Info-structure enables a variety of purposes such as self-surveillance (the "quantified self"), genomics-tailored services to individuals (about capabilities, motivation, epigenomics), robots, or diagnostics and treatment tools (which will be specialised, personal, and dynamic allowing flexibility). Large databases and infrastructure will be needed as well as network infrastructures across different organisations (hospital, GP clinics, etc.).

In this the role of government is crucial as it will be custodian of health data and provider of data and data analytics. Medical data analytics will open access to all disease-related data for the medical sector, sick people/older people and the young generation. Public knowledge sharing hubs are also a service/infrastructure to support.

The use by baby boomers of telemonitoring will lower the costs of relevant devices and will thus enable their spread to lower-income segments of society. The third sector will have a role in supporting the less advantaged sectors of society with initiatives such as time-banks or peer-to-peer support (either tangible or intangible)

- **What roles of HSC staff?**

Physicians will be responsible for large numbers of patients managed by a combination of technology, lower status staff and data analytics. Professionals will keep being the important actors in the system however with much diversified roles including professional caring but also as educators about caring for people, mentors encouraging responsible behaviour from the patient, consultants, and a new role as integrators of various types of information about patients. Training of medical actors and chronic ill people will be essential for success of telemonitoring.

The role of certain groups will change because of technology. For example, doctors will also become managers/consultants; carers may have more time for their patients; service chains and their management will change. Despite the advent of technology, professionals will continue to be the final decision makers on ways of treatment/action and day carers will still need the doctors for decision making although they could also help them get acquainted with the use of PHS. Health plans will be co-creation together with the patients responding to the demand for empowering patients but also for better responding to compliance programmes.

Alongside professionals, family, friends and peers, local communities and patient groups will also have an important role especially in spreading the use of PHS, helping the elderly with applications, supporting patients psychologically as well as promoting wellness and health prevention.

Baby boomers will be first users of new monitoring technologies offered by private companies and/or obliged by insurance companies. The role of HSC staff as well as all PHS users (RADs) will also be crucial in the spread of PHS technologies.

- **How are PHS services financed and the system governed?**

Due to shrinking public budgets there has to be a plurality of funding sources combining the public, private and third sector as well as wealthy individuals. In addition, funding depends on type of services in question. High-tech, sophisticated, costly services will target more RADs, provided anywhere and paid by private money.

The basic level health care will still be financed from taxation, but will be rationed by compliance with treatment and lifestyle factors. Wellness services will be an area where private support will be incentivized. Treatment will remain in the realm of the public sector funding and institutions (especially the acute incidents) but will be rationalized. Social care services will continue to be provided publicly at the basic level but also extra services may be offered under private expenditure.

The RAD population will procure “top-up” healthcare in addition to basic state provision of healthcare while the public sector may be the major investor and procurer of innovation. Niche innovative services or technologies may be supported by private insurance companies but it is the state that will still finance innovation aiming at lowering HC costs. Dynamic citizens will be able to create their own medical support systems financed by their own money.

New forms of organization will appear alongside the stationary and static organization of most of today’s services that will allow service provision on the go whether at home or mobile (or even in ambulances, etc.). New funding models will appear combining all different sectors under new approaches (e.g. new approaches to employee/employer funding of hospital or other treatment; new mechanisms for refunding of telemonitoring medical consultations which accelerate the expansion of preventative technologies, etc.).

The role of government remains strong in the scenario although it cannot claim full control as noted above. Nevertheless, it has a significant role especially in regulation for interoperability and formal ontologies, medical knowledge standards and distribution, public knowledge sharing hubs, open data distribution, standardization, and data security.

There will be more ‘governmental centres’ in the public health systems of tomorrow spread across the public, private and combined health markets of the future. Governmental centres will also be responsible for checking compliance and penalizing, and will encourage new models of care. As the state will realize that it will have to make room for the private and other sectors to get strongly engaged in HC, it will try to keep control through regulation.

2.3 SCENARIOS: MOVING ON

The three scenarios that were eventually elaborated had a good deal in common, and while they retained some features of the original PHS2020 starter scenarios, they could quite reasonably be seen as minor variations on an overall scenario of fairly steady but still rather incremental change. Much modification of health systems and their financing was anticipated through the application of PHS, but there was less of a break with current systems than many proponents of PHS might anticipate. In the next step of the workshop we moved on to seek a more in-depth appraisal of what these developments might mean for people experiencing various health challenges.

3. THE PATHWAYS

In order to get a better grasp of the scenarios and how PHS might actually work within them, three new BOGs were requested to explore how particular conditions were treated now, and how this might have changed by 2030 with the advent of PHS. Three conditions were chosen, which were selected so as to contrast very different and complex circumstances such as are encountered in everyday life – and which affect a good many people. We chose conditions which involved several distinct issues, so as to capture some of the challenges that are often encountered in the real world, and where different elements of the HSC system need to be coordinated.

The three conditions, then, that were dealt with in three different BOGs, were:

- a) Diabetes (+ alcoholism),
- b) Pregnancy (+ hypertension) and
- c) Cardiovascular diseases (+ obesity).

The first step for each BOG was to describe the way in which each condition is handled right now, across different stages in the health pathway (see Annexe 3). Then, our original aim had been to contrast the treatment of the condition in each of the three elaborated starter scenarios. However, given that the scenarios had converged to such an extent, each group focused on its collective understanding of how PHS might enable change in the response to this condition, and what the PHS ecology might be. This was of course rather a simpler task – examining one possible future rather than contrasting a set of different scenarios.

3.1 “DIABETES + ALCOHOLISM” GROUP

The group discussed the case of Type 1 diabetes combined with a “behavioural” problem like alcoholism (though this later element was not given so much attention in the BOG’s work). The present pathway of the diabetes condition is described in the following table.

Table 1: Present pathway of Diabetes condition

<i>Stage in pathway</i>	<i>Crises, symptoms, treatment</i>
A Maintaining	Find a balance between a) insulin therapy, b) diet, and c) exercise.
B Challenging	Crises occur if blood sugar is either too low or too high.
C Responding	Adjusting insulin therapy, return to balancing the triangle (stage A)
D Monitoring	Can crises be reduced? Do late stage complications occur (eye damage, kidney damage, diabetic foot etc.)?
E Exit	Diabetes 1 cannot be cured. If treated well, it is not lethal either.

The future may see three generations of PHS technologies and services serving stages A, B, C and D. These are summarized in the following table.

Table 2: Future generations of PHS solutions serving the Diabetes pathway

Generation of PHS solution	PHS solution	Stage in pathway
1 st generation	<p>PHS solution: diabetes portal. After measuring blood glucose, patients send information via portal to health professional, who decides about intervention.</p> <p>Requires big data management.</p>	Stages A,B,C
2 nd generation	<p>PHS solution: GPS for diabetes patients. Food showing indicators about ingredients, an info-structure that allows people to access important information concerning foodstuffs, meals, etc.</p> <p>Observation: Supports patients in dealing with exceptional situations. In everyday life, diabetes patients learn to cope pretty soon how to deal with their illness, and calculate effect of their normal food on blood sugar rather well. But when invited or eating in restaurants, on holidays etc, it is more difficult to adhere to diets.</p> <p>Requires the food industry to cooperate.</p>	Stages A,B,C
3 rd generation	<p>PHS solution: smart insulin pumps in a closed loop within body. Sensors calculate effect on blood sugar in advance, and automatically inject the right amount of insulin. Help keeping blood sugar levels continuously within accepted limits.</p> <p>Requires pharmaceutical industry, health professionals and technology developers to cooperate.</p>	Stages A,B,C
	<p>PHS solution: Lab-on-chip for DNA or biomolecule detection, or special sensors for measurement of certain indicators (e.g. blood pressure) in a 3-month-interval.</p>	Stage D

- **Who is receiving what services and where?**

Diabetes is a disease that requires a certain life-style management to be retained at acceptable levels. Currently, diabetes patients maintain blood sugar levels within accepted limits through a combination of exercise and diet. They receive treatment when levels go beyond the limits through insulin injection which can either take place at home or hospitals.

- **What PHS and medical facilities, other facilities and infrastructure?**

Current PHS devices for diabetes monitoring have certain limitations. For instance, insulin pumps are not smart, glucose sensors cannot be implanted and they only provide a late response (~ 30 min). In the future GPS technology may enable detection of vital parameters about food and drinks available in the area. Smart insulin pumps will enable automatic monitoring and insulin release, while there will be more sophisticated monitoring (through lab-on-chip technology) or more sensitive technology to forecast glucose levels. Analytical skills of PHS data and information will thus be very important.

Other devices may be created for example for monitoring blood pressure to measure long-term complications or enabling multiple-parameter and big data analytics to determine insulin requirements. Personalized IT systems should also be developed to measure exercise for diabetes.

- **What roles of HSC staff?**

The group noted that the role of professionals will still remain important in the future. They will be the main actors intervening in crises situations, instructing curative measures (i.e. for late stage complications) but also in training diabetes patients. A steady and trustful relationship between doctor and diabetes patients is of major importance in order to ensure compliance.

Hence, it is not desirable to keep patients from seeing their doctors. Yet, it is desirable to delay onset and to keep patients out of hospitals. However, this requires new business models as currently funding is based on the number of people treated in hospitals.

For diabetes patients it is also important to develop a trustful relationship with family and friends that are able to take care of them when the need arises. Home and family play a major role in dealing with this condition. As diabetes needs a specific life-style, education, and training are also important and thus the respective professionals who in the future can be specialized coaches, or mentors or consultants. The overall aim would be to ensure a flexible life for diabetes patients like all other people. Furthermore, the 2nd and 3rd generation of possible PHS solutions, as mentioned above, require close collaboration with the food industry as well as pharmaceutical companies.

- **How are PHS services financed and the system governed?**

In terms of financing, current PHS devices (like blood sugar devices and strips) are presently reimbursed by the public health care system. Public financing is still seen important for the specific condition in the future alongside public governance. It is also important to define new business models based on the share of patients able to be monitored and treated outside the hospital. (This is already possible, as the BOG discussed the example of a Dutch insurance company active here.) In terms of governance, the role of government will still remain important in the future.

3.2 “PREGNANCY AND HYPERTENSION” GROUP

Pregnancy and delivery involve extremely high costs for the healthcare system. Pregnancy care practices vary today from country to country. In the Netherlands, for example, nurses make home visits to help women give birth while in Spain pregnant women usually make visits to hospitals or birth clinics. In between these two examples there are other options too like the “birth houses” (domino units) in the UK.

At the same time there are also major cultural differences with regard to perception and management of risk. In the Netherlands for example problems associated with complications are high because of the riskier approach taken to give birth at home. In Germany instead this rate is low because of the dominance of hospital care and risk adverse culture.

In future PHS could provide multiple types of support for monitoring the health status of pregnant women and providing relevant training to maintain a good health status all through pregnancy, delivery and child bed. Devices and services could focus on measuring weight, blood pressure, heart beat, or having ultrasounds, but also monitoring the fetus with non-invasive methods.

PHS devices and services could help better monitor and control risky pregnancies in the future by facilitating early detection and treatment. In support of such a development, there is an increasing trend towards risk avoidance alongside an increasing market for portable monitoring devices and certain other technologies that become standardized like genetic testing.

- **Who receives what services and where?**

Currently several non-invasive monitoring tools are available that are low-cost and easy to use as well as several informative applications for mobile phones, tabs, etc. In case of complicated pregnancy conditions more sophisticated PHS monitoring tools would be useful allowing measuring certain features of the mother and the fetus (blood pressure, weight, sugar levels, etc.) through non-invasive techniques that also link to specialized advice.

PHS services for pregnant women are able to deliver anywhere including homes, hospital or birth houses or while on the move.

- **What PHS and medical facilities, other facilities and infrastructure?**

Monitoring PHS devices for pregnant women could be connected to mobile devices. Alongside these devices there should also be applications integrating the data and storing them using cloud infrastructure. Such infrastructure could be public or private. The important thing is that it is trusted and privacy issues are respected. Monitoring could also be enabled through sensors, and other non-invasive medical instruments enabling for example fetal electrocardiogram.

- **What roles of HSC staff?**

PHS devices and services for self-monitoring may help filter the patients' condition allowing more time for healthcare professionals to attend to those that are more in need of professional help. In future new expertise will also be required in relation to monitoring and integrating analysing relevant data, dealing with post-natal depression through PHS, coaching to women to keep fit and health and training professionals as well as lay people to use the new technology.

- **How are PHS services financed and the system governed?**

PHS services and devices for pregnant women should be publicly financed driven by the interest to avoid hospitalization and lower the high costs of pregnancy and delivery. More sophisticated (luxury) services could be always supplied to the wealthy based on private funding.

3.3 "HEART DISEASE AND OBESITY" GROUP

In a condition of a cardiovascular disease combined with obesity the maintaining stage (maintaining a good state of health in order not to go over the threshold) of the respective pathway is the most challenging one. In maintaining a good state of health not to go over the threshold, monitoring is crucial. This is so, both before and after an acute incident, after which rehabilitation is also important so that the patient can go home faster.

In a future situation, as not all population can be monitored, selected segments of society should be chosen based on risk factors. Currently there are several PHS devices available for monitoring specific health conditions. The issue is to increase their use and acceptance by professionals. At the same time, there are also other factors hindering the use of PHS reflecting social or cultural issues that have to do with denial or reluctance in acknowledging the problems of heart disease and/or obesity and the need for serious behavioural changes that accompany them.

- **Who receives what services and where?**

The type of services can refer to evaluation of health status, diagnosis, treatment, monitoring, rehabilitation and palliative care. Where services are provided depends on the specific pathway stage. For instance, maintaining and monitoring services would be provided everywhere. Even today there are technologies enabling testing one's health condition on the spot, like the 'lab on the disc'⁸ (Scotland) or 'cardiac2' (Norway) or health monitoring kiosks⁹ in public places (Japan). Such monitoring or on-the-spot diagnostic devices /services would be linked to specialized services provided in hospitals in the responding stage of the pathway. Rehabilitation would need to be linked to specialized hospitals and also home care. Acute incidents would need to be treated in specialized hospitals.

Outside the hospital, the family would be the "unit of intervention" for providing psychological support and dealing with coping issues of the patients.

Prevention is very important for the specific combined condition. People with a predisposition would receive preventive measures. However, promoting healthy life styles is crucial even at very early ages of school children and students. Education has a primary role to play in this apart from policy campaigns, and regulation.

- **What PHS and medical facilities, other facilities and infrastructure?**

In the future, creating a gene profile for every individual would be the norm although this may entail certain ethical and legal issues in case the profiling becomes mandatory. Monitoring services will be taken even further along with more awareness and promotion of prevention through modern information technologies.

Technology will have a dual role; as a facilitator enabling all people to deal with patients (passers-by, lay people, waiters in shops, etc.) and as a substitute of certain interventions (like physicians' advice). Possible examples of devices/services include for example nano cleaners of blood vessels, ECG sensors, wearable, implantable, injectable devices for monitoring, hybrid human-technology services, anti-obesity drugs, non-invasive early warning systems, or predictive modelling. Overall, technology will be made more user-friendly empowering patients but also being fun through games and avatars. Attitudes of people towards technology will thus change and this may also lead to increased use and acceptance of PHS on the side of professionals.

A combined approach will be applied, even at the responding/treatment stage, involving surgery (which may increasingly become non-invasive), knowledge and awareness raising, and promotion of nutrition/healthy eating.

- **What roles of HSC staff?**

In the future there will be more specialization at the same time with more diversification of services provided by professionals. On the one hand, there will be different layers of specialization (GPs, practitioners,

⁸ See for example <http://pubs.acs.org/doi/abs/10.1021/ac203163u>, last accessed 2-7-2013.

⁹ See for example <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2705220/> last accessed 2-7-2013.

specialized staff about information integration, for supporting people to change behavior, coaches for mental support, etc.).

There will also be more professionals in diagnostic and surveillance processes to deal with the volume of information collected and all medical staff will be trained to use and apply PHS devices.

While medical training and education will be more sophisticated to respond to acute conditions in treatment but also apply PHS, softer services like health coaching and mentoring will be provided by additional, new staff categories with less specialized training. Coaching and mentoring will need to be provided a two levels; first in making people understand and accept their condition and treatment and secondly in the maintaining and monitoring stage. Overall, a variety of specialists will be coordinating their efforts based on PHS infrastructures.

The role of the food industry is important in promoting healthier eating habits with lower prices in low fat food for example. However, as this may clash with certain vested interests there is need for policy regulation in this area and additional measures (like campaigns, tax measures, etc.).

- **How are PHS services financed and the system governed?**

As in the other condition pathways, the plurality of financing sources is recognized in this case too. While prevention and monitoring devices/services would be for the RADs mainly financed by private sources (and as a consequence, public budgets can be shifted to where treatment and research are really needed), public and third sector sources would cover coaching and maintaining services. Public sources would still be the norm for dealing with acute incidents like heart attacks.

A driver of change would be that prevention is covered by public funding and actual treatment when needed is funded by individual's own money. This would reflect the cases of no compliance. However, ethical and other issues may arise if such an approach is taken also because of the complexity and uncertainty referring to how non-compliance is defined and how it is attributed to the individual.

At the same time investment needs to be made in prevention and promotion of health life-styles. In this regard there is room for certain regulations like tax measures on fat/sugar or junk food, the revenue of which can then be re-invested in prevention and treatment.

In the case of cardiovascular disease and obesity the role of government as well as media is of crucial importance given that informed people make better choices. While specialized hospitals and services will still remain important in responding to acute situations, the solutions lies in promoting healthy life-styles and putting emphasis on prevention. In this regard, policy measures like taxes on unhealthy food, mandatory labelling of products or even regulations banning unhealthy food in restaurants and public places may be possible solutions. This requires close collaboration with the food industry to increase and ensure food quality which may entail fighting certain vested interests.

At the same time, media campaigns and commercials promoting healthy life would also be relevant to sensitize society. The use of 'representatives' of certain groups that are less reachable for social/cultural reasons (like the Roma) would also be useful so as to spread the knowledge and relevant messages among their peers.

4. IMPLICATIONS

Several issues emerged as important across the different groups' discussions. These addressed all the different areas of action including science and technology, society, economy, and policy, while several of them spanned several of these areas.

The underlying objectives that emerged from the discussions that could also be considered as the main aims of a possible vision in PHS were about decreasing social inequities, and making healthcare affordable, focusing more on prevention than cure, decreasing mortality and increasing quality of life, and access to health care.¹⁰

4.1 IMPLICATIONS FOR PUBLIC POLICY

A common issue discussed in all groups was the issue of big data management, and data privacy. This offers an opportunity to understand trends, treatment impacts, real-time patient satisfaction and better organize healthcare systems and services with data analytics. Public financing of certain PHS services was also highlighted to increase access to as many segments of society possible in order to avoid increasing social divides.

Next, came the issue of certification and standardization of hardware, software, devices and systems to ensure quality of services and allow interoperability. Today there are organisations with such a mission created on the private sector's initiative such as the Continua Alliance¹¹. However, standardization and quality assurance is one of the main roles of public policy and steps towards this direction are necessary.

At the same time, policy should also pay attention to further developments of intelligent sensor-based devices and systems. Such a focus should aim at facilitating the:

- a) Bridging of technological gaps in existing devices (e.g. insulin pumps being not smart yet, glucose sensors not able to be implanted yet, etc.); and the
- b) Development of new PHS concepts, devices, and systems targeting special segments like people with dementia as these may find it difficult to operate "conventional" PHS applications.

The possible clash between interoperability and privacy issues should also be mentioned here. If not standardized and made interoperable data will not be used effectively causing major losses in the health systems. On the other hand, with interoperability and the emergence of developments like the "medical Internet" issues of privacy and data security come forth. Decisions should be made and special measures should be taken on ensuring data privacy and security while not hindering effectiveness of systems operation.

Public policy should also be oriented towards facilitating technological innovations and disseminating innovations in the area of PHS and also measures to facilitate development of lead markets in enabling users/patients' autonomy, filtering the complicated cases, and improving communication between users and professionals. Pre-commercial procurement – by public and/or third sector organisations – could play a crucial role in this regard. Existing initiatives in this direction like in the area of Ambient and Assisted Living promoted by the European Commission could set good practice examples¹².

The public and private sectors should work together in several respects. It was highlighted in the discussions about heart disease and obesity that the food industry should be in close collaboration with the public sector to promote prevention and healthy food and healthy eating habits. At the same time, there is room for improvements in the collaboration among fragmented public organisations to better support the patient pathway.

¹⁰ These aims were made explicit in the "heart disease and obesity" group discussion.

¹¹ <http://www.continuaalliance.org/>

¹² See for example <http://www.aalliance.eu/public/events/1st-european-forum-for-public-procurement-of-healthcare-innovation>

Another point noted was that the divide between different types of PHS devices would be related to the divide between RADs and REDs. RADs would have sophisticated personal devices which can provide service and care anywhere, REDs would come to special places like hospitals where they can either visit a doctor, or use “healthmats” (kiosks or devices similar to ATMs). In this regard, PHS devices would also be different: simple and cheap devices used by REDs (like cell phones) and luxury devices used by RADs. Decreasing social inequalities is an area of major importance for public policy.

Promoting wellness was among the major objectives set by the participants. In doing this a variety of ideas were mentioned about public measures and / or public-private collaborations. For instance public measures could be devised to support companies to help / guide their employees towards healthy life styles through occupational health programmes¹³. These could be accompanied by relevant industry measures within their corporate social responsibility programmes in partnership with their private health insurance policies. Public / industry campaigns could be created to increase engagement of society. Other types of measures were also suggested taken from existing ideas like the People Olympics for Social Innovation¹⁴ or companies to fight sedentary behaviour.

Another type of measures could be for example prevention campaigns or games and reaching the whole of society and through games. Such measures could be combined with taxing unhealthy food and/or providing incentives to make healthy food cheaper. Another point of public-private collaboration mentioned addressed measures and regulations to increase access to drugs (in collaboration with pharmaceutical companies).

Underlying all suggestions for measures to promote wellness the need was highlighted to improve the existing and also create new indicators for measuring quality of life by deploying both subjective (qualitative) and objective (quantitative) indicators. General indicators for change achieved over the years could include for example:

- Secured sharing of information across the health system
- Rate of use of PHS devices and services
- PHS devices and services become more user-friendly
- Patient (consumer) satisfaction / experience from the new services
- Doctors and nurses accept and increase making use of them
- Increasingly cheaper devices are designed
- Integration of PHS technologies and services in doctors' / public education
- All specialists are available at a distance through technology (video-based, mhealth)
- Statistics about consultation / training about PHS and healthy life-style management
- Long term: surveys during chronic conditions and before, after acute incidents about health status of patients using and not using PHS
- Training and education programmes such as at the new PHS departments in universities to fill the arising cross-disciplinary skill gap
- The emergence of visible signs of substantial differentiation between PHS segments (emergence of luxury devices, custom-made services, alongside simple, cheap PHS devices).

¹³ An example is the hypertension screening in the North of France
<https://www.programmevigisante.fr/>

¹⁴ http://www.linkedin.com/groups/PEOPLE-OLYMPICS-SOCIAL-INNOVATION-4844962?gid=4844962&trk=hb_side_g

Policy also has a role to play in disseminating good practice and modes of PHS application as well as in monitoring impacts and implications not only on primary individual users (micro-level) but also on health professionals and carers (meso level) as well as the whole health system (macro-level).

4.2 IMPLICATIONS FOR SOCIETY

While technology can support PHS developments, it is society that will drive PHS use, specialisation and expansion. PHS devices and services are oriented towards prevention and empowering patients and citizens in general in leading healthier life-styles. In this regard the behaviour and attitude of society has to be receptive of such a role.

Ensuring wide technology literacy and access and education about healthier life-style management is crucial in this respect. In certain groups like the “heart disease and obesity” it was made clear that relevant education and training programmes about healthy eating habits should start as early as primary school and continue over the years. A new relation with the health services should be established promoting life-long healthy habits and health life-styles.

At the same time education of health professionals should also include technology literacy and use while training for additional professions that become important in the health sector should be made possible like health consultants, mentors and coaches. Measures should also be taken to avoid potential wrong use of future devices while the negative effects of existing devices should also be further researched.

The role of the third sector was highlighted several times in the discussions both in terms of undertaking the provision of healthcare services to certain vulnerable groups of society (like in patients’ organisations) as well as in devising measures to support community and out-of-hospital patient care. Overall, it was considered important to promote the sense of belonging needed by people towards the third sector and the community by engaging in care and promotion of good health. At the same time social media could be used also in promoting the concept of “wellness” by also engaging the young people.

4.3 IMPLICATIONS FOR ECONOMY AND MARKETS

It was evident in all scenarios and conditions that PHS need new business models combining all different sources of finance (public, private and non-profit) while also reversing the current model of remuneration which is based on the patients received in hospitals rather than those that are monitored / treated outside the hospital. Non-technological infrastructure (e.g. insurance schemes) will also need to be redesigned.

Public-private partnerships were mentioned several times in financing and provision of PHS services. A common trend appeared to emerge more across the different scenarios, and then in the different condition pathways, that more conventional and standardized, publicly funded PHS services should be able to provide for as many segments of society as possible, while more sophisticated and highly personalized “luxurious” services would always be available for the more advantaged segments of the populations. Adding to those, the services supported by the third sector - like patients’ organisations, non-profit organisations, etc. - should be available for specialized groups.

Another common trend that seemed to emerge was that monitoring and maintaining services would more likely be available based on private financing and provided everywhere, while treating acute incidents would be a responsibility of public financing and specialized hospitals. The idea also came up that gains from providing niche services to the rich could be used for caring of the poor to serve the ultimate goal of getting more people treated.

It is also very important to stress the need for multi-disciplinarity in the PHS domain. It is not sufficient to have new technology developments only, while even sufficient technology is not enough to penetrate the market and be accepted by society. Appropriate market conditions and features of the technologies (like cost alongside reliability, robustness, user-friendliness, etc.) have to come to place.

5. CONCLUSIONS

An earlier version of this report was circulated to workshop participants to see if they wished to add further conclusions or elaborate action proposals indicated by the groups and in the plenary discussions, summarised above. **The authors of this report would like to thank all of the participants for their enthusiasm and inputs into the workshop and this text.**

Procedurally, the workshop was an unusual experience for its organisers, in that the “starter scenarios” from PHS2020 were not found to work well for this group. PHS2020 was an impressive study, and we had expected its scenarios results to remain relevant. However, perhaps because of the rapid changes underway and accumulation of experience in the PHS field and in public health more generally, this was only partly true. Ongoing technological change, results of social experiments, and effects of the economic crisis and its political reactions have all destabilised expectations. Nevertheless, the general approach has yielded valuable results, with rich accounts of possible future developments and the experiences likely in the three pathways.

The results of the workshop provide much food for thought. The PHS2020 scenarios were in part discarded because transition was thought likely to be largely an incremental affair, in no small part due to the complexity and scale of health service systems. The workshop proceeded to elaborate views of plausible futures which reflected this. One question, however, is whether we should pay more attention to possible shocks and “wild cards” that would promote more radical change – technological breakthroughs other than in PHS (for instance, in anti-ageing treatments), serious disease problems (new epidemics of high severity), crises in health services (e.g. exposure of systemic financial or ethical failures), and so on.

Even without wild cards, there are still many open questions about the development of PHS, perhaps more especially around the business models, and governance, of health and social care organised around these systems. The challenges and room for experiment here look to be less easy to forecast than do the technological trajectories.

In later steps in the PHS Foresight project we will be seeking to build a “success scenario” that can represent an aspirational future, around which a good deal of consensus can be established as to what is desirable and how we may get there. The present workshop has been an excellent step in this direction. The group of around 30 participants, comprising experts from a number of fields (technology developers, academics, researchers, industrialists, representatives of NGOs policy-makers) actively engaged in the workshop discussions and provided valuable information, comments, views, and ideas. This is reflected in the present report which is primarily based on their inputs. We hope this report will stimulate the participants to provide further feedback.

For the sake of objectivity we should also make the point that this report is less objective in the sense of questioning the necessity of PHS to start with. This is because the PHS Foresight project itself starts with the assumption that PHS offer such promising opportunities that versions of these systems are very likely to be applied, and it is far less likely that they will be rejected widely than that their use will be implemented in ways that reflect social concerns (about privacy, exclusion, inequality, security, isolation, and so on). The project

thus assumes that we should try to explore best ways of development for the benefit of society, and the workshop discussions reflect this.

To wrap up this note, we would like to end with some extracts from a note that Corinne Marsolier (Director, Healthcare Practices, Cisco Consulting Services) provided in response to the first draft of this report. Among other points, she wrote that our

“Health Care Systems have been responding to a large range of pressures by seeking “to place the patient at the centre of a connected health system, focus on prevention rather than treatment of diseases, coordinate not just healthcare but resources and processes in social care, education, life sciences; in simpler terms giving citizens the information and tools to take more responsibility for their state of health.” But, she notes that this strategy has been difficult, and that the “straightforward action plan can be summarized by the words ‘we all need to work together and break the silos’. Among the four interlocking themes that can act as pivot-points for change: integrated care, care at a distance, dynamic care, education. Our current healthcare systems are slow to innovate. Creating some disruptive innovation on the edge of the system may be the fastest way forward.”

ANNEXE 1 - BACKGROUND NOTES SENT TO PARTICIPANTS BEFORE THE WORKSHOP

PHS Scenarios: Workshop Note

Introduction

This is a background note for the PHS Foresight scenarios workshop to be held in Manchester on June 13 and 14, 2013. In the first of the three following sessions, it introduces the scenarios that are the starting point for the workshop, which have been borrowed from earlier work on this topic. More information on these scenarios is provided in an Annexe.

The scenarios are not intended to be predictions of what will happen, but to provide some idea of the range of plausible developments that might characterise the PHS field. Reality is liable to be a complicated and diverse mixture of different elements of these scenarios, varying over time, place, organisation, even medical conditions. The purpose of scenarios is to provide us with insight into the circumstances under which different developments might unfold, and the relations between different issues. We are likely to want to modify these starter scenarios to some extent so as to aid in this task.

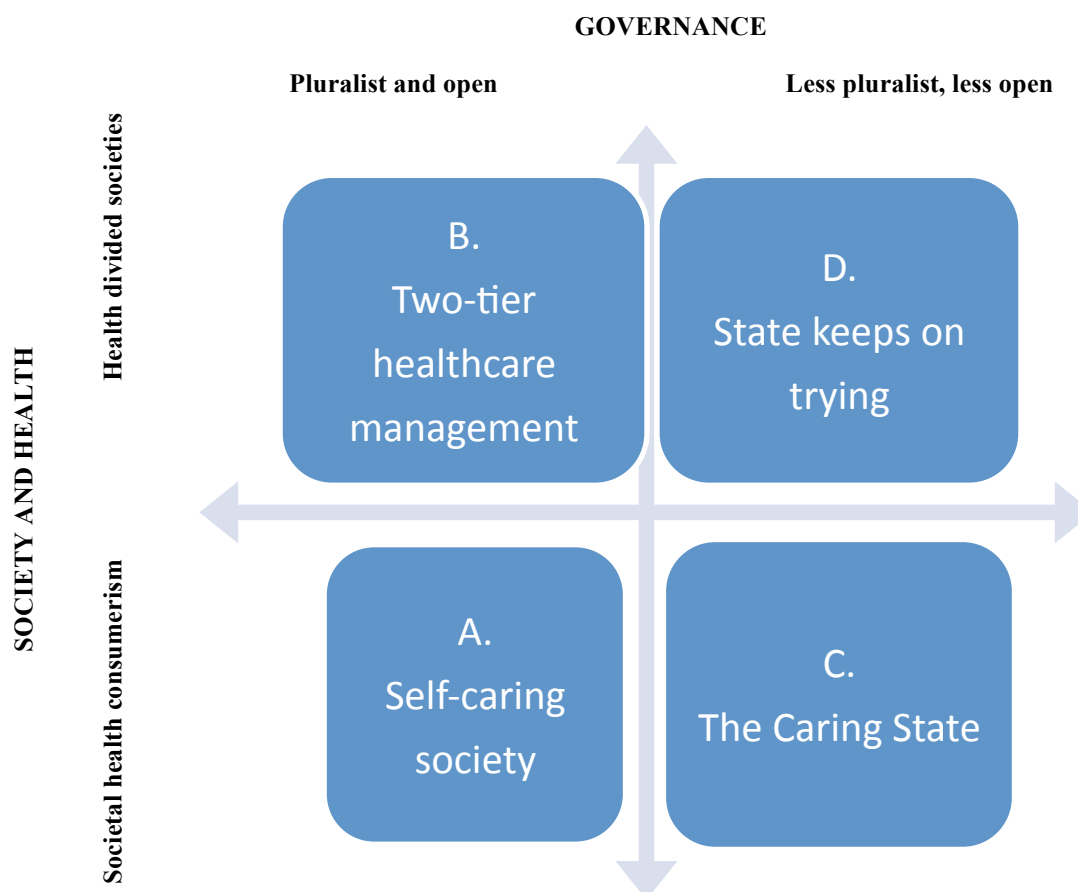
The second section of this note outlines the activities planned for the workshop. It will begin with overviews of the project and the PHS field, and we will then spend a while focusing on the scenarios. Once we are happy that we have a good grasp of these alternative future possibilities, we will move to consider what they might mean in practice for a set of exemplary health and wellbeing conditions. This should help us assess the implications of different ways of implementing PHS, and the choices that may need to be taken to influence these choices and their outcomes.

The final section of this note provides some final points of orientation.

We look forward to meeting you at his workshop!

Four Scenarios

This section outlines the four scenarios developed in an earlier study of PHS (Personal Health Systems), and originally published in the [PHS2020 Scenarios report D3.1](#), in 2008.¹⁵ This earlier study reviewed a large range of drivers of change in the PHS context, before elaborating four scenarios. We intend to use these scenarios as the starting point in our current exercise.¹⁶



¹⁵ A convenient way to access this is from the book of the earlier project, **“Reconstructing the Whole: Present**

and Future of Personal Health Systems” prepared by Cristiano Codagnone (whose work we draw on extensively here), and available at http://www.evia.imasdtic.es/cli_aetic/ftpportalweb/documentos/phs2020-book-rev16082009.pdf. Much of our text here is taken fairly directly from Codagnone’s material, with some editing to fit the purposes of this document.

¹⁶ For more on the present project, and our initial report ‘[Personal Health Systems: State of the Art](#)’, see the material at <http://www.phsforesight.eu/>. The references in these two footnotes should provide a concise introduction to the PHS field.

The scenarios, it will be seen, are demarcated in terms of two axes, that have been designed to capture many of the drivers seen as active in this field. These axes are:

- **Governance:** *how far will governments opt for a “lighter touch” state that substantially withdraws from production, control and financing of services (opening these roles up to new players), and also withdraws from efforts to shape consumers/patients attitudes - or will they retain a strong involvement in many ways (financing, enforcing healthy behaviours and compliance with standards, retaining full control of both production and delivery of services) and limit new players providing healthcare?*

The Governance axis presents this in terms of two possible extremes:

a) a **more pluralist and more open** governance and delivery of health care - where the government will focus mostly on policy making and monitoring of healthcare outcomes, will reduce its direct financing role, will introduce regulations and measures leading to new financing and business models, will stimulate public healthcare organisations and professionals to relinquish their full control on service provision, creating many new spaces for third party players to operate within;

b) A **less pluralist and less open**, government-dominated, governance - where the state and its network of healthcare organisations and professional remain the dominant players, where public financing will continue to be the main source of funding along already existing output based models and with closure to third party players confined to very limited niche markets.

- **Societal differentiation:** *how far will we live in a fairly homogeneous society where individual attitudes, behaviours and capabilities in relevant domains (attitudes to health, to technology, willingness/capabilities to pay) will tend to converge – or one in which we witness increasing differentiation, to levels even more marked than those visible today?*

The Society and Health axis presents this in terms of two possible extremes:

a) **societal health consumerism**, in which societies feature high levels of confidence in technology and specifically in remote treatment with little health professional intervention; these attitudes have permeated as much as 95% of the adult population, reducing potential problems of social exclusion;

b) **Health divided societies**, where the differentiation existing today has persisted and even been exacerbated, leading to a health-divided society, with serious problems of social exclusion.

These developments are “ideal types”. Real-world evolution may well be much more partial and uneven, with developments occurring at different rates and to different degrees across regions, countries, social groups, medical conditions, technology applications, and so on. The course of evolution will quite possibly be a stop-start one, with some trends emerging and then being replaced by countertrends. The precise mixture of arrangements is liable to be varied in complex ways, then. The ideal types, and the scenarios derived from them, are intended to help us grasp alternative possibilities, and the issues and drivers associated with these, rather than to predict the actual course of change.

Turning to the four scenarios, we can highlight a few of the major features. In **A**, “**Self-caring Society**”, government withdrawal and an open and pluralist governance framework is mutually reinforcing with an health consumerist society which poses relatively few social exclusion challenges. In **B**, the “**Two-tiers Healthcare Management**” scenario, a lighter touch government, confronted by

a split society, makes the conscious choice of a two-tiers management with a plurality of delivery players and models for the health consumerist segment of society, but with government intervention where social inclusion issues persists that can only be addressed through government funded traditional delivery. Healthcare's tiers result from conscious political choice. On the opposite site of the governance spectrum, in **C**, "**The Caring State (Good Big Brother)**" government retains full control and leverages social conditions to fully develop and use selected technology-driven PHS. The diffusion of such technologies and strong lifestyle guidance help contain rising healthcare costs and (though at the expense of full free choice for some consumers), can produce benevolent outcomes for citizens/patients. On the contrary, scenario **D** is to some extent a simple extrapolation of the current situation with its problematic elements worsening. The "**State Keeps on Trying**", but the impossibility of leveraging technologies and shape attitudes and behaviours results in steeply rising costs and to a *de facto* tiered healthcare with a worsened quality of publicly provided healthcare and a social gap s between those who can or cannot pay for better and more sophisticated services, including PHS. (One difference between the tiered nature of healthcare that exists in "**Two-tiers Healthcare Management**" and in "**State Keeps on Trying**" is that in the former it results from a conscious choice to cope with social exclusion issues, while in the latter is more a *de facto* result of trends that exacerbate such issues.)

ANNEXE 1.1 outlines each of the scenarios in two pages. In the workshop, we will for some of the time operate in break-out groups, and groups will be asked to explore how the application of PHS and the development of related services might vary across the scenarios.¹⁷

Workshop Activities

The workshop will proceed in the following manner.

First, we will review the broad spectrum of developments in PHS, and the potential and problems of these developments in addressing the health problems of advanced industrial societies. In keeping with the overall objectives of this study, we are not focusing on a celebration of possible technological breakthroughs that could "solve" health problems, but looking at PHS developments in the context of the service delivery systems and the business and service models of the different stakeholders that are at work here.

Second, we will outline the four scenarios (and the background analysis that went into their production), and consider how – if at all – we might need to further elaborate to alter these to deal with (a) the changes in the environment that have occurred in the last 5 years – which include obviously the economic crisis (and its political ramifications), but also possibly changes in terms of technological development and learning about the operation of new health systems; and (b) the longer time horizon that the present study is working to (beyond 2020). We will work in break-out groups that will consider how various features of the scenarios might evolve; we may even rename the scenarios; in any case the aim is to arrive at a working set of scenarios to be used in the next steps of the workshop. The scenarios should indicate plausible paths of development that innovators, policymakers, and other stakeholders need to take seriously when thinking about the long-term development of health systems.

¹⁷ For a brief introduction to scenario planning methods and approaches, set within the context of a more general introduction to Technology Foresight, see p 168-193 in The United Nations Industrial Development Organization (UNIDO) **Technology Foresight Manual** (vol.1) 2005, available at https://www.unido.org/foresight/registration/dokums_raw/volume1_unido_tf_manual.pdf

Third, we will move from general discussion of the scenarios to consider some actual health conditions. For example, we might consider the case of an elderly person with some degree of dementia, and also suffering from one or more chronic conditions such as diabetes; a middle aged person recovering from a stroke or serious accident; a young mother-to-be in need of support associated with health and social circumstances. The precise cases are still being determined, but for each of those finally selected, we will want to develop a basic blueprint of the main ways in which the service is configured at the present time. We may well need to take into account that citizens of different types may have different experiences within a given system, and that health service arrangements of different types are currently in existence. Such different starting points may be more or less influential on the configuration of future PHS arrangements.

Fourth, we shall examine how the management of services and treatment of citizens/patients is liable to vary across the four scenarios. What are the differences in configurations of service provider, in technologies and PHS devices in play across the scenarios? How might systems of finance and reimbursement vary across the scenarios? Can we depict these in the framework of new blueprints or pathways of service provision?

Fifth, we shall bring together the analyses developed around particular health conditions, and look for common features and points of divergence between them. Possibly stakeholder arrangements seen as appropriate in one case are applicable in other cases; perhaps they represent radical alternatives. We shall explore these points, and seek to develop some general conclusions about possible evolution of PHS arrangements across the different scenarios.

Finally, we will derive recommendations from these discussions, dealing with such topics as: indicators that we are moving more in the direction of one scenario than others; challenges that will need to be faced in the event of materialisation of one or other set of changes; needs for monitoring, research, and compilation of evidence; steps to outlining a desirable future that could be widely endorsed across EU member states (or, if this is not practicable, different models that might apply to different circumstances).

This is a challenging agenda, so the discussions will need to be tightly structured, and the organisers will thus propose that we treat issues in particular ways, for specific periods of time, using such tools as white boards and post it stickers to capture points arising. We will be asking participants to engage in the activities with an open mind, and to avoid presenting lengthy prepared statements or the position of one or other organised group. This will establish the possibility of a real learning experience.

End Note

We hope that workshop participants will join in activities in an active and open-minded way. We are not expecting participants to bring prepared speeches, and we request that you discuss matters on the basis of your own knowledge and experience, rather than presenting the position of one or other organisation.

Annexe 1.1: Four Scenarios from the PHS2020 study

SCENARIO A: Self-caring Society –part 1

Scenario story

With pervasive health consumerist attitudes and behaviours in a society where digital inclusion is almost complete and confidence in technology high, the government has moved to a steering role (oversees outcomes and stimulate compliances through soft methods) reducing the direct intervention and financing of healthcare except for acute problems and has opened up to a variety of players, who compete for public but decentralised reimbursements provided through an outcome-based model and/or for consumer out of pocket expenditure and thus provide integrated PHS services at competitive prices to consumers/patients taking most health matter in their own hand and at ease with remote technology driven services entailing little intervention from healthcare professionals.

Macro environment

- While the implications of ageing society have become fully visible with increase in chronic diseases and in their co-morbidity patterns and large pool of elderly requiring assistance with neuro-psychological disorders are also on the rise, improvement in prevention and the widely PHS tools available to individuals in their double role of consumer/patients and ‘care consumer managers’ for friends and relatives, together with full digital inclusion and technology confidence, are maintaining the equilibrium of the system and reducing compliance problems among the elderly;
- The government has moved from ‘rowing’ to simply ‘steering’ in a new pluralist and open Networked Governance model where the principle of horizontal subsidiarity is fully implemented. With the exception of acute medicine, other functions are exercised also by private health organisations and by other non health care players especially for the delivery of PHS services, competing with public health care organisations. Government is engaged in strategic policy making, facilitating the processes (privacy, data sharing, standards, interoperability) monitoring and measuring of outcomes, devising indirect control and soft incentives to compliance, all of which has been largely centralised with lower roles for regional and local governments except for the allocation of outcome based reimbursement. As a result the public funding share of healthcare expenditure has decreased, but affordable coverage of the population is maintained through cooperation and competition between public and private players;
- Government, however, will be directly involved in decision, investments and realisation of basic infrastructures favouring the development of innovative technology based PHS and other eHealth applications
- Healthcare costs are still high after years of rising trends but the trend is stabilised and being gradually reversed, and new public resources have been realised for spending on public health and prevention.

(continued)

SCENARIO A: *Self-caring Society – part 2*

Transactional environment

- Public funding has become decentralised and competitive. Regardless of the different institutional model (NHS or social insurance) the higher level bodies provide fixed budget to lower tier bodies who are free to allocate them according to various scheme and particularly using outcome based competitive reimbursement to public and private healthcare organisations and to third parties. Also public healthcare organisations in turns can outsource some of their tasks and enter into various deals with private players. Willingness to pay and actual out of pocket outlay are increasing for most sophisticated services. Outcome based financing is also used by private insurances signing schemes directly with healthcare providers;
- Public healthcare organisations and their professionals, as well as General Practitioners, have embraced PHS services providing full empowerment to consumers/patients directly or through the intervention of third parties. The new top down standards and inter-operability requirements and the need to open to external private provider and/or compete with them has favoured integration of data systems, which in turn are fostering integrated care solutions at the local level. Benefits are being felt and large public healthcare organisations show a 80/20 patterns, where 80% of less complex matters are taken care by PHS directly entrusted on the citizens/patients or provided by third parties, whereas resources and expertise (naturally with diminished budget) will concentrate on the 20% most critical and difficult cases and on new research;
- Advancement in technological solutions and the new state approach have enabled the emergence of a few large technology suppliers and media companies that, aggregating the services of the many providers populating the value chain, have achieved standardisation, inter-operability and economy of scale. This has mainstreamed earlier niche innovative and very expensive products/services into mass market ones provided at affordable prices.

Users

- They are fully confident in technology, digitally included, and technology-users interaction, if need be, is facilitated bottom up by social intermediaries (family and friends);
- They want to take full part in deciding about their treatment in a symmetric and negotiated relationship with healthcare professionals;
- While increasingly aware and informed, some still represent risks in terms of compliance;
- Are comfortable with remote interaction and willing to proceed with little intervention on the side of healthcare professionals;
- They are reluctant, except that in most acute conditions, to use invasive and uncomfortable data gathering devices;
- Outcome based competitive public reimbursement reduce exclusion from PHS for the socio-economic disadvantaged;
- Recently retired wealthy baby boomers pay for more sophisticated and advanced PHS services.

SCENARIO B: Two-tiers Healthcare Management – part 1

Scenario story

While social gaps with respect to health consumerism and access to, and confidence in, technologies persist, nonetheless the government has moved to a steering role (oversees outcomes and stimulate compliances through soft methods) reducing the direct intervention and financing of healthcare except for acute problems, and opened to a variety of players competing for public but decentralised reimbursements provided through an outcome-based model and/or for consumer out of pocket expenditure thus providing integrated PHS services at competitive prices to consumers/patients, who take most health matter in their own hand and are at ease with little intervention from healthcare professionals. The gains and savings derived from the approach to the most advanced health consumers, are used to subsidise the other segment of consumers/patients and provide them traditional treatment and specific PHS services with sophisticated inter-face and with the support of professional intermediaries.

Under this scenario the macro and transactional environment resemble the description provided for the “Self-caring Society”, with some variations and additional characterisation. Below we emphasise the more particular elements.

Macro environment

- With the implications of ageing society fully visible (see description provided for Scenario A) the two-tiers management of healthcare and the related fairly large use of PHS services by the consumerist segment of society help addressing the traditionalist segment while containing the pressure on healthcare but cannot entirely restore the financial equilibrium of the healthcare system;
- The government has moved from ‘rowing’ to simply ‘steering’(see description provided for Scenario A) but has preserved ad hoc funds and delivery mechanisms for intervention where social inclusion issues persists that cannot be addressed otherwise than through government funded traditional delivery;
- The rise in healthcare costs is contained and partially stabilised but no signs of reversing are visible.

(continued)

SCENARIO B: Two-tiers Healthcare Management – part 2

Transactional environment

- Public funding has become decentralised and competitive for the delivery of services to the consumerist segment of users (see description provided for Scenario A), but central budget allocation are preserved for the treatment of the traditional segment of users;
- Besides full provision of PHS service by public and private and new players see description provided for Scenario A), especially public healthcare institutional use ad hoc government funding for delivering services to the traditionalist segment of users;
- The provision of PHS services to the consumerist users by way of new financing mechanisms (see description provided for Scenario A) has helped mainstreaming earlier niche innovative and very expensive products/services but not in such a way to turn all of them into mass market ones provided at affordable prices. Some remain niche services provided for out of pocket payment only by the most affluent among the consumerist users.

Users

Given the split of society between a segment of health consumerist digitally included and technology confident users and one presenting opposite characteristics the characterisation of users under this scenario resembles that of “**Self-caring Society**” scenario with the following additional elements:

- The segment of health consumerist and technology confident users are strongly encouraged to use remote PHS services provided by several players and do use them with ease;
- In society there still is a considerable segment of users who have passive attitudes toward health and/or are digitally excluded, and/or are still not confident with technologies and continue to prefer face2face interaction with healthcare professionals. These users rely on traditional treatment provided by publicly funded public or private healthcare organisations;
- The conscious differential treatment of the two segments of society pursued by government attenuate social divides that, however, persist to some extent in relative terms (the consumerist segment having more opportunities than the traditionalist one and within the consumerist the more wealth having more choices).

SCENARIO C: The Caring State (Good Big Brother) – part 1

Scenario story

Although pervasive health consumerist attitudes and behaviours became dominant, the outbreak of acute crisis management have led the government to retain and increase control and direct financing and production of all healthcare services including PHS and reach high level of public financing of healthcare expenditure with little, if any, reliance on private players. Additionally the state enforce through hard incentives as a social responsibility healthy lifestyle and monitoring onto consumers/patients and aims to leverage and shape consumerist attitudes by fully controlling some prioritised PHS, placing high emphasis on compliance with treatment and lifestyles prescribed by healthcare professionals.

Macro environment

- With the implications of ageing society fully visible (see description provided for Scenario A) government controlled and provided PHS services focussing mostly on ensuring compliance and in monitoring acute conditions help containing the pressure on healthcare but cannot entirely restore the financial equilibrium of the healthcare system;
- The government directly and through its various healthcare institutions takes the full responsibility for the health status of its citizens, at all levels. Healthcare is funded for above 80% by public money, gathered through the general tax system. Except for the case of the elderly with ability problems, strict rules sanction non compliance to treatment and lifestyle guidance, excluding the non compliant from public funding of certain treatment and requiring from them cost-sharing for others. Inter-operability, guidelines, and standards for the provision of PHS are strictly dictated from the centre that monopolise the management of PHRs, not inter-operable and open to third parties players such as technology suppliers and media companies;
- Centralised government control and direct intervention in many domains bring about positive outcomes in terms of inter-agency integration and also of integration across social support, primary, secondary, and tertiary care, with healthcare organisations and professionals resistance overcome leveraging against them the expectations and needs of citizens/patients for seamless and technology supported services. Inter-mediate government tiers such as regions and local governments loose power;
- The trend of rising healthcare costs is contained but not reversed, despite efforts to curb non compliance and to enforce healthy lifestyles;

(continued)

SCENARIO C: *The Caring State (Good Big Brother) – part 2*

Transactional environment

- Public funding remains centralised, with a limited role for private insurance and the out of pocket outlays remaining of the same level as in the past. The prioritised PHS services provided by public healthcare organisations are directly financed by central government;
- Public healthcare organisations and their professionals, as well as General Practitioners, retain full control of government funded PHS services, without any third party intervention and without relinquishing control in favour of consumers/patient empowerment. While some resistance still remain, government enforcement leads to integrated care solutions in limited areas, mostly aiming at early diagnosis compliance and enforcing healthy lifestyles;
- Despite top-down inter-operability and emphasis on some specific PHS applications, the PHS market taken in its entirety is not mainstreamed and remains fragmented into niche each dominated by few preferential providers of public institutions. In parallel a market develops based on PHS voluntarily provided by consumers to large technology and media companies who are also providing PHS services, where the scale and nature of such services is such that their prices remain high and thus they mainly cater to wealthy individuals able to pay for them.

Users

Users present the same characteristics described in Scenario A “**Self-caring Society**”, with the following additional characterising elements:

- Most citizens/patients tolerate the benevolent but intrusive and limiting approach of government in exchange to the wide and affordable coverage it provides also in terms of PHS services. While reluctant, under certain conditions, they even accept PHS services based on invasive and/or uncomfortable data gathering devices;
- Those most independent and interested in taking health in their hand resort to advanced web tools for information and self-diagnosis provided by non public actors as well as to web 2.0 and community of interests;
- Affluent in the age group 45-55 and recently retired wealthy baby boomers pays for niche PHS services (different from those provide by the government) delivered by private players, while socio-economic disadvantaged individuals are fully excluded from PHS services other than those prioritised and provided by the government.

SCENARIO D: State keeps on trying – part 1

Scenario story

Social gaps with respect to key dimensions (health consumerism, access to, and confidence in, technologies) have persisted (constraining take up and mainstreaming of PHS and other eHealth innovations), the role of government related healthcare institutions and basic financing mechanisms have not changed but rising costs are de facto eroding the full public coverage of the population, with PHS services consolidated into a niche consumer electronics market and paid for by out of pocket outlays, thus sharpening social divide between those who can and those who afford them, although acute resources shortages have led to increasing deployment of a few PHS systems especially for long term care of the elderly being financed out of the public budget.

Macro environment

- With the implications of ageing society fully visible (see description provided for Scenario A) and given little innovation and limited take up of PHS healthcare systems are under strong pressure;
- The government directly and through its various healthcare institutions remains the main player and funder of healthcare, although public budget crisis are slowly but gradually *de facto* eroding public coverage of the population, with quality of care varying widely across the system and increasing problems of access and waiting lists, forcing increased out of pocket expenditure and the adoption of private insurances. The government has difficulty to enforce issues of interoperability, guidelines, and standards for the provision of PHS, though pilot projects and some local specific developments consolidate for some specific applications;
- Fragmentation increases both in verticals terms (across tiers of governments) and within the different tiers of healthcare (GPs, primary, secondary, etc).
- Growth rates in healthcare cost are no longer sustainable and the government is forced to reduce overall amount of funding while still trying to preserve universal coverage, which leads in practice to rationing and high variability in quality of publicly funded/provided care;

(continued)

SCENARIO D: State keeps on trying – part 2

Transactional environment

- With public funding *de facto* eroded and affecting average quality and access, besides out of pocket expenditure, regional bodies and/or large healthcare organisation are testing localised agreement with private insurances to cover some segment of their population of reference. Even public healthcare organisation increasingly provide special services and treatment for out of pocket payments;
- • Public healthcare organisations and their professionals, as well as General Practitioners still show resistance to PHS and little signs of integrated care. On the other hand increased workloads and acute shortage especially of nurses and other staff needed to care for patients recovering from sever conditions and for severely impaired elderly in need of steady assistance pushes them to adopt some specific PHS solutions in cooperation and partnership with technology suppliers;
- The consumer electronic models directly paid by consumers/patients consolidate, but the products on offer are not enough for the mainstream; the market for these products is still characterised by niche players, fragmentation, and high prices that are affordable only by the more affluent segments of society.

Users

Users present the same characteristics described in Scenario B “**Two-Tiers Healthcare Management**”, with the following additional characterising elements:

- Within the segment of health consumerist and technology confident users the more affluent pay for the limited PHS services available in the consumer electronics market
- Within the segment of non consumerist and more traditionalist users, the wealthy pay for higher quality services provided by private organisation or by public organisation outside of publicly funded schemes, whereas the less affluent must relying only on the traditional services publicly funded, adapting to varying quality and waiting lists;
- The elderly and those in need of long term care are forced to accept technology based solution given lack of carers paid by public financing and of means to pay for private carers;
- Those presenting the characteristics of full health consumerism described in the “free choice self-care” scenarios and capable of paying use the limited services available in the consumer electronics market;
- Social divides are evidently increasing.

ANNEXE 2 - WORKSHOP TIMETABLE

The timings presented here are those originally proposed: in the event there was much slippage.

	930	30mins	Introductions
	1000	60mins	Introductory presentations on project and PHS
Tea/coffee (1100)			
	1130	15 mins	The three scenarios
	1145	75 mins	Break-outs: elaborating scenarios (3 groups, one for each scenario – exploring overall most common business models and service ecosystems)
Lunch (1300)			
	1400	30mins	Plenary: summarising scenarios – the three dominant models for PHS. <i>Presentations by rapporteurs</i>
	1430	15mins	On pathways
	1445	30mins	<i>Break-outs: service pathway for health conditions now (3 groups, one for each condition)</i>
Tea/coffee (1515)			
	1545	60 mins	Break-outs: service pathway for health conditions in each scenario (continuing 3 groups, one for each condition)
	1645	30 mins	Feedback from rapporteurs

	930	30 mins	Plenary: comparing conditions and scenarios (includes session 4 powerpoints) <i>Further presentations by rapporteurs; discussion</i>
	1000	60mins	Break-outs: Generalisation and synthesis (3 groups, one for each scenario) <i>Note: these groups were organised by pathway, in the end</i>
Tea/coffee			
	1130	30 mins	Carousel session - move around posters of issues and actions. <i>Note: this session was not conducted, due to overrun of previous activities</i>
	1200	30mins	Plenary: Messages - priorities and issues arising
	1230	30mins	Wrap-up
Lunch (1300)			

ANNEXE 3 - PARTICIPANT NOTES FOR WORKSHOP

PHS WORKSHOP: NOTES FOR PARTICIPANTS

This hand-out provides description and orientation to the various activities we will be undertaking in Break Out Groups (BOGs). It consists of the following sections:

- (1) A brief account of the BOGs and the roles in them. (p2)
- (2) Summary of the three scenarios (these will be renamed) introduction (p3)
 - a. Scenario A (p4)
 - b. Scenario B (p7)
 - c. Scenario C (p9)
- (3) The Scenario Characterisation Task (p11)
- (4) Three Pathways and the Pathway Characterisation Task (p12)
- (5) Pathways and Scenarios – the Task (p13)
- (6) Learning from Scenarios (p14)

In addition to the BOG sessions listed here we will also be engaging in plenary discussion and the like.

BREAK-OUTS

Why break-out groups? Smaller groups allow more people more chance to make inputs, and provide an opportunity for more focused discussion. There are several roles involved:

(1) Each group should appoint a chair and a rapporteur at the outset. The groups should, ideally, also be composed heterogeneously, e.g. health professionals, technology specialists, researchers, etc. The role instructions below should be known to members.

(2) Chair's role: to keep the break-out groups to their tasks; to ensure that all participants have a say and that people are not being excluded due to other people's forcefulness or superior status, to defuse conflicts. To stop criticism that inhibits creativity and free expression. To prevent people giving long lectures and not engaging with the task or listening to others. May provide leadership and impose a procedure, but may not impose one perspective.

(3) Rapporteur's role: to keep notes on the process and decisions, and be prepared to report these back to the workshop, in a succinct way. To prepare a 5-10 minute presentation when feedback is expected from a session or set of sessions. It helps to write down ideas as they emerge onto a laptop, a whiteboard and/or on flip charts, etc. This demonstrates that ideas are being captured and gives a point to reflect back on. Such captured information may also be useful for the plenary presentation; as a guide to how things were discussed, or a list of major points.

(4) Everybody's role: Remember that you are being asked to participate as an individual, not a representative of an organisation. Please talk on the basis of your views, your knowledge – not just echoing the "line" of a particular organisation. Please talk in relation to the tasks, do not try to give a prepared lecture, take this as a conversation where we can learn from each other. When we brainstorm, let ideas flow, do not stop to criticise each others' thinking. One ground-rule of "Foresight" work is that remarks are not attributed to individuals (unless they want credit!), and people should be free to express their views, and to debate each other's views, in the spirit of constructive dialogue. This is not a career development review!

Note that we have very limited time to conduct some quite ambitious discussions. This meeting will not be the final word, but should be a great starting point for further thinking. In order to get some sense of priorities and group feeling, we will have to select among the many things that are deserving of attention. One way to do this is to take the top few items that strike us as particularly worth further attention. This should not mean that other points are lost from the collective consciousness, just that they will be put to one side in the discussion today (though they may well pop up again in any case!).

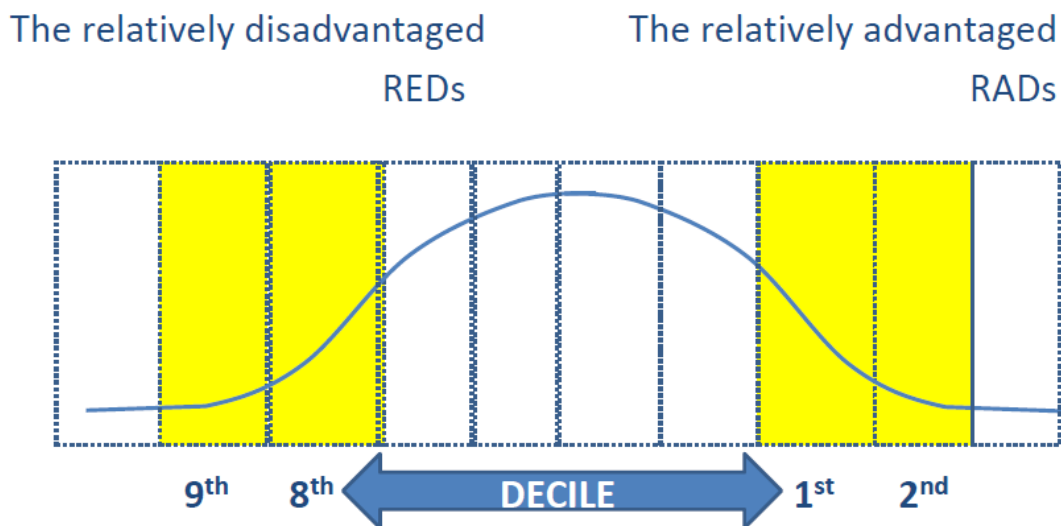
THE “STARTER” SCENARIOS

The first task for each BOG is to make the scenario they have been assigned their own. Establish a vision of this scenario that represents a plausible future for you of how the PHS scene could be in a European country in 2030, something that could really happen (though details might differ from place to place). Develop an account of what this scenario looks like, where it comes from, what drives it. Give it a name.

The three scenarios are on the following pages.

To deal with social divides, we consider two (not quite extreme, but contrasting) social groups:

- REDs – relatively disadvantaged – 8th and 9th decile
- RADs - relatively advantaged – 8th and 9th decile.



Note that the acronym HSC= Health and Social Care.

SCENARIO ALPHA

This is a fusion of self-caring Society and Two-Tier Healthcare scenarios from the earlier studies. Thus it combines the two earlier scenarios that each feature **more pluralist and more open** governance and delivery of health care - where the government focuses mostly on policy making and monitoring of healthcare outcomes, reducing its direct financing role; the state introduces regulations and measures leading to new financing and business models, and it stimulates public healthcare organisations and professionals to relinquish their full control on service provision, creating many new spaces within which third party players can operate. (The two original scenarios differ mainly in terms of social inclusion/exclusion; if you find the “merged” description below inadequate, please feel free to select one or other part of the account and revise the remainder.)

We label this Scenario Alpha below – please give it your own name that captures its essence.

Scenario Alpha’s story

*The government has moved to a steering role, overseeing outcomes and stimulating compliance through soft methods. Its direct intervention in and financing of healthcare has been substantially reduced, except for acute problems. HSC has been opened up to a variety of players, who compete for public but decentralised reimbursements (provided through an outcome-based model) and/or for consumer out of pocket expenditure. These players provide **integrated** PHS services at competitive prices to consumers/patients who take most health matters into their own hands, and are at ease with remote technology-driven services entailing little intervention from healthcare professionals. However, social gaps persist with respect to such health consumerism and access to, and confidence in, technologies; digital inclusion and spending power are far from equally distributed. The most advanced health consumers (RADs) have excellent PHS, and this permits some gains and savings in HSC services that can be used to provide other segments of consumers/patients both with traditional treatment and specific PHS services with sophisticated interfaces and with the support of professional intermediaries.*

Scenario Alpha’s Macro environment

- The implications of ageing society have become visible with increases in chronic diseases and in their co-morbidity patterns, and a growing pool of elderly requiring assistance with neuro-psychological disorders; but improvement in prevention and the wide availability of PHS tools available to individuals in their double role of consumer/patients and ‘care consumer managers’ for friends and relatives, together with full digital inclusion and technology confidence, help maintain the equilibrium of the system and reduce compliance problems among the elderly;
- Healthcare costs are still high after years of rising trends - but the trend is stabilised and being gradually reversed, and new public resources have been realised for spending on public health and prevention.
- The government has moved from ‘rowing’ to simply ‘steering’ in a new pluralist and open Networked Governance model where the principle of horizontal subsidiarity is implemented. With the exception of acute medicine, other functions are exercised also by private health organisations and by other non-

health care players especially for the delivery of PHS services, competing with public health care organisations. Government is engaged in strategic policy making, facilitating the processes (privacy, data sharing, standards, interoperability) monitoring and measuring of outcomes, devising indirect control and soft incentives to compliance, all of which has been largely centralised with lower roles for regional and local governments except for the allocation of outcome based reimbursement. As a result the public funding share of healthcare expenditure has decreased, but affordable coverage of the population is maintained through cooperation and competition between public and private players;

- The government has preserved some ad hoc funds and delivery mechanisms for intervention where social inclusion issues persists that cannot be addressed otherwise than through government funded traditional delivery;
- Government is also directly involved in decision, investments and realisation of basic infrastructures favouring the development of innovative technology based PHS and other eHealth applications
- The two-tiers management of healthcare and the related fairly large use of PHS services by the consumerist segment of society (RADs) help addressing the traditionalist segment (REDs) while containing the pressure on healthcare but cannot entirely restore the financial equilibrium of the HSC system.

Scenario Alpha's Transactional environment

- Public funding, at least for the delivery of services to the consumerist segment of users, has become decentralised and competitive. Regardless of the different institutional model (National Health Service or social insurance) the higher level bodies provide fixed budgets to lower tier bodies who are free to allocate them according to various schemes - particularly using outcome-based competitive reimbursement to public and private healthcare organisations and to third parties. Public healthcare organisations can outsource some tasks, and do enter into various deals with private players. Willingness to pay and actual out of pocket outlay are increasing for most sophisticated services. Outcome based financing is also used by private insurance firms, signing schemes directly with healthcare providers;
- However, there may be elements of a two-tier system still in place, with some central budget allocations still needing to be preserved for the treatment of the traditional (less consumerist) segment of users;
- Public healthcare organisations and their professionals, as well as General Practitioners, have embraced PHS services that provide full empowerment to consumers/patients directly or through the intervention of third parties. The new top-down standards and inter-operability requirements, and the need to open to and/or compete with external private providers has favoured integration of data systems - which in turn are fostering integrated care solutions at the local level. Benefits are apparent, with large public healthcare organisations showing a 80/20 patterns, where 80% of less complex matters are taken care by PHS directly entrusted on the citizens/patients or provided by third parties, whereas resources and expertise (naturally with diminished budget) will concentrate on the 20% most critical and difficult cases and on new research;

- However, some public healthcare institutions still need to use ad hoc government funding for delivering services to the traditional (non-consumerist) segment of users. While the provision of PHS services to the consumerist users by way of new financing mechanisms has helped mainstreaming innovative products/services (that were earlier often niche and expensive solutions), many of these are still not mass market ones provided at affordable prices. Some remain niche services that are provided for out of pocket payment only by the most affluent among the consumerist users;
- Advancing technological solutions and new governance approaches have enabled the emergence of a few large technology suppliers and media companies. These, aggregating the services of the many providers populating the value chain, have achieved standardisation, inter-operability and economy of scale. This has also helped mainstreaming of innovative products/services into mass markets.

Scenario Alpha's Users

- RADS: Recently retired wealthy baby boomers pay for more sophisticated and advanced PHS services.
- Many people, including many elderly people, are fully confident in technology, digitally included, and technology-users interaction, if need be, is facilitated bottom up by social intermediaries (family and friends);
- The segment of health consumerist and technology confident users are strongly encouraged to use remote PHS services provided by several players and do use them with ease; they are comfortable with remote interaction and willing to proceed with little intervention on the side of healthcare professionals;
- They want to take full part in deciding about their treatment in a symmetric and negotiated relationship with healthcare professionals;
- While increasingly aware and informed, some still represent risks in terms of compliance;
- They are reluctant, except that in most acute conditions, to use invasive and uncomfortable data gathering devices;
- Outcome based competitive public reimbursement reduce exclusion from PHS for the socio-economic disadvantaged;
- However, there is some split of society between a segment of health consumerist digitally included and technology confident users, and a considerable segment of REDs. These users who have passive attitudes toward health and/or are digitally excluded, and/or are still not confident with technologies and continue to prefer face-to-face interaction with healthcare professionals. These users rely on traditional treatment provided by publicly funded public or private healthcare organisations;
- The conscious differential treatment of the two segments of society pursued by government attenuate social divides that, however, persist to some extent in relative terms (the consumerist segment having more opportunities than the traditionalist one; and within the consumerist segment, the more wealthy having more choices).

SCENARIO BETA

This is a scenario where governance of PHS is more government-dominated and where there are substantial health divides in society. The state and its network of healthcare organisations and professional remain the dominant players, and public financing continues to be the main source of funding along already existing output based models and with third party players confined to limited niche markets. Social differentiation existing today has persisted and even been exacerbated, leading to a health-divided society, with serious problems of social exclusion. This was originally described as “State Keeps on Trying”, we label this Scenario Beta below – please give it your own name that captures its essence.

Scenario Beta’s story

Social gaps between RADs and REDs with respect to key dimensions (health consumerism, access to, and confidence in, technologies) have persisted (constraining take up and mainstreaming of PHS and other eHealth innovations), the role of government related healthcare institutions and basic financing mechanisms have not changed but rising costs are de facto eroding the full public coverage of the population, with PHS services consolidated into a niche consumer electronics market and paid for by out of pocket outlays, thus sharpening social divide between those who can and those who afford them, although acute resources shortages have led to increasing deployment of a few PHS systems especially for long term care of the elderly being financed out of the public budget.

Scenario Beta’s Macro environment

- With the implications of ageing society fully visible (with increases in chronic diseases and in their co-morbidity patterns, and a growing pool of elderly requiring assistance with neuro-psychological disorders). This scenario features relatively limited innovation and take up of PHS. Thus HSC systems are under strong pressure;
- The government directly and through its various healthcare institutions remains the main player and funder of healthcare, although public budget crisis are slowly but gradually *de facto* eroding public coverage of the population, with quality of care varying widely across the system and increasing problems of access and waiting lists, forcing increased out of pocket expenditure and the adoption of private insurances. The government has difficulty in enforcing issues of interoperability, guidelines, and standards for the provision of PHS, in general; though pilot projects and some local specific developments do promote consolidation for some specific applications;
- Fragmentation increases both in verticals terms (across tiers of governments) and within the different tiers of healthcare (GPs, primary, secondary, etc).
- Growth rates in healthcare cost are no longer sustainable and the government is forced to reduce the overall amount of funding while still trying to preserve universal coverage. The result, in practice, may often involve rationing and high variability in quality of publicly funded/provided care.

Scenario Beta's Transactional environment

- With public funding *de facto* eroded and affecting average quality and access, besides out of pocket expenditure, regional bodies and/or large healthcare organisation are testing localised agreement with private insurances to cover some segment of their population of reference. Even public healthcare organisation increasingly provide special services and treatment for out of pocket payments;
- • Public healthcare organisations and their professionals, as well as General Practitioners still show resistance to PHS and little signs of integrated care. On the other hand increased workloads and acute shortage especially of nurses and other staff needed to care for patients recovering from sever conditions and for severely impaired elderly in need of steady assistance pushes them to adopt some specific PHS solutions in cooperation and partnership with technology suppliers;
- The consumer electronic models directly paid by consumers/patients consolidate, but the products on offer are not enough for the mainstream; the market for these products is still characterised by niche players, fragmentation, and high prices that are affordable only by the more affluent segments of society.

Scenario Beta's Users

- There are strong social divides between RADs and REDs. Within the segment of health consumerist and technology confident users the more affluent pay for the limited PHS services available in the consumer electronics market
- Within the segment of non consumerist and more traditionalist users, the wealthy pay for higher quality services provided by private organisations - or by public organisation outside of publicly funded schemes. In contrast, the less affluent must relying only on the traditional services publicly funded, adapting to varying quality and waiting lists;
- The elderly, and those in need of long term care, may be forced to accept technology-based solutions given the lack of carers (limited public financing for these, and many individuals have few means to pay themselves for private carers);
- Social divides are evidently increasing.

SCENARIO GAMMA

This is a scenario where the state and its network of healthcare organisations and professional remain the dominant players in PHS, with public financing continuing to be the main source of funding along already existing output based models and with third party players confined to limited niche markets. There is substantial effort to limit inequalities and reduce social exclusion, which is supported by popular attitudes – not least high levels of confidence in technology (including in remote treatment with little health professional intervention); these attitudes have permeated the great majority of the adult population, reducing potential problems of social exclusion. This is close to the earlier study’s “Caring State”, and we label this Scenario Gamma below – please give it your own name that captures its essence.

Scenario Gamma’s story

Although pervasive health consumerist attitudes and behaviours became dominant, the outbreak of acute crisis management have led the government to retain and increase control and direct financing and production of all healthcare services including PHS and reach high level of public financing of healthcare expenditure with little, if any, reliance on private players. Additionally the state enforce through hard incentives as a social responsibility healthy lifestyle and monitoring onto consumers/patients and aims to leverage and shape consumerist attitudes by fully controlling some prioritised PHS, placing high emphasis on compliance with treatment and lifestyles prescribed by healthcare professionals.

Scenario Gamma’s Macro environment

- The implications of ageing society fully visible (with increases in chronic diseases and in their co-morbidity patterns, and a growing pool of elderly requiring assistance with neuro-psychological disorders). Government controlled and provided PHS services are used as part of the solution. They are focussed mostly on ensuring compliance and in monitoring acute conditions; they help containing the pressure on HSC but cannot entirely restore the financial equilibrium of the HSC system;
- The government directly and through its various healthcare institutions takes full responsibility for the health status of its citizens, at all levels. Healthcare is funded in large part (above 80%) by public money, gathered through such means as the general tax system. Except for the case of the elderly and others with ability problems, strict rules sanction non compliance to treatment and lifestyle guidance. Thus the noncompliant may be excluded from public funding of certain treatment and required to share costs for others.
- Inter-operability, guidelines, and standards for the provision of PHS are strictly dictated from the centre that monopolise the management of PHS. These are rarely interoperable and open to third parties players such as technology suppliers and media companies;
- Centralised government control and direct intervention in many domains bring about positive outcomes in terms of inter-agency integration and also of integration across social support, primary, secondary, and tertiary care, with healthcare organisations and professionals resistance overcome

leveraging against them the expectations and needs of citizens/patients for seamless and technology supported services. Inter-mediate government tiers such as regions and local governments loose power;

- The trend of rising healthcare costs is contained but not reversed, despite efforts to curb non compliance and to enforce healthy lifestyles.

Scenario Gamma's Transactional environment

- Public funding remains centralised, with a limited role for private insurance and the out of pocket outlays remaining of the same level as in the past. The prioritised PHS services provided by public healthcare organisations are directly financed by central government;
- Public healthcare organisations and their professionals, as well as General Practitioners, retain full control of government funded PHS services, without any third party intervention and without relinquishing control in favour of consumers/patient empowerment. While some resistance still remain, government enforcement leads to integrated care solutions in limited areas, mostly aiming at early diagnosis compliance and enforcing healthy lifestyles;
- Despite top-down inter-operability and emphasis on some specific PHS applications, the PHS market taken in its entirety is not mainstreamed and remains fragmented into niche each dominated by few preferential providers of public institutions. In parallel a market develops based on PHRs voluntarily provided by consumers to large technology and media companies who are also providing PHS services, where the scale and nature of such services is such that their prices remain high and thus they mainly cater to wealthy individuals able to pay for them.

Scenario Gamma's Users

- Most citizens/patients tolerate the benevolent but intrusive and limiting approach of government in exchange to the wide and affordable coverage it provides also in terms of PHS services. While reluctant, under certain conditions, they even accept PHS services based on invasive and/or uncomfortable data gathering devices;
- Those most independent and interested in taking health into their own hands resort to advanced web tools for information and self-diagnosis provided by non public actors as well as to web 2.0 and community of interests;
- Affluent middle-aged people and recently retired wealthy baby boomers pays for niche PHS services (different from those provide by the government). These are delivered by private player.
- More socio-economically disadvantaged individuals are excluded from PHS services other than those prioritised and provided by the government.

TASK 1- SCENARIO CHARACTERISATION

Task 1.1 (indicative time 15 minutes)

Read the scenario description.

- Are you satisfied with this? What needs changing, because it is implausible or inconsistent? What are the most important features?

Prepare a succinct statement of just what the scenario is (30 words maximum); create a name (catchy and telling) for the scenario.

Task 1.2 (indicative time 50 minutes) Discuss the scenario in more detail. Consider:

- What drivers have taken us toward this future? How did they operate?
- How are PHS operating?
- For Reds and RADs, Who is receiving What services,
- where,
- using what PHS and what other medical facilities?
- What are HSC staff of different types doing,
- where?
- How is the (PHS) system governed?
- How is the (PHS) system financed?

The answers to these questions provide us with a much fuller account of the PHS ecosystem for each scenario.

Please write the main points onto post-its and attach to the posters/flip charts.

Task 1.3 (indicative time 10 minutes) Summarise main points of the discussion in a coherent form, for rapporteur to take them to plenary. There will be only 5-10 minutes to “sell” the scenario to the plenary.

- What is the essence of the scenario?
- What are the business models involved here, what is the PHS ecosystem?

THE PATHWAYS

We will use a simplified version of the health/care pathways that are now used extensively in some HSC systems to design treatment for people with different conditions and in different circumstances. The simplified framework defines the pathway in terms of 5 stages:

- A. Maintaining – the normal state of affairs for the individual
- B. Challenging – presentation of symptoms or problems
- C. Responding – medical or other interventions are applied
- D. Monitoring - effects of interventions and compliance with regime assessed
- E. Exit – departure from pathway.

We shall be considering pathways for three different types of person/condition, attempting to capture an acute, a chronic and a more "regular" set of circumstances, and taking into account people's variations in living conditions, and the frequent co-occurrence of HSC problems. If a BOG feels it would be more capable of dealing with a slightly different condition, then it may choose to modify the one being considered.

The conditions are:

- (1) Diabetes plus either a "behavioural" problem like alcoholism, or a cognitive problem like Alzheimer's or related senility.
- (2) Pregnancy plus a cause for concern such as high blood pressure, hypertension
- (3) Trauma sustained by a major accident (e.g. car accident) involving substantial loss of limb function and visual impairment.

We suggest that (1) involves an elderly and socially isolated person, (2) a woman of average means in a stable relationship; and (3) a young adult. However, we would appreciate it if we could consider differences that might apply to REDs and RADs.

TASK 2 – PATHWAY CHARACTERISATION

(indicative time: 30 minutes)

For each stage of this pathway, what is the situation NOW? Please try to outline this in terms of the following features:

- What services does the patient/consumer receive,
- where,
- using what medical facilities
- and contributing what inputs or behaviours themselves (with what role of informal carers)?
- What are HSC staff of different types doing,
- where?
- How is the system governed?

- How is the system financed?

Please write the main points onto post-its and attach to the posters/flip charts.

PATHWAYS AND SCENARIOS

We now apply the three scenarios as a framework for thinking about how PHS use might have reshaped each of the three pathways by 2030. We are particularly interested in points that are in common, or that are divergent, across the three scenarios.

TASK 3 – DIVERGENT EVOLUTION OF PATHWAYS ACROSS SCENARIOS

(indicative time: 60 minutes)

For each stage of this pathway, what might the situation look like in the three scenarios? What features do they have in common, what features differ? (Hint – a good way of thinking about this, often, is to consider elements that two of them might have in common that the third does not share.

Please try to outline this in terms of the following features:

- What services does the patient/consumer receive,
- where,
- using what PHS devices,
- and what medical facilities
- and contributing what inputs or behaviours themselves (with what role of informal carers)?
- What are HSC staff of different types doing,
- where?
- How is the (PHS) system governed?
- How is the (PHS) system financed?

What differentiates the scenarios? What do they have in common?

Please make a list of the most important features to bring back to report to the plenary session.

Make 3-10 points about: where the main and most important points of similarity are.

Make 5-10 points about: where the main and most important points of difference are.

LEARNING FROM SCENARIOS

We now return to a focus on each of the three scenarios. We have looked at the scenarios overall, and at how particular health pathways might be manifested in each one. So, what are the main messages to come out of this? Exactly what these messages are may well be a matter of what we are hoping to achieve by way of such objectives as population health and quality of life, social inequality, innovation, entrepreneurship, personal responsibility, public expenditure.

TASK 4 – INDICATORS AND IMPLICATIONS OF SCENARIOS

(indicative time: 60 minutes)

Task 4.1 (indicative time 10 minutes)

Please discuss the following questions:

- What would be indicators that we are on the path toward this scenario, or something like it?
- What sorts of event would happen, what trends would be apparent?

Identify 3-5 key indicators to report back to plenary.

Task 4.2 (indicative time 10 minutes)

Please discuss the following questions:

- If events do seem to be leading us toward this sort of PHS scenario, what does this mean for social objectives such as population health and quality of life, social inequality, innovation, entrepreneurship, personal responsibility, public expenditure.
- Are there some objectives which are particularly problematic in this scenario?

Identify 3-5 key challenges to report back to plenary.

Task 4.3 (indicative time 140 minutes)

What are the policy measures (for national governments, the ERC, other stakeholders) that could help overcome the problems that have been identified? Here are a suggestive set of areas that could be considered (feel free to suggest others):

- Technology: Devices
- Technology: Networks
- Data Storage and Analysis
- Public Education
- General Skills & Training - HSC workers
- Specialist skills (High-skilled medics, data analysts, etc.)
- Business Models
- Health & Social Policy

Please put as many suggestions as possible onto post-its and attach to posters/flip charts.

ANNEXE 4 - LIST OF PARTICIPANTS IN THE WORKSHOP

Experts

Name	Institute
1. Alexander Peine	University of Utrecht
2. Carmel Dickinson	Manchester Mobile Health people (mHealth)
3. Daniel Bieber	ISO-Institute Saarbrücken
4. Marco Viceconti	University of Sheffield
5. Narciso Gonzalez	University of Jyväskylä
6. Niels Boye	Aarhus University
7. Corinne Marsolie	Continua Health Alliance / Director, Cisco
8. Poppe Toon	Heart Link Online
9. Rainer Guenzler	HSG-IMIT
10. Sisse Finken	Department of Informatics, , The Design group
11. Anne Moen	University of Utrecht
12. Gabriela Scintee	National School of Public Health and Sanitary Mgmt.
13. Eva Orosz	Eotvos Lorand University, Budapest.
14. Maria Lluch	European Commission-JRC-IPTS
15. Oleg Ena	Higher School of Economics
16. Miikka Ermes	VTT
17. Gonul Bodur	University Istanbul
18. Jack Smith	University of Ottawa
19. Irina Efimenko	Higher School of Economics
20. Nikolay Zezulinsky	FORS Development Center

PHS Foresight partners

Name	Institute
21. Totti Könnölä	Impetu Solutions
22. Laura Pombo-Juárez	Impetu Solutions
23. Susanne Giesecke	Austrian Institute of Technology
24. Doris Schartinger	Austrian Institute of Technology
25. Günter Schreir	Austrian Institute of Technology
26. Ian Miles	Manchester Institute of Innovation Research
27. Ozcan Saritas	Manchester Institute of Innovation Research
28. Effie Amanatidou	Manchester Institute of Innovation Research

PERSONAL
HEALTH
SYSTEMS
FORESIGHT

