THEMATIC NETWORK 2018

SMART HEALTHY AGE-FRIENDLY ENVIRONMENTS

SMART
HEALTHY
AGE-FRIENDLY
ENVIRONMENTS

BIG DATA

Ai

iot
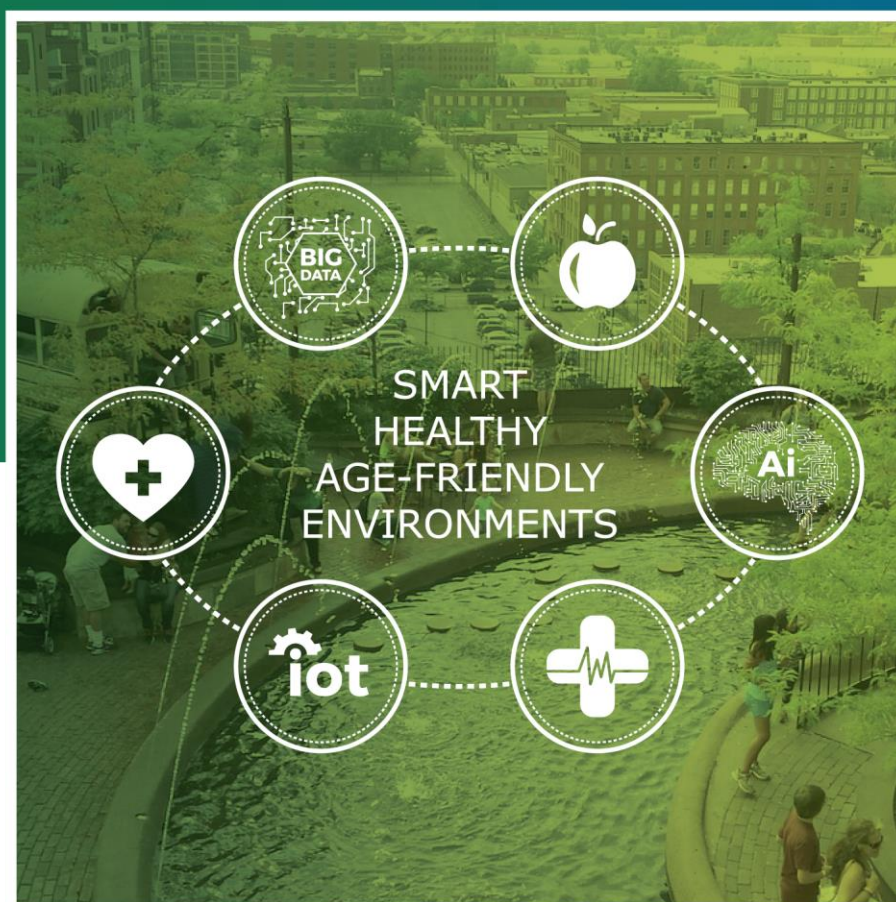
Cáritas Diocesana de COIMBRA

AUTHORS

- Carina Dantas, Innovation Director Cáritas Diocesana de Coimbra
- Willeke van Staalduinen, Co-founder AFEdemy ltd.
- Melvin van der Mark, AFEdemy ltd./Utrecht University
- Ana Luísa Jegundo, Project Manager Cáritas Diocesana de Coimbra
- Javier Ganzarain, Co-founder AFEdemy ltd.

FRAMING PAPER – Table of Contents

List of figures

List of tables

2. Introduction

Caritas Coimbra and AFEdemy Ltd, are coordinating one of the three Thematic Networks for 2018, under the theme *Smart Healthy Age-Friendly Environments* (SHAFE), in close cooperation with main partners, such as the European Innovation Partnership on Active and Healthy Ageing (EIP-AHA), European Innovation Partnership on Smart Cities and Communities (EIP-SCC), Reference Sites Collaborative Network, European Covenant on Demographic Change, Eurocities, Utrecht University (a former partner of the European Framework for Age-Friendly Housing), European Centre Social Welfare Policy and Research, European Health Telematics Association (EHTEL) and ECHAlliance.

The European Commission (DG SANTE) launched a call for proposals in November 2017 on strategic initiatives for a Joint Statement in 2018. Ten proposals were voted until December 7th in the European Union Health Policy Platform; SHAFE was the most voted and was confirmed by the European Commission in March 2018.

The Thematic Network kick-off meeting was held on April 10th, at the European Commission premises in Brussels, and was attended by EC representatives and the coordinators of the three selected networks – besides SHAFE, also Societal Impact of Pain and Consumption of Fresh Fruits and Vegetables. In 2018, Thematic Network SHAFE will deliver a Framing Paper and a Joint Statement on Smart Healthy Age-Friendly Environments that will be presented to the European Commission in November.

SHAFE aims to facilitate the creation of healthy and friendly environments for all ages through the use of new technologies, towards the production of a comprehensive and participatory joint statement. In more concrete terms, it is intended to highlight the importance of People and Places in the creation of digital solutions for eHealth and mHealth, with better quality but still accessible to all. The main aim is to value the Person as a central element of the whole process of digitisation.

This Thematic Network aims to create a high-level political alignment of different networks and initiatives for age-related themes. It is aligned with the EU's Health Priorities in creating synergies that will increase quality, innovation and sustainability for the implementation of better health and care systems, economic growth and sustainable health, in line also with the objectives of the Blueprint on Digital Transformation of Health and Care.

3. Background and challenges

The impact of demographic ageing within the European Union (EU) is likely to be of major significance in the coming decades. Consistently low birth rates and higher life expectancy are transforming the shape of the EU-28's age pyramid; probably the most important change will be the marked transition towards a much older population structure, a development which is already apparent in the several EU Member States.

The population of the EU-28 on 1 January 2016 was estimated at 510.3 million. Young people (0 to 14 years old) made up 15.6 % of the EU-28's population, while persons considered to be of working age (15 to 64 years old) accounted for 65.3 % of the population. Older people (aged 65 or over) had a 19.2 % share (an increase of 0.3 % compared with the previous year and an increase of 2.4 % compared with 10 years earlier).

According to projections from Eurostat, the overall size of the population is projected to be slightly larger by 2070 than in 2016. The EU population is projected to increase by about 3.5% between 2016 (511 million) and 2040 (at 528 million) when it will peak, to then remain stable until 2050 and to thereafter decline to 520 million in 2070 (see Figure 1). While the total EU population will increase by 1.8% over 2016-70, there are wide differences in population trends across the Member States, with the population increasing in half of the EU countries and falling in the other half.
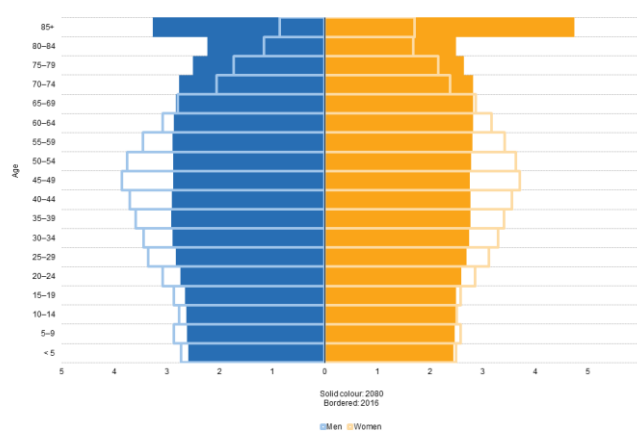
Figure 1 - Population pyramid EU-28, 2016 and 2018 (% of the total population)

The demographic old-age dependency ratio (people aged 65 or above relative to those aged 15-64) is projected to increase significantly in the EU as a whole in the coming decades. Being about 25% in 2010, it has risen to 29.6% in 2016 and is projected to rise further, in particular up to 2050, and eventually reach 51.2% in 2070. This implies that the EU would move from four working-age people for every person aged over 65 years in 2010 to around two working-age people over the projection horizon.

As a result, the proportion of people at working age in the EU-28 is shrinking while the relative number of those retired is expanding. The share of older people in the total population will increase significantly in the coming decades, as a greater proportion of the post-war baby-boom generation reaches retirement. This will, in turn, lead to an increased burden on those at working age to provide for the health and social expenditure required by the ageing population for a range of related services.

Health care services represent a high and increasing share of government spending and total age-related expenditure. Furthermore, the ageing of the EU population may entail additional government expenditure. This makes public spending on

---

[1] http://ec.europa.eu/eurostat/statistics-explained/images/f/f5/Population_pyramids%2C_EU-28%2C_2016_and_2080_%28%25_of_the_total_population%29.png

health care an integral part of the debates on the long-term sustainability of public finances.

The projection for those aged 80 years and more will almost triple by 2060. This trend will cause an increase of social expenses in forms of pensions, healthcare and institutional or private care. Under this scenario, public spending on the older people will be a major problem in upcoming years.

This demographic change will have considerable consequences for the EU public finances. Based on current policies, it is estimated that **'exclusively' age-related (pensions, health, and long-term care) public expenditure will increase by 4.1 percentage points of GDP between 2010 and 2060, from 25% to 29%**. Only expenditure on pensions is expected to increase from 11.3% to nearly 13% of GDP by 2060. However, there are significant differences between countries, depending largely on the progress made by each country in the reform of the pension system, which confirms the need for policy action to meet the challenges of an ageing population.[2,3]

---

[2] The 2018 Ageing Report: Underlying Assumptions and Projection Methodologies
https://ec.europa.eu/info/publications/economy-finance/2018-ageing-report-underlying-assumptions-and-projection-methodologies_en

[3] Eurostat - Population structure and ageing
http://ec.europa.eu/eurostat/statistics-explained/index.php/Population_structure_and_ageing

4. Scope

Moving age-related topics to the big umbrella themes of the Health and Digital Single Market is a vital process to pursue the societal scope of a Europe prepared to provide quality of life and well-being through the whole life cycle. The revitalisation of Active and Healthy Ageing initiatives (preparing post-2020) will imply high-level crossover discussion between different groups, networks, Directorates of the European Commission (DGs), European Innovation Partnerships (EIPs) and even international organisations, understanding the symbiotic interdependence of these subjects towards a Healthy and Competitive Europe. This Thematic Network intends to create a high-level policy alignment of all these networks and initiatives towards Health in Ageing subjects.

The specific aim of SHAFE will be to enhance the 2 main aspects of Age-Friendly Environments – Places and People – in the creation of eHealth and mHealth solutions - especially focused on quality and costs.

On eHealth, a special emphasis will be given to its current state of the art in e-support of smart homes to people who suffer from chronic diseases and impairments - e-support like robotics, smart living environments and smart communication with formal and informal care. These smart environments need to align physical and technological development with the building industry in terms of policy and funding, in order to make smart homes available, affordable, and large-scaled in Europe. This broad adoption may be the keystone to a more efficient health care system that adds better quality for less investment.

On mHealth the focus will be on understanding and bridging the main gaps between technological development and real user needs and expectations, proposing policy measures that favour and enhance a real market entrance of new solutions, hoping to decrease inequalities in the access to health services.

Alignment with European health priorities

SHAFE aligns with the Communication from April 2018 from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on enabling the digital transformation of health and care in the Digital Single Market; empowering citizens and building a healthier society. The Communication calls for further EU action regarding:

 ➢ Citizens' secure access to and sharing of health data across borders;
 ➢ Better data to advance research, disease prevention and personalised health and care;
 ➢ Digital tools for citizen empowerment and person-centred care.

SHAFE also aligns with EU health priorities in creating synergies that will increase quality, innovation, and sustainability towards the implementation of better health and care, economic growth, and sustainable health systems. It is also proposed in line with the Blueprint on Digital Transformation of Health and Care (2016) - more specifically, with the following objectives:
1. Deployment of Innovation

2. Investment in digital innovation for health and care

3. Reach people in Europe benefitting from digital innovation on active and healthy ageing

In terms of the [Digital Single Market](), SHAFE crosses with the following objectives:

1. Cybersecurity (especially privacy issues)
2. Boosting e-commerce
3. European data economy
4. Adapting ePrivacy rules to the new digital environment
5. Helping to develop the necessary digital skills for everyone

5. Partners

The partnership of the Thematic Network is developed in a quadruple layer-scheme, with the intention to implement a Europe-wide network of stakeholders that actually provide inputs to the Joint Statement framing paper and call to action:

1. Coordinators

    Cáritas Coimbra and AFEdemy develop the overall strategy of the Thematic Network, coordinate the partnership contributions, tasks, and roles, provide the dissemination materials and external communications and represent SHAFE in events and by the European Commission. They also develop the main guidelines of the framing paper and call to action and will make the final edition of the document to be presented as Joint Statement.

2. Main partners

    The main partners are the European organisations and networks that supported the Thematic Network official proposal:

    - European Innovation Partnership on Active and Healthy Ageing (EIP-AHA)
    - European Innovation Partnership on Smart Cities and Communities (EIP-SCC)
    - Reference Sites Collaborative Network
    - European Covenant on Demographic Change
    - Eurocities
    - Utrecht University (a former partner of the European Framework for Age-Friendly Housing)
    - European Centre Social Welfare Policy and Research
    - European Health Telematics Association (EHTEL)
    - ECHAlliance

3. Associated partners

The associated partners are all organisations and networks that cooperate with the coordinators by delivering work, suggestions and comments on the draft Framing Paper and draft Joint Statement. The 109 registered partners on November 5th, 2018 are:

- 40+ Lab
- AD ELO – Associação de Desenvolvimento Local da Bairrada e Mondego
- Advita – Associação para o Desenvolvimento de Novas Iniciativas para a Vida
- AGE Platform Europe
- Age.Comm – Unidade de Investigação Interdisciplinar – Comunidades Envelhecidas Funcionais
- Alzheimer's Disease and related disorders Heraklion Prefecture "ALLILENGII" (SOLIDARITY)
- ANGES - Associação Nacional de Gerontologia Social
- APCC-Associação de Paralisia Cerebral de Coimbra
- APDP Diabetes Portugal
- Association E-SENIORS
- Autonomlab
- Azienda Ospedallera Universitaria Federico II
- Belgian Building Research Institute
- BMGI Consulting
- Caregivers Portugal, Associação Portuguesa de Cuidadores
- Case Western Reserve University
- Center for Assisted Living Technology Aarhus
- Centro de Investigação Interdisciplinar em Saúde (CIIS), Universidade Católica Portuguesa
- Centro de Solidariedade Social da Adémia
- CINTESIS-ICBAS UP
- Clínicas Leite Lda.
- Coimbra Health School – Polytechnic Institute
- Comissão de Coordenação e Desenvolvimento Regional do Centro
- COTEC – Council of Occupational Therapists for the European Countries
- D'article Enterprise
- De Montfort University
- Direção Geral de Saúde - Portugal
- DKIT NetwellCASALA
- Dublin City University
- Dublin Institute Technology
- Egas Moniz Cooperativa de Ensino Superior CRL
- empirica
- Escola Superior de Enfermagem de S. João de Deus – Universidade de Évora
- Escola Superior de Tecnologia da Saúde de Coimbra
- Eurohealthnet
- European Chronic Disease Alliance
- European Health Futures Forum
- European Pain Federation
- Exatronic, Lda
- Faculdade de Medicina da Universidade de Coimbra – Instituto de Patologia Geral
- Faculdade de Motricidade Humana, Universidade de Lisboa
- Faculdade de Psicologia e de Ciências da Educação da Universidade de Coimbra

- Faculty of Sport Sciences and Physical Education – University of Coimbra
- Fundação Dr. José Lourenço Júnior
- Global Health and Tropical Medicine, Universidade Nova de Lisboa
- Fundação Nossa Senhora do Bom Sucesso
- Gradiant
- Hamburg Ministry of Health and Consumer Protection
- HEI-Lab: Digital Human-Environment Interaction Lab/Universidade Lusofona
- iHomeLab, Lucerne University of Applied Sciences and Arts
- IDEABLE SOLUTIONS, SL
- INESC TEC
- Innjoy Agency for Innovation and Development
- INOVA+
- Institute of Systems and Robotics – University of Coimbra
- Instituto de Administração da Saúde, I-RAM
- Instituto Politécnico de Viana do Castelo – Escola Superior de Educação
- Instituto Politécnico de Viseu
- Instituto Principe Real
- Instituto Superior de Engenharia de Coimbra
- Instituto Regionale Rittmeyer Per i Ciechi
- Iscsp Universidade de Lisboa
- International Society for Telemedicine & eHealth
- LANUA International Healthcare Consultancy
- Liga dos Amigos do Centro de Saúde de Alf. da Fé
- LILT Biella (Italian League against Cancer)
- Lithuanian University of Health Sciences
- MAGGIOLI S.P.A.
- Mativision Limited
- Medical University Vienna, Institute for Outcomes Research
- Métis – Comunicação em Gerontologia
- MultiMed Engineers srls
- Município de Miranda do Corvo
- Município De Pampilhosa Da Serra
- NOVA Medical School – EpIDoC Unit
- NOVUSENS Innovation and Entrepreneurship Institute
- Nuada
- Nursing School of Coimbra
- Pain Alliance Europe
- Politecnico di Milano
- Porto4Ageing
- Projeto Aventura Social
- Projeto R
- Reference Site Asturias

- Regione Campania
- Research Centre for Anthropology and Health
- Research Unit in Education and Community intervention (RECI)
- RMIT Europe
- SANMEDI bv
- Santa Casa da Misericordia de Lisboa
- Santa Casa da Misericordiosa de Vila Viçosa
- SCOPE (COMUNIDADES, ORGANIZAÇÕES E LUGARES SUSTENTÁVEIS) | CIS-IUL
- SEN Slovensko a Cesko
- Senior Group
- SingularLogic S.A.
- SLOVECO
- Smart Homes
- South Denmark European Office
- Spark Works ITC Ltd
- STC – Serve the City Portugal
- Stedelijke Ouderen Commissie Den Haag (Older people's council The Hague)
- The Bartlett Real Estate Institute UCL
- TICE.PT
- UA paal, University of Alicante, Dep. Of Computing Technology
- UCC Cubo Mágico da Saúde – ACeS Baixo Vouga
- Unidade Local de Saúde do Baixo Alentejo
- Universidade da Biera Interior/CIDESD
- Universitat Rovira i Virgili – Smart Health Research Group
- University of Aveiro
- University of Bucharest
- University of Deusto
- UPM – Universidad Politécnica de Madrid, LifeSupporting Research Group
- Utrecht University
- Van Berkum Communicatie
- Virtualware
- Warsaw School of Economics, Poland

4. Endorsing partners

The endorsing partners are all networks or organisations that subscribe the final version of the Joint Statement that is presented to the European Commission in November 2018.

6. Objectives

SHAFE's main objectives are the following:

- Produce a Joint Statement 2018 that summarises a common position on Smart Healthy Age-Friendly Environments, priorities for policy making and recommendations beyond 2020, aiming at a White Paper in 2019;

- Provide a forum to exchange policy priorities and technical expertise on Age-Friendly Environments and eHealth and mHealth solutions;

- Inform the European Commission and the Member States on knowledge and expertise available in the stakeholder community about challenges, solutions, and best practices on Age-Friendly Environments and eHealth/mHealth;

- Bring better local practices already implemented by local and regional authorities that have been identified in the EIP-AHA for twinning or scaling-up and collect lessons learned towards policy drawing;

- Promote common principles as person-centred interventions, protection of personal data, standardisation, interoperability, data-enabled research, personalised medicine, and quadruple helix.

7. Questions

As a departing point to the research activities, 4 questions were defined. The answers to these questions will define SHAFE's outcomes:

1. How to enhance Places and People in the use and installation of eHealth and mHealth solutions, with special focus on quality and costs?

2. What is the current state of the art in Europe in terms of e-support at home to people with chronic disease and/or impairments?

3. How to align technological development with the building industry for smart environments in terms of policy and funding, enhancing a more efficient health care system that adds better quality for less investment?

4. How to bridge the main gaps between technological development and user's needs and expectations?

8. Methods

The research activities concerning the previous sections were executed, and the first results were available on mid-June 2018 and presented during the webinar on June 19th, 2018.

The research was executed by performing:

- Desk research - using dedicated search terms in databases such as Google Scholar, PubMed, Cochrane, Scopus, WorldCat, PiCarta, Web of Science, ACM Digital Library, NARCIS, OATD, DOAJ, BASE, CORE, Paperity, AAL-database, CORDIS and Innoradar.eu. It included search in grey literature in EU countries, using search terms in own languages by associated partners.

- Survey - on Smart Healthy Age-Friendly Environments, published online in the EU Survey website and broadly disseminated through the networks of the Coordinators and Main partners (See also Annex 3).

- Interviews - with several opinion leaders on the topics related to eHealth, mHealth solutions, active ageing, Age-Friendly Environments, chronic diseases, and impairments, living independently, with the help from associated partners (documents related to the interview are available in Annex 4).

Besides research, activities of discussions, comment and support on the draft Joint Statement and research results were performed through events and dissemination activities, namely:

- EIP-AHA Action Group meeting in Manchester (2-3 July 2018), during which SHAFE will have a 30 minutes slot to be presented and interact with EIP and Eurocities members.

- AAL Forum Silver Week Bilbao 2018 (24-26 September) – Workshop 12 "Smart Healthy Age-Friendly Environments and the role of caregivers in the deployment of ICT based approaches" (25 September 16:00-17:30) results were presented and discussed.

- Online consultation through SHAFE's webpage - https://www.caritascoimbra.pt/en/shafe/.

- Thematic Network webinars on June 19th and October 9th, 2018.

9. Research outcomes

The Thematic Network's main conclusions concern the role of Places and People in the use and uptake of eHealth and mHealth solutions, with special focus on quality and costs.

9.1.   Desk Research

The main outcomes of the desk research study are grouped in 5 main areas:

1. Well-being and Quality of Life

2. Healthcare delivery and prevention

3. Independent living and age-friendly environments

4. Ethical and privacy issues: Healthcare professional in a new role

5. Efficiency and efficacy

Below the main findings of the desk research are presented. The numbered references are to be found in Annex 1.

Next to the research in scientific literature, we have identified which European funded projects are available on topics such as 'eHealth', 'mHealth', 'telemonitoring', 'age-friendly environments', 'independent living', 'ageing in place' executed for or suitable for people with chronic diseases and/or impairments. European funding programmes are FP6, FP7 and Horizon 2020. Databases: CORDIS and INNORADAR. The found projects are presented in the boxes at the end of each paragraph.

1. Well-being and Quality of Life

With the rapid technological advancement, new solutions arise to support people with (chronic) diseases or impairments to improve quality of life and feeling well. For this purpose, eHealth can be defined as a form of information provision about health state, health care, and a form of support for such people and their informal caregivers, via the use of a computer or internet-related technologies (1). eHealth may complement or replace traditional professional support to some extent (2,3), for instance, providing information about the illness and possible treatments, support in decision-making, support in self-management, or connecting to fellow peers advise and emotional support (1).

mHealth is a form of eHealth thus supports similar functions but then through the use of mobile smartphone applications and other connected wireless devices. It has the potential to radically transform health service delivery (4). Driving this potential are three factors: (I) rapid growth in mobile technologies and applications, (II) new integration technologies and (III) a continued widespread coverage of mobile phone networks (5). The technology can include health information applications, measuring body functions, or patient communication tools (4).

mHealth can vastly extend the reach of healthcare; where conventional therapy would consist of face-to-face meetings, mHealth can offer a new digital dimension. It offers the possibility of distant interaction between patient and therapist, where the patient can inform, manage, and evaluate on its condition without having to meet personally with the therapist. Like this, empowering the patient by giving it tools to become self-active. A critical note would be that providing extra or re-accessible information to the patient does not automatically better its condition. It can, however, contribute to the more effective decision-making of the therapist, and reduce the reaction time for appropriate action. In regards of safety, digital systems can act as a safety net by improving control and evaluation means via improved Electronic Health Records (6–8), external sensors for lifestyle monitoring (9), and by giving the feeling of ownership (10).

mHealth lends itself best for rural and developing areas, due to the long distance to service provision, and can bridge the lack of availability, infrastructure, and level of technology. As smartphone adoption in rural areas can be similar to that of urban or developed areas, it offers a solution (11). The highly integrated use of smartphones in daily living increases the accessibility to and usability of digital health technologies (12). Wherein some patients do not have to burden themselves with getting used to other new devices or meeting up with a health professional but can use the smartphone they have accustomed to. Increasing the potential for health technology usage among those with smartphone literacy.

EU-GENIE, developed in FP7, is a self-management intervention which uses participatory methods of social network mapping to encourage patient's engagement with its surroundings, to inspire positive change and link patients with useful resources via existing databases. link

Figure 2 - EU-GENIE project

A precondition for quality assurance would be that provided health information is of sufficient quality and evidence-based. However, as the commercial and evidence-based markets are intertwined together, regulation is necessary to secure a high quality of healthcare and provision. The lack of uniformity among care

providers to cover the cost of mHealth solutions in care delivery limits their position for taking financial responsibility for its provision (13). It is found that mHealth solutions are widely accessible and accepted in clinical and preventive settings (14).

Furthermore, mHealth tools can connect patients with the same pathology in groups, digitally and/ or physically, to motivate each other in therapy and outside (15). They can aid and guide a chronic patient in their lifestyle, as well as deliver more patient-centred care by providing personalised care, improving patient knowledge and giving a greater feeling of being cared-for (16). mHealth utilises the high portability of a smartphone and the functionality of mobile monitoring. Smartphone functionalities can successfully be used to monitor and adjust a patients behaviour, for instance by audio or visual feedback loops or connecting to peers (17,18). It also offers the possibility to let the patient feel secure, participating more effectively in its own health management, and feel included and not forgotten (19). Though older people, and possibly other vulnerable groups, as potential users of mHealth, require more suitable and usable designs, compared to what is currently available in the market (20).

Thus, many developments are made in the area of wellbeing and quality of life. These new developments offer new solutions in healthcare. However, we have to evaluate the balance between digitalised care and face-to-face care delivery. Most studies tend to focus on efficiency and miss out on the patient's personal experience.

Table 1 - Wellbeing projects CORDIS and INNORADAR

Identified EU projects for wellbeing in CORDIS and INNORADAR (by acronym)

EU-WISE	SIGNS FOR EUROPE	AALUIS
EU-GENIE	OTOSTEM	CO-LIVING
SOUND OF VISION	SOCIAL ROBOT	CAPMOUSE
RICHARD	DISCIT	CONNECTED
NEBIAS	VALUE-AGEING	VITALITY
ACTION	SILVER	EXPRESS-TO-
SIMPLESKIN	TEC FOR LIFE	CONNECT
RECALL	BETTER AGEING	FEARLESS
SIFORAGE	IMANAGE CANCER	INCLUSION SOCIETY
EGOVISION4HEALTH	MY AIR COACH	
OPTIFEL	DECI	
	NEPRHON+	

2. Healthcare delivery and prevention

eHealth used for care delivery and prevention defines itself in: improving clinical diagnostics (21), supporting decision-making (22), expanding therapy intervention tools (23), self-monitoring tools (24) and other information sources. eHealth tools also commonly include remote or home telemonitoring, web and computer-based interventions, virtual reality tools, and use of sensors. These tools can include questionnaires, video recording or games, and be used for the purpose of gaining more clinical data, better decision making, and increasing healthcare accessibility

(2). Tools can also be used for, continuous monitoring, remote testing, or provide a report of self-activity and testing. The motivation for more patient involvement versus automation varies depending on patient capability and condition (25).

mHealth applications or wearables in the field of quantified-self are similar to eHealth solutions but utilise the smartphone. Which allows for real-time insights in monitor progress, like in vitro diagnostics of the heart rate via the camera. Other applications utilise the global positioning system (GPS) for tracking physical activity or wandering, in case of dementia (19). External measuring devices utilise the telecommunication network of the smartphone through a Bluetooth connection (26). The gathered information can be used for self-management of the user, and for decision-making by the health professional.

Smart textiles, like the one from the SimpleSkin project, offer washable sensing fabric which can measure body movement, electric signals, activities and changes in body capacitance. With their project they open-up the possibility for production to a wider audience. link

Figure 3 - SimpleSkin project

Both can be used for curative and preventive purposes. However, therapy application often derives from incentives, whereas preventive application is carried by the willingness of the user. Though the evidence for favourable impacts on the clinical endpoint is promising, as it appears that it can benefit the best the **patients** who have the most to gain (27). Improved Electronic Health Records can offer greater documentation and overview functions for targeted patient delivery to those who need it most, such as an SMS reminder service for increasing adherence (28). This includes the possibility of behavioural interventions via the web- or computer-based interventions with or without the use of mobile applications (29).

Big data has a significant potential for healthcare. As a result of the exponential growth in medical data collection, there are large datasets with different kinds of data usable for healthcare (30). Physicians and other health professionals struggle to stay current with the vast amount of daily publications, and one of the potentials of big data is improving knowledge dissemination. Data analytics can assess a patient's medical record, evaluate medical evidence, and then display potential treatment options ranked by level of confidence. The health professional can use

this information for clinical decision making (30). A prime example is IBM's Watson, though it is still a long way for clinical application (31).

IBM Watson, a question-answering computer program, was originally designed to answering questions in natural language for the quiz show Jeopardy playing against human players and winning the game. In healthcare developments are made in hypothesis generation and evidence learning capabilities to function as a clinical decision support system, having the ability to analyse scientific information much faster than humans. link .

New developments are made in creating a health cloud where datasets, health professionals, patients and linked devices come together.
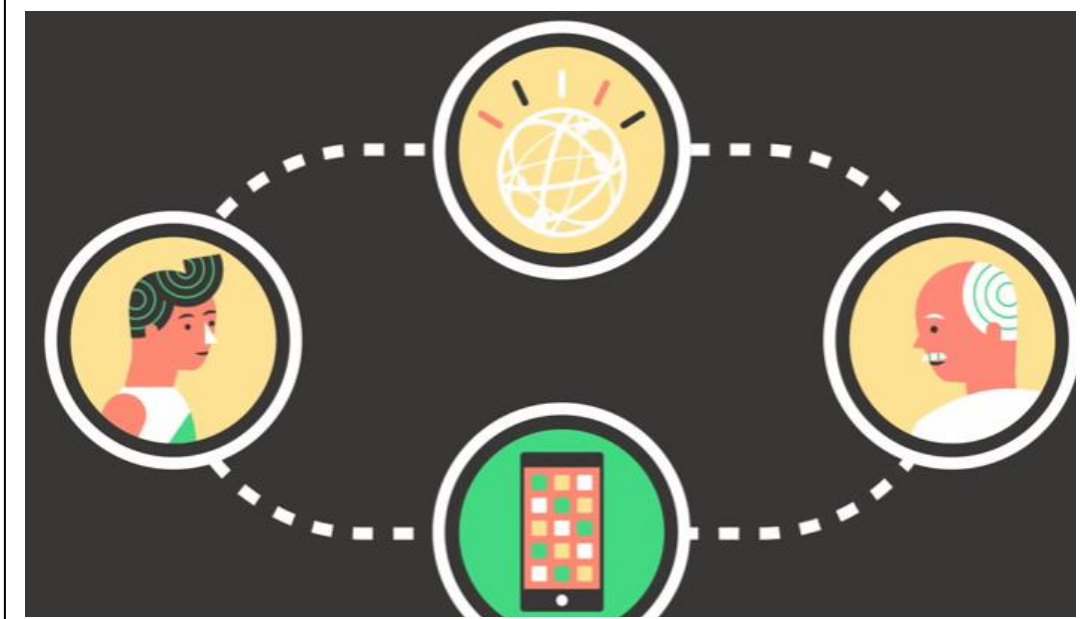
Figure 4 - IBM Watson project

A rise in genome identification technology lowers the cost of individual genome mapping, which delivers a new dataset for clinical use. Especially in the field of oncology, there is a great interest in an understanding tumour/patient/drug interaction. Each tumour and patient are unique. Genomic data can potentially be used for predictive modelling of drug treatment in the fields of personalised medicine and targeted drug development to aid successful treatment. Though it is still in its infancy (32,33).

CareCloud together with Marshfield Clinic Health System Information Services (MCIS) have developed a new cloud-based Electronic Health Record (EHR). Reshaping the EHR for better workflow and improved patient management. Next to including population health data for identifying care gaps and predict high risk patients. Integrating a patient portal for appointment scheduling, viewing their own record and care plan, and updating their health information link.
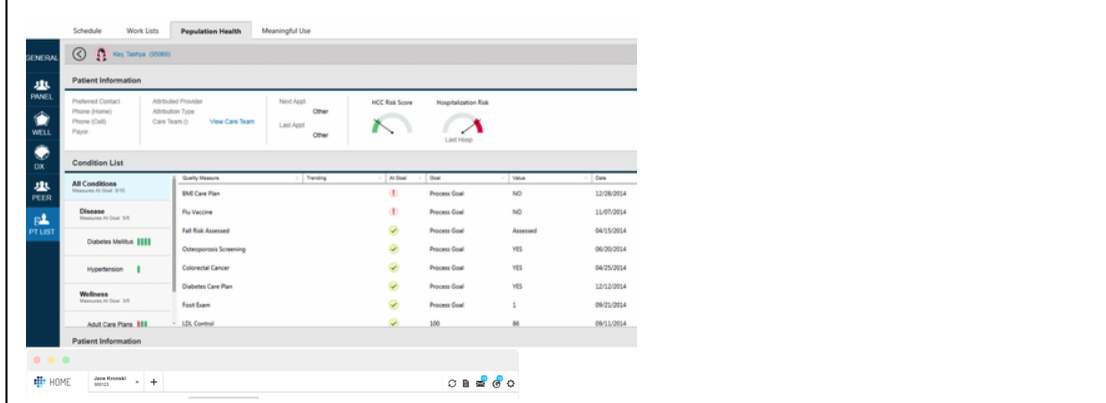
Figure 5 - CareCloud project

The PERSSILAA EU project defines a set of services to screen and prevent functional decline related to frailty. For that purpose, the project developed a screening method that allows for the collection and analysis of data to determine the frailty status of a person. Including input from training modules. It comes together in the intelligent core module, where the screening, analysing and processing is displayed. In order to detect changes and behaviour and do personalized suggestions. link
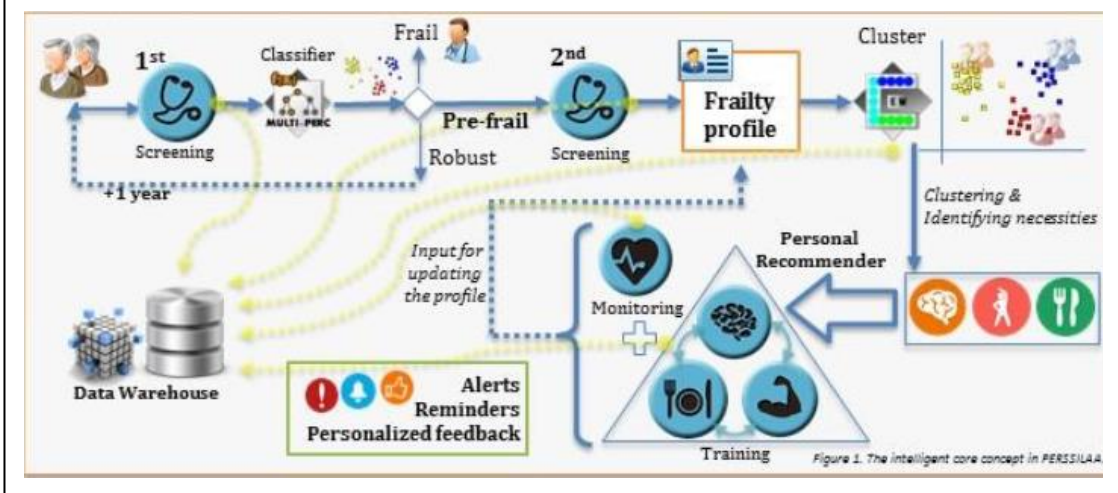
Figure 6 - PERSSILAA EU project

In conclusion, promising services and platforms are being developed that can aid the health practitioner in their care delivery. Many potentials but for clinical relevance, it often does need further validation. Though it is certainly an area to be looking out for.

Identified EU projects for health in CORDIS and INNORADAR (by acronym)		
FARSEEING ISTOPPFALLS DEM@CARE MATSIQEL HEALTH-ON-THE-MOVE COOLNESS CARDIOPROOF DOREMI EURO-URHIS UNCAP	FOODSMART SWORD REHAB@HOME PASTA V-TIME IROHLA EUROBATS I-DON'T-FALL WALKX-ROBOT HELENA VELOINFO PRECIOUS	PEGASO PERSSILAA PREVENTIT MY-AHA GIRAFF+ ACCESS ICT4LIFE APA PRIMER COG SPOTLIGHT RECALL

Table 2 - Health projects CORDIS and INNORADAR

3. Independent living and age-friendly environments

Independent living depends on many aspects such as accessible housing, home automation, level and availability (24/7) of care or support, outdoor environments. In the scope of this research on request from DG SANTE, here we only focus on the use and availability of eHealth and mHealth.

The integration of technology in the home environment has the potential to increase independence and support the creation of age-friendly environments. The most prominent trend is that of the Internet and Wireless Sensor Networks, or commonly known as the Internet of Things (IoT), which enables a holistic approach to the healthcare system infrastructure development (34). The dynamic network systems are composed of a large number of smart connected objects (portable devices and sensors), that allow for broad data exchange (35). The three main characteristics of IoT are: anything communicates, anything is identified, and anything interacts (36). In terms of mHealth, IoT brings a new concept for information gathering and exchange which bridges interoperability challenges (37). Such systems provide information to patients and their doctors regardless of where the objects are located in their homes (38). mHealth in this regard offers digitally available wearable sensor devices and tools through mobile device applications. These self-monitoring devices have the capability of instant analysis of personal data. Which can eliminate the necessity of hospital visits (34).

Denmark as one of the frontrunners:		
Indicators	Denmark	Average of 27 EU member states
Households with broadband connection	74 %	47 %
Regular internet users	80 %	56,4 %
Household with internet connection	82 %	57,5 %
GP practices with professional IT support	93 %	69,6 %
Electronic exchange of patient data for at least one purpose	98 %	40 %
Use of a computer during GP's consultations	91,6 %	56,8 %

Figure 7 - Denmark and the use of the internet

A cross-national analysis shows a digital divide within Europe. What differentiates member states from each other cannot be solely explained by technology in

isolation, but instead ICT infrastructure and penetration, internet users, mHealth applications and use among health professionals. See in the box below (40).

Residential living environments have a strong influence on the physical and psychological well-being of older people (41,42). Ageing-in-place has been promoted by policymakers as the optimal residential solution for later life; it is however not as straightforward. Evidence shows that next to high levels of residential satisfaction, there is growing discontent about one's own environment, which is in some cases still a reason for relocation, such as house designing and layout, and the inability for social interaction within the local community (43). This suggests that home environments should be adaptable and accommodate losses in physical and social function. Smart home technology for age-friendly purposes has been identified as a promising development to support independence and maintain the quality of life of older adults (44). The technology includes a range of emergency assistance systems, security, and safety features, fall prevention features, sensors, and timers for monitoring purposes. It also refers to a special kind of home or residence with equipment that is intended to monitor and guide the inhabitants to improve his or her experience at home (45).

The readiness of the home environment plays a role in the successful implementation of eHealth and consists of appropriate IT infrastructure, building renovations to accommodate the change, along with the appropriate management, amongst others (46). Not every eHealth solution is universally suitable for every type of living environment, which may also be limited by physical geography (47). Environmental factors include available and accessible ICT and power supply, telecommunication access and availability, cost, and network security (48). One study used the availability and location of outlets and connections as co-measurement between rural and urban hospitals to determine the readiness of telemedicine adoption (49). Studies indicate environmental readiness to be the second most crucial factor for eHealth implementations, next to user readiness (48).

There are four key applications for smart homes (50):

(a) Home automation: like remote or automatic control of devices or managing consumption, and

(b) Monitoring wellness: monitoring one's health-status to maintain his or her well-being.

(c) Home safety and security: using technology and devices to prevent intrusion or harbour emergency need when required.

(d) Real-estate management: the process of managing tools, equipment, and asset to build, maintain and repair the property when necessary.
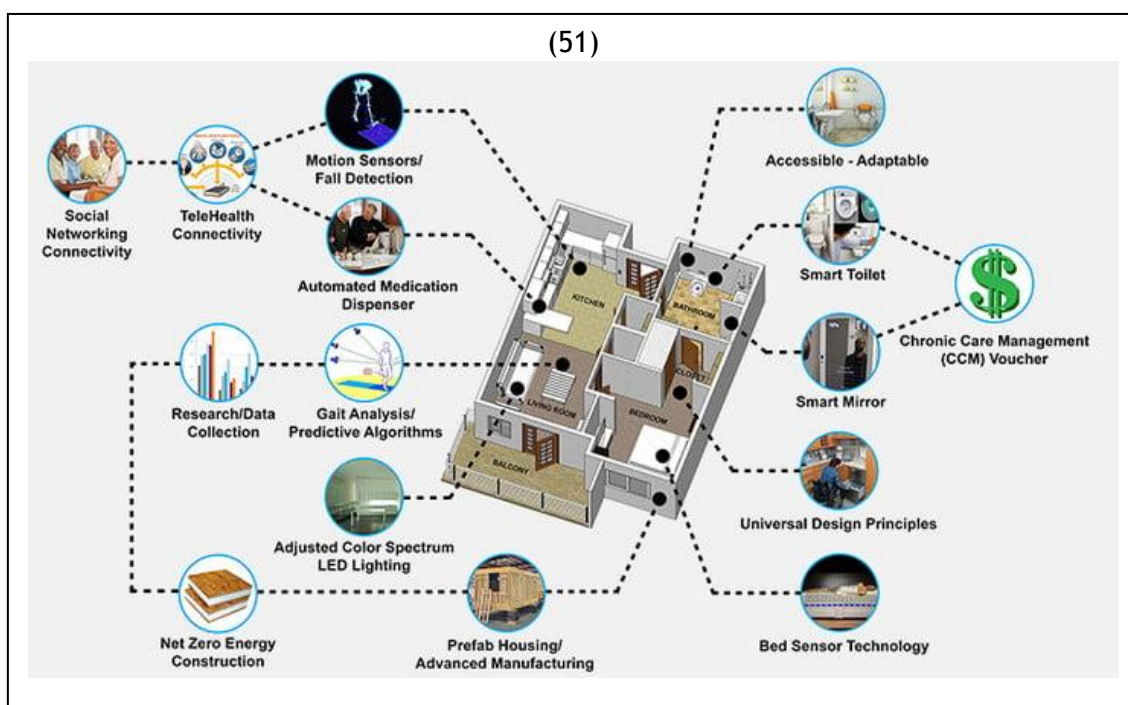
Figure 8 - Smart building in use

Including the social environment of the patient is considered of great importance, by developing the family knowledge, and including them, in care delivery, a long-term benefit can be achieved (16). With the use of health technologies, it can decrease the stress on the caregiver. In terms of self-preservation, it is indicated that mobile tools can be used to improve adherence to care and thereby increase the level of independence, as it does not require human intervention. The majority of participants studied, including low-income, bilingual, vulnerable and hard-to-reach patients, reported a good comprehension and satisfaction using eHealth tools (52). Using mobile adherence tools increased the patient's independence and confidence in disease management. Patients or caretakers appreciated the decreased burden of reminding self-testing and self-care. For older people or adults living alone and/or with memory issues, adherence tools were considered especially useful by the health professionals (52). These tools enhance the ability for independent living and reduce strain on the social environment.

Alfred, an FP7 project, developed a mobile, personalized assistant for older adults, which can support independence, coordination with cares and foster social contacts. It functions as a butler with voice activation, social event finder, real-time monitoring, and preventive capabilities. It can answer questions and follow commands. Alfred also searches events based on interest and social network, which is a continuous process. Body sensors are integrated in clothing for monitoring. Alfred can define a personal user profile of the user-specific impairment and will then suggest a set of serious games to assist the user's condition. link

Figure 9 - ALFRED project

In conclusion, clear and practical attributes have been identified that can stimulate independent living. It is however not that one-size-fits-all. Therefore personalisation should always be in mind, which asks a level of flexibility and adaptation to the client changing needs.

Identified EU projects for independent living in CORDIS and INNORADAR (by acronym)

MARIO SILVER ALFRED JADE INNOVAGE AQB-CARE COMPATABILITY HOMECARE	IBENC REAAL ACCOMPANY PRO ACT MIRACULOUS LIFE USEFIL CITY4AGE MY LIFE ROSETTA	AUTONOM@DOM LIFE LONG LIVING ANDALUSION TELECARE SERVICE CARPETSYSTEM GROWMEUP

Table 3 - Independent living projects CORDIS and INNORADAR

4. Ethical and privacy issues: health professional in a new role

Many mHealth solutions use some form of data and information gathering or processing. Which implies a large number of personal data generation. New policies are set in place to stimulate a data-intensive economy (53). Though the EU General Data Protection Regulation (GDPR) is a step in the right direction in terms of personal ownership. Increasing data collection and data analytics in the area of healthcare warrants caution, as lessons can be learned from other fields.

Data collection and analytics already plays a major role in other areas outside of healthcare. Algorithms, mathematical procedures for analysis, are used to navigate through vast amounts of data. By the use of which companies can influence which information reaches us to inform ourselves about events, products, or services. However, the functioning of these algorithms is not made public, and with the

value of these companies based in selling personal data, it questions the integrity of its promised value. Especially when the distinction between sponsored results and non-sponsored tend to be difficult. For instance, during the oil disaster in the Gulf of Mexico (2010), the responsible oil company BP purchased top result space in Google Search to put in their own sponsored links. When people inform themselves via Google Search, then it opens up possibilities for the selective guidance of the public opinion.

The intense integration of social media in society also raises ethical questions. Especially when notions come out that the sole purpose of its creation is to induce digital addiction. With up to 2 billion users spending an average of 50 minutes a day, it has a large impact on daily living (54). With the use of social media negative associations have been made on self-esteem and well-being, resulting in the possibility of developing depression and similar negative mental states (55,56). It also brings to the next question, how much a person is fully aware of what information is collected and for what purpose about itself. It was discovered in 2015 that Facebook was also tracking internet users who do not even have a Facebook account (57). What about conscious permission, then?

Data breaches seem imminent, as major organisations like Linkedin, MySpace, Adobe, Dropbox and more have all been a victim (58–61) with the result that the personal information of millions of users has been made public. Healthcare is no exception (62). Intensifying the digitalisation of personal data, therefore, demands the responsibility of appropriate data protection. As technology becomes more and more integrated into daily living, people get more dependent on it, and this dependency makes people vulnerable when technology fails. Research on cybersecurity of Internet of Things devices found that 70% did not encrypt (read: secure) communications (63). The combination of digitalisation of services and potential for losing control of data asks therefore for appropriate preparations and attention.

The Harvard study of adult development gives a different perspective on healthcare, which is now increasingly focused on digital efficiency. The study is tracking the health of people now almost for 80 years. It is one of the longest studies of adult life. The study reveals that good and healthy relationships make people healthier and happier (64). Good social connections to friends, family, to the community make people live longer, influencing both the mind and the body. It is the quality of close relationships that matter, which together with the feeling of satisfaction in relationships can predict your health status later in life. Where the highest levels of satisfaction are associated with the healthiest lives. With the eyes focused on greater efficiency and transparency, one can ask the question who benefits. Is a talking mobile application going to benefit the older person living in the country-side?

5. Efficiency and efficacy

Placing big data at the centre of operations gives way for more opportunities for improving quality and efficiency. The aggregated data greatly expands the capacity to generate new knowledge. Analysing the unstructured data within Electronic Health Records (EHR) using new techniques permits finer data acquisition in an automated fashion (30). As such big data can be used to form a 'Learning healthcare system' to improve health provision at the individual and population level, healthcare, and biomedical research. For instance, interrelating all the now separate EHR's and combining them for analysis to form as a population database

for that region or patient type (65). This field is usually referred to as 'Health Informatics', which taken collectively proposes a framework for this learning system, it has overlaps and interconnections with branches of informatics like 'digital health', 'digital medicine', 'precision medicine', and 'personalised medicine' (66).

Down below you find the different processes of ischemic stroke patients in two hospitals. Note that different processes are being done throughout the care pathway of the patients.
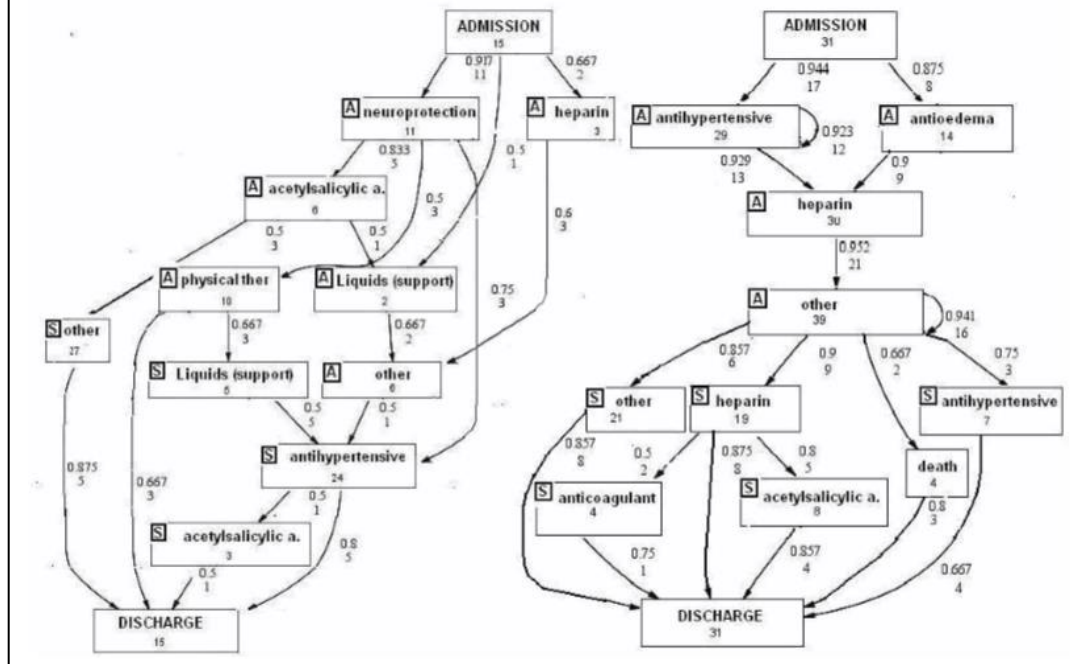
Figure 10 - Two different care pathways ischemic stroke

In terms of workflow or care processes, a new technique can be used to identify different processes in a hospital for instance. Which gives insight into the current processes with the desired one, which offers specific targeting of problems to increase efficiency. As such, current information systems in hospitals create event data, about what is happening where and with who. This data can be analysed in order to improve compliance and performance. See an example in the box below (67).

The ICT4LIFE project goal is to develop an efficient and cost-effective service-oriented ICT-based collaborative platform which exploits latest advances in sensorization, processing, communications and personalized HMI. ICT4Life will develop a modular Health Service Platform that will allow the provision, easily and in an adaptive way, of 6 ICT4Life Cluster Services for integrated care according to different end-user needs. link

The four categories of scenarios are displayed below:

Figure 11 - ICT4Life project

Introduced via Bitcoin, the blockchain technology provides a distributed database for managing unique digital assets among parties (68). Which allows for the secure transaction of data and opens up possibilities for managing and transferring many types of data over unsecured channels. It represents a new way of information registration and distribution and eliminates the need for a trusted party to facilitate digital relationships (69). In the area of healthcare, it can facilitate collaboration, give faster access to shared data, increase transparency, as well as decrease cost of care (70). Though, not fully explored. It can provide a secure and efficient solution for the increasing health data exchange between organisations.

Clinical decision support and evidence-based treatments algorithms can be incorporated into electronic health records and/or patient registries to guide and help treatment decisions. Though aimed towards providers, such tools can also be incorporated by patients themselves (71). The use of eHealth tools can increase both the quality and efficiency of care pathways: like a decrease of nurse staffing levels, improved clinical decision support, and decrease of unnecessary clinical diagnostic tests (72). Cost-benefits can be found with the use of tele-homecare versus hospital admission. While reducing the travelling time and improving the efficiency of care delivery (2). Though most economic evaluations are done on relatively short-term, one or two years, there are indications that, especially in rural areas, using eHealth tools are cost-beneficial compared to conventional healthcare services. Either by decreasing administration costs, automated screening and increase of work efficiency (73) & (74).

The staff reduction is not immediately the result. As the use of eHealth and mHealth require some form of digital skills to get acquainted and efficient with these tools. The technology has to be fully integrated into the organisation before any reduction of personnel can be achieved. It can, however, in a shorter term improve efficiency and productivity. Granting the ability to diagnose and monitor

patients remotely, quicker access to information. Which in turn, should offer the potential of providing health services to more patients (75).

Thus, there are efficiency improvements possible, and technology can increasingly assist in mapping and analysing large datasets. However, attention should be left to the relevance of human interaction in care and increasing efficiency should not be the sole focus.

Identified EU projects for efficiency/efficacy in CORDIS and INNORADAR (by acronym)		
FUTUREID MAESTRA FERARI ANCIEN SOPHIE	WE-CARE TICD NOVEL COURAGE IN EUROPE AGE-FRIENDLY VALUE-HEALTH	ELECTOR ROBOT-ERA INTEGRATE

Table 4 - Efficiency and efficacy projects CORDIS and INNORADAR

6. Summary of advantages and disadvantages eHealth and mHealth

Summarizing, the desk research shows that eHealth and mHealth can provide the following:

- **Advantages for wellbeing and quality of life**: eHealth enables people to better manage their own lives, supports people to maintain healthy lifestyles and organises personalised care. Also, eHealth connects people to social care or healthcare organisations that lead to the feeling of being secured and looked after. Finally, it supports people to connect with each other.

- **The disadvantage for wellbeing and quality of life**: eHealth minimises personal and face to face contact between people. In research and surveys, people indicate that they disvalue the digitalisation of human interaction.

- **Advantages for healthcare and social care**: eHealth leads to improvement and higher quality of decision making and clinical diagnostics. Also, it improves the quality of healthcare provision, because, if properly designed, ICT delivers without mistakes, where human beings sometimes may fail. Further, eHealth supports the monitoring of people with diseases and the results of therapies. eHealth also supports the collection of (big) data, real-time insights and improves knowledge of workers in healthcare. Following these benefits of eHealth, research indicates that patients have most to gain from ICT.

- **Disadvantages for healthcare and social care**: Although promising, the development of eHealth for healthcare and social care is still in an early stage. Also, the acceptance of eHealth and mHealth by healthcare workers is not progressing fast. Many costs, much research and much time must be invested to have eHealth and mHealth widely and maturely implemented in health and social care.

- **Advantages for independent living**: eHealth and mHealth support independence and maintain the quality of life. Also, they lead to more

security and safety for the people involved. They can provide aid for walking and cycling outdoors (physical activity) and for finding daily errands. Further, eHealth improves adherence to therapy, because the patient, family and peers are better informed. Finally, eHealth decreases the burden for patients or (informal) caregivers by the notification and alarm function.

- **Disadvantages for independent living**: to be profitable, service providers need to sell as many batches of ICT-devices/features as they can, without other assemblage or further development costs. On the other hand, to enable people to prolong independent living including people with severe impairments or diseases, it requires personal, tailor-made approaches, and one-size-fits-all doesn't work. These different approaches lead to the lack of appropriate business models and expensive ICT-solutions. Appropriate business models and cost-benefit calculations are missing.

- **Efficiency and efficacy**: eHealth increases the efficiency of care pathways: it leads to less patient-doctor visits, less staff involvement, better quality of treatment decisions, less clinical tests and reduces travelling time in rural areas. Because eHealth supports better decision making and tailored interventions to risk profiles, less inappropriate hospitalisations take place and the duration of stay can be reduced. Finally, it reduces administration costs.

- **The disadvantage for efficiency and efficacy:** Though efficiency improvements can be made, a balance between digitalisation of services and human intervention has to be reached. Successful business models to increase industrial exploitation are missing. Together with clear cost-benefit calculations of these new technologies. Which halts the creation of legitimacy in healthcare.

Seeing above advantages and disadvantages that were found as outcomes in literature during the desk research, it is quite questionable…

- Why healthcare systems and independent living provisions are not widely implemented and accepted to use in Europe?
- Why do pilots often only remain pilots and in case of positive results are not scaled up elsewhere?
- Why aren't the proven workable solutions implemented elsewhere in the region or country?
- Which barriers do people and organisations face to upscale and implement eHealth and mHealth solutions?
- What strategies are available to cross the gaps between sectors and places of initiatives?

In the following sections, SHAFE tried to find answers to these questions. The online survey examined the barriers people face, possible changes/impact of ICT on people and organisations, on independent living and also collected recommendations of respondents. In the interviews with European opinion leaders, they were asked to identify good practices and to recommend further strategies.

9.2.   Survey results

As an essential part of the Thematic Network 2018 SHAFE, the coordinators prepared an online survey using EUSURVEY. The questionnaire was open from June 4th until August 6th. The answers are stored at the EUSURVEY database of DG DIGIT of the European Commission. Answers were given anonymously unless respondents specifically provided their email in the last question.

To reach potential respondents, the main and associated partners of the Thematic Network SHAFE were asked to spread the survey to their networks and to fill in the survey themselves. Also, social media such as LinkedIn and Twitter were used to draw attention to the questionnaire and demand for broad participation.

Before participating in the survey, respondents were asked to best describe their interest in Smart Healthy Age-Friendly Environments and to choose one category. Their choice was linked to the appropriate questionnaire.

The following interests were recognised:

- Person (or partner, family, informal care) with limiting chronic disease(s) and/or physical and/or sensory impairment(s)

- ICT – development, provision, installation

- Construction and building

- Healthcare/social care

- Citizens representation/advocacy

- A public authority (local, regional, national, European administration)

- Financing/investment

- Insurance

- Regulation (standards, norms, codes of practice)

- Research (universities, applied science university, research centres)

- Architecture, urban planning

The survey got 81 submitted responses. The main interest groups to respond were universities and research centres (33), health care/social care (17) and ICT – development, provision, installation (14). No responses were received from insurance and architecture. Main responding countries were Portugal (21) and Italy (16). Public organisations (36), private non-for-profit (21) and private for-profit (17) were the most mentioned legal entities.

All ranges of applications and services were used or provided by the respondents, such as personal safety, personal health, house comfort, house security, social inclusion, administration, and energy efficiency. Respondents also indicated to use or provide all kinds of devices, such as tablets, personal computers, wearables, and smartphones.

Technology and users

Almost 1 out of 5 of the respondents do not recognise any gap between technological applications and the user's needs and expectations. The vast majority, however, recognises a digital gap between users and technology. This is mainly caused by digital illiteracy, need for intuitive and easy to use technology, dedicated to user's needs, lack of contact between users and developers and lack of adoption/acceptance with end-users. Recommendations to bridge the gap are more co-creation with end-users, more user-friendly applications, better education and promotion, make use of experience such as the Integrating the Healthcare Enterprise (IHE) provide and take care of secured data exchange. Zooming into the answers of the respondents concerned, they answered that IT/technology meets their needs and expectations. Reasons are that technology solves their problem and works as it should to remain independent, but in case of an emergency can notify the family.

ICT and living environments

There is a need to guarantee the minimal infrastructure for ICT to work. Easy access to the power supply for recharging and good coverage of network for accessing to internet services are needed. ICT solutions must be placed in a suitable place, be user-friendly and well adapted to users' habits. The introduction of Wi-Fi reduced in many cases the need for major physical alterations in the living environments. However, connectivity of Wi-Fi (3G, 4G, 5G) is an issue. Another aspect is the lack of space and narrow housing that is mentioned as one of the significant obstacles to installing sensors, internet connection and other IT solutions. It also depends on the kind of the solution if significant alterations in the living environment are needed, for example, steps prevent the wheeled robot from navigating through the entire space, which also needs more room than telemonitoring.

eHealth and changes to people and/or organisations

Respondents mentioned a wide variety of changes. Many of them were positive about the changes mHealth provides, however negative consequences were mentioned too. The most important change that has been mentioned is the improvement of the quality of life and independence of people, patients and their (informal) carers. Respondents mention that an essential condition is that people are involved with the development and application of ICT from the beginning. ICT empowers people to self-monitor and self-manage prevention and diseases. ICT enables social participation and (remote) connectivity, however one respondent questions if social contact is stimulated by ICT or isn't. Feeling safe and being cared for is another positive aspect of ICT. People with visual impairments benefit much from ICT. Further, ICT diminishes the workload, reduces dull tasks, eases monitoring and facilitates the provision of health and care. Respondents mention the ability to communicate faster, have better access to information and be more productive. Also, it modifies work procedures/standards, leads to greater efficiency and efficacy, coordination among departments and affects the improvement of public service.

Mentioned negative aspects are the following: more and faster communication/monitoring also leads to an increased workload. Expectancy to direct response becomes irritating if it lasts longer or when things do not work (properly), and perhaps there is less capability to deal with frustration. Another negative aspect is new/different diseases concerning the muscles and skeleton by the use of ICT.

ICT and independent living

Most respondents answered positively on the question if ICT/robotics/domotics bring any substantial changes to the opportunity for people to age in their own homes and (continue) to live independently. The main reasons hereto are that ICT helps to connect with other people and health care in order to be more safe and secure at home. This helps to feel confident enough to manage the own life and continue independent living autonomously. People are also enabled to manage their own (chronic) diseases at home. Family and caregivers are supported by ICT. On the other hand, respondents indicate the low level of development of many ICT-solutions (low TRL and maturity). Another challenge is that ICT/domotics is only used by a few people who can afford it, and there is no large-scale implementation yet.

Barriers to the use of ICT

Technical problems are the most significant barriers to the use of ICT. Low interoperability, low available/adequate infrastructures, lack of support in case of bugs or misfunctioning, lack of intuitively design, complex technical installation and maintenance challenges including many updates, lack of standardisation in the design and services are the main reasons causing technical installation and maintenance problems.

Almost equally the human factor is mentioned as a barrier. Low acceptance degrees by older people and family, lack of skills and competence to deal with ICT, fear of change, inadequate training of staff and patients are the main specifications. One respondent refers to better consider the impact of ICT on human rights (United Nations Independent Expert).

Financial problems and the high costs of technology are also mentioned as a barrier. Excellent business models and more scientific evidence on cost-efficacy are needed. This would help to get funded or get credit.

Ethics and privacy: the approval from an Ethics Committee takes much time, and the data handling and privacy-issues need a lot of preparation time.

Recommendations to public authorities and administration

The final question of the survey regarded the recommendations to European, national, regional, or local policy makers/administration to accomplish a broad implementation of smart age-friendly environments that improve health and living independently. It also asked what steps they should have to take. Many recommendations were sent in. Below a summary:

<u>Legal</u>:

- Request for a more dedicated and harmonised national and EU legislative framework and standards to install and use mHealth applications.
- Additional to the GDPR: rules for data security, privacy, transparency, and open interoperability.
- Rules regarding ethics and the rights of older people.

<u>Finances/economy</u>: Besides the often-done request for more funding:

- Define basic provisions by ICT and fund these. Extra payments for comfort or other extra provisions.
- Better business models and cost-efficacy evidence. Including better links to potential buyers, information exchange from users to producers and its benefits for producers.
- Ease contracting start-ups in the sector and support 50+ to start-up a new business so more qualified staff will become available.
- Provide multiannual budgets and easier access to credit.
- Support tax relief or other support for supporting families to hire carers and by/rent the required equipment.

<u>Societal</u>:

- Raise awareness that social activity and connectivity is most important for everyone, in general, and for older people, in particular.
- Cross the digital gap and adapt technology to the needs of users.
- Increase education and training.
- Involve and support families. Permanently demonstrate: WE NEED YOU!

<u>Environmental</u>:

- Age-friendly cities for residents and to receive tourists.
- Clean, well-maintained, safe pedestrian routes and areas. Accessible, safe and secured and comfortable buildings, infrastructure and housing to age-in-place. Good air quality and low carbon use. Provision of sufficient (and affordable) public transport, green spaces, rest and walking areas.
- Use of technology in public spaces: smarter outdoor spaces.

<u>Building/technical</u>:

- Accessibility Act to include universal design.
- Age-friendly design and interoperable ICT standards/labelling.
- Urban planning and construction sector should get better acquainted with older people, their daily living and needs.
- Intergenerational areas.
- Share good practices.

Health system:

- Attention to prevention and empowerment of citizens to age well.
- Acknowledge ICT as part of the health care and medical needs and guarantee interoperability.
- Better integration and communication between housing, health and social care services and provide affordable services.
- Better interlinkages between smart energy systems in housing and health care.

Political:

- Older people have to be directly represented at all levels to ensure to be heard on every policy issue that is of interest to them.
- Better collaboration across boundaries and involve ICT organisations.
- Free Wi-Fi and hotspots across Europe.

9.3.   Interview results

From June to August 2018, SHAFE coordinators and some partners performed structured interviews with open questions to 36 stakeholders across Europe. The list of interviewees, questionnaire and instructions are published in Annex 4.

The interviewees were selected based on their knowledge and experience on SHAFE's themes, and there was a concern in collecting information from a multidisciplinary group of relevant actors in the areas of Health, ICT, Infrastructure and Social Care. One of the respondents was an organisation not represented by a natural person, and 2 of the interviews were delivered by two 2 people each (colleagues from the same organisation that answered together) – therefore, the analysis of the respondents will include data from natural persons - 37 stakeholders.

In terms of gender, there were 20 men being interviewed and 17 women, which leads to quite balanced gender distribution.
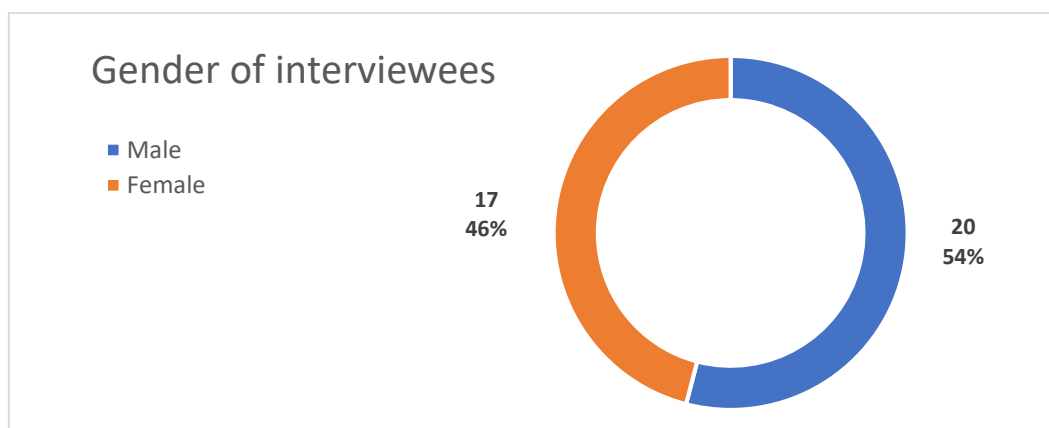

Figure 12 - Gender of interviewees

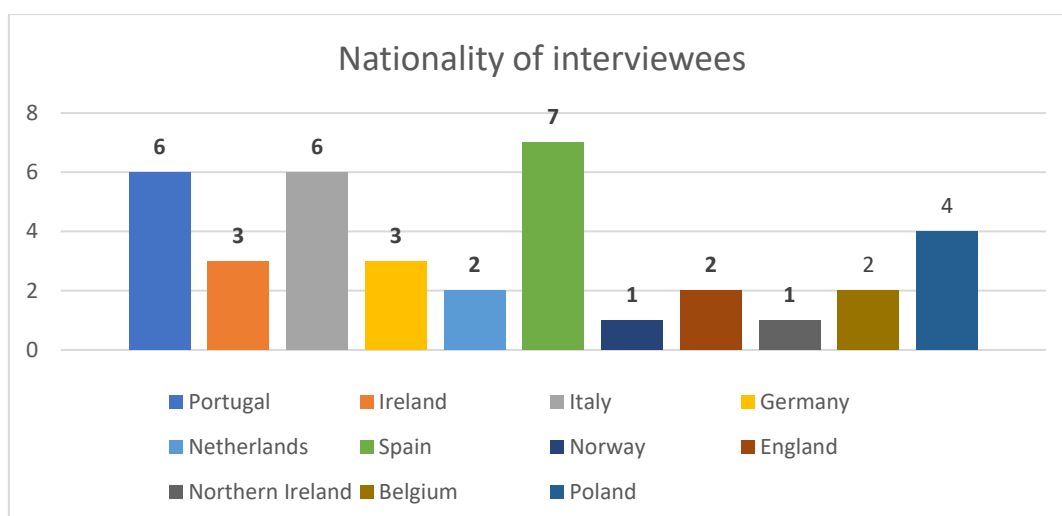As for the respondents' nationality, the interviews involved stakeholders from 11 different countries:

Figure 13 - Nationality of interviewees

Some of the interviewees have assumed the answers on behalf of their organisation as others preferred to provide personal expert opinions, not bound to their affiliation. Therefore, affiliations will not be displayed, but it can be mentioned that respondents were public servants/ public authorities, either at the local, regional, or national level. Academia and researchers, representatives of NGOs and citizens and also owners of private companies (especially in the areas of Health, ICT, and building/architecture) were also involved. European networks and organisations, as well as professionals of the European Commission also agreed to reply, providing a more high-policy overview of the areas discussed.

As for the content, the interview was divided into 4 main areas/questions, each addressing a policy area, with the linkage to relevant strategies, concepts, and documents:

- Health

- Information and Communication Technologies (ICT – with focus on eHealth and mHealth)

- Age-Friendly Environments (AFE)

- Sustainable Development goals (connected to SHAFE).

To analyse the outcomes, two lines of methodology were addressed. At a first stage, categories were extracted with the support of NVivo computer software reaching the most referred terms and expressions of questions 1 and 2, that can be consulted in Annex 3. The tool is used for qualitative data analysis of the interviews, through open coding categories are made and concepts sensitised.

Because this theoretical analysis brought interesting but extensive results that were difficult to be interpreted without comprehensive knowledge of the interviews, it was decided to select 4 main themes for each question that represented the most referred categories in answers:

Funding, economics, and business models	Governance and coordination	Communication, people, and societal challenges	Learning and knowledge management

The following tables will present the text of each question followed by the 4 main categories, and a summary of the most relevant content expressed linked to the number of participants referring to them. These summaries will be taken directly into an account for the formulation of the recommendation in the Joint Statement.

Question 1 - In your opinion, how shall the European Commission support EU countries on public health aiming at better quality for less investment? Could you select what you consider to be the 3 strategic actions that could lead to these outcomes?		
	Funding, economics, and business models	Funding was an issue for 19 interviewees. As public health is a critical area for states, it demands funds for existing needs but also for innovation in new areas and products. They suggested three main strategies for funding: 1. Funding aiming directly at the consumer, since they can buy devices and remodel their homes, fomenting this market and industry, as these improvements, for now, are expensive though the tendency is they will be cheaper in mid-term prevision; 2. Fund to undercut time to market and scale up initiatives is fundamental so that projects acquire sustainability and financial capability; 3. Fund for research and innovation, where local, national, and transnational levels are taken into consideration, enabling cooperation between private and public actors.
	Governance and coordination	This issue was considered important by 16 interviewees. The problem of coordination and connections was indicated due to several difficulties in conducting public health policies in Europe. There were three main trends: 1. Issues on connections within international policies in Europe, and how EC have limitations orienting these since Health is under the authority of each Member State; 2. Connections among cities and regions tend to be contained inside borders. It is difficult to overcome this separation (although the initiative to interconnect Electronic Health Records that will be released soon is good news); 3. At the local level, many initiatives happen but are often not aligned with a broader strategy, as well as they are not shared between peers.
	Communication, people, and societal challenges	This issue was mentioned by 9 interviewees. Communication is a problem that commonly follows the lack of coordination and integration of AFE policies. As it is extremely diffuse, it is not correctly followed by important sectors of society and stakeholder representatives. 1. Among public policy actors, many initiatives are not known, leading to diffuse answers and disconnected actions that confuse citizens or disturb a clear communication (e.g., of new services available). 2. People cannot take advantage of many services available for lack of information or accessibility. Also, if people are not aware of these innovations then cannot take part in decision making, creating a bigger gap towards user needs and expectations.

	Learning and knowledge management	This issue was mentioned by 11 interviewees. The need to share and exchange leanings and knowledge is imperative in this sector since it involves several actors and demographic patterns around Europe. In this sense, interviewees envision the improvement of the circulation of knowledge as a key action to success: 1. Improve knowledge between individuals at the grassroots level can engage people in public policies focused on AFE; 2. Shared knowledge between government departments is also important to strengthen national public policies and multiple good practices and results.

Question 2 - The Blueprint Digital Transformation of Health and Care for the Ageing Society states that: "Given the diversity of initiatives at EU, regional, national and local level and by industry, that relate to the digital transformation of professional and informal health and social care, the Blueprint will "connect the dots" between policy, health governance and R&I, between demand and supply, across health, social care and wellbeing, across technology, solutions and services platform (e.g., data). It will support the development of a broader and more compelling political vision on digital innovation for ageing well and the silver economy that will strengthen the societal dimension of the Digital Single Market and the digital society portfolio of the European Commission."

In your opinion, has this objective already been achieved with policy and concrete measures? If yes, can you give us 1-3 examples on eHealth or mHealth? If not, what are the main issues or initiatives you believe should be put into action to have a true implementation of a broader political vision for ageing well?

	Yes	2
	Partially	20
	No	10
	No answer	4

	Governance and coordination	In total, 18 interviewees agreed on Coordination as a strategy to have a true implementation of digitalisation. Overall, interviewees identified that it is such a deep theme that requires very good governance since it touches on critical issues of social life such as education, health care, Human Rights, and political participation. So effectively it is needed to solve mainly: 1. The gap in planning: the distance between local, national and EU goals, without objective measures to assess success or failures. It must be grounded in reality, not only on documents and papers; 2. Connect different dots of the field is essential to develop good policies. As there are different kinds of stakeholders, effective coordination must put them to speak the same language, strengthening cooperation and results. Especially, because

		important stakeholders are missing conversations, like the building industry; 3. Political coordination is essential due to different views of the same phenomena in each country. They have local and national issues, and this does not necessarily help to scale up initiatives.
	Funding, economics, and business models	10 interviewees brought the economic issue as an important factor regarding the implementation of digitalisation. In addition to calls for further funding to this area, interviewees indicated inequalities in the market that could undermine the implementation of digitalisation and the spread of successful initiatives. 1. Although more funding was requested to address issues of m/eHealth, they demonstrated special concern with what would come after each specific funding finishes: how to up-scale and adopt? Procurement? Consumer's market? Who pays?; 2. As well, a dichotomy in the digital market appears when big companies monopolise it and tend to undermine SME capacities. At the same time, SMEs normally aren't able to see the big picture of this setting; 3. A special role for incubators and entrepreneurship is seen as a possible advantage for digitalisation. They can bring innovation and address problems in collaborative ways.
	Learning and knowledge management	10 interviewees pointed out some lack of concreteness in this field because of the absence of tangible results. Although many of them received the Blueprint with so many expectations, they now feel it was not grounded on much pragmatic measures and objectives. 1. As the lack of coordination is a problem, many of the initiatives are not brought to light and evolve separately, reducing outcomes; 2. Time factor extremely important: there are still many pilot projects that no one can know it will scale up and achieve a trans-border status because they are too incipient.
	Communication, people, and societal challenges	10 interviewees pointed out that the social factor is an essential lens of analysis which many projects lack. Without considering the humans behind technological devices, it is hard to achieve a full cycle of digitalisation as successful as it is in other areas such as banking, energy, and industry. In order to improve this issue, they have some considerations: 1. Projects must rely on digital and health literacy of users. Without it, much of development is isolated from social needs which lead to inequalities in society; 2. In addition, people are not able to comprehend these changes and benefits of digitalisation. It is important to reach older people, otherwise, only in decades the earlier generations will be able to take advantage of it;

		3. It is essential to involve people in the development process to specifically address their needs and wills, therefore maximising and contributing to their health and wellbeing.

Question 3a – The World Health Organization defines Age-friendly environments as those that foster health and well-being and the participation of people as they age. They are accessible, equitable, inclusive, safe, and secure, and supportive. They promote health and prevent or delay the onset of disease and functional decline. They provide people-centred services and support to enable recovery or to compensate for the loss of function so that people can continue to do the things that are important to them.

Do you know a true AFE? Where and why?

Regarding the question of knowing a true Age-Friendly Environment, most answers provided refer that these are not full or holistic AFEs but that are places already working with that goal and that are coming to achieve many conditions that should be present in a true AFE – most referred are accessibilities, urban planning, transport, communications, among others.

Below the list of places referred to in this question 3:

Countries	Regions	Cities/communities
The Netherlands	Campania	Stuttgart
Ireland	Imperia	Hong Kong
China	Louth	Manchester
	Friuli Venezia-Giulia	Freiburg
	Biella	Aarhus
	Bizkaia	Coimbra
	Basque Country	Lisbon
	Malopolska Province	The Hague
		Zaragoza
		Deventer
		Batalha
		Lousã
		Vilamoura
		Birmingham
		Granada
		Guetxo
		Warsaw

Table 5 – Named places of Age-Friendly Environment

Question 3b - What are the main features you believe a Smart Healthy Age-Friendly Environment should include regarding People (as in people-centred) and Places (as in building environments) so it could integrate digitalisation in the best way possible?

	Communication, people, and societal challenges	This issue was addressed by 18 interviewees. This concerns the conditions which citizens take part in AFE in at least three levels: 1. Conditions of participation: whether people are listened and consulted, that is, their role in the generation and production of AFE. If they understand and if devices are easy and intelligible; 2. Technology must be accessible and take into consideration people's aims, desires and behaviour. 3. Inclusion is seen as an enabler of AFE, if the technology is accessible regarding, e.g., disabilities, social conditions, literacy, cultural differences.
	Funding, economics, and business models	This theme was addressed in 10 interviews. The main issue is that AFE should be implemented and supported by the State when necessary for the long-term societal and also economic gains. Some pragmatic suggestions: 1. Implement SHAFE through new partnerships, e.g., the EC could work closely with the European Investment Bank, to select important initiatives that could be funded for scaling-up; 2. Investment plans should be provided to support facilities for ageing autonomously, namely, to adapt, refurbish and restructure public and private buildings and environments; 3. Funding and actions should be taken in different sectors involving many actors such as urban planning, housing, transport, and service providers. 4. Knowledge and available technology are not the main issues anymore; the challenge is the deployment and scaling-up, e.g., economic constraints, ownership of data, digital skills, acceptance by citizens and caregivers, and usability.
	Governance and coordination	This issue was addressed by 12 interviewees. Most of them agreed on the necessity of integration of services in the direction of a holistic approach to AFE. The very idea of dispersed dots that must be linked is present, in the way that transportation, buildings, public spaces and services must be thought of as a whole in order to deliver results more efficiently.
	Learning and knowledge management	This issue was addressed by 8 interviewees. They highlighted the amount of information and data that circulates through technological devices. 1. Data can be positively used to analyse tendencies, outcomes, and changes in population. It can pose new questions and achieve answers; 2. At the same time, it touches in individual and intimate areas, since many times through technology one can access private life and misuse this type of data. In this sense, its collection must be well regulated and transparent.

	Question 4 – How can we progress in terms of policy, both from EU and as from the Member States, to implement Smart Healthy Age-Friendly Environments?	
	Communication, people, and societal challenges	This issue was addressed by 11 interviewees. Cultural and societal change underlies technological achievement. In this sense, interviewees agreed that ongoing social challenges should be faced: - older people status in society, - lifelong approach to health and education, - ageing policies that integrate people of different ages - favour the importance and experience of older people. The participation and empowerment of society are crucial to defining good policies and effectively bring people to AFE.
	Learning and knowledge management	This issue was addressed by 11 interviewees, and it was pointed as necessary in terms of sharing and exchange in initiatives. It is a common opinion that public, private, and academic sectors must be hand by hand to accelerate AFE solutions.
	Governance and coordination	This issue was addressed by 13 interviewees. This was a hard topic in opinions on how to develop AFE and exposed some issues in the relation between EU and the Member States and also between these and national and local governments. - All seem to agree on the need for some strategic change; - Some agreed on the role of EU in coordinating, promoting, funding and publicising initiatives in a big picture of the European context, gathering best practices and achievements across Europe, in a kind of vertical policy integrating all the way down different political levels; - Nationally, they stress how AFE is not coordinated among government authorities and departments, NGOs, the private sector, civil society, etc; - At the same time, most of them recognise EU limitation on health policies; - On the other hand, more regulation is seen as dangerous by one interviewee; - There is a claim for concrete results and examples to improve implementation.
	Funding, economics, and business models	This issue was addressed by 8 interviewees. Their concern was focused on: - the problem of return on investment of AFE policies; - the budget applied to research and innovation in this area; - which business model will be responsible to scale-up and sustain these policies; - the price for users to be affordable.

		For example, one option elicited was to propose tax incentives for those who change lifestyles towards healthier standards.

Besides this more scientific analysis, the most interesting, innovative, and pragmatic recommendations were also extracted from the interviews, even if only referred once, if shown relevant to the content of the Joint Statement.

10. Answering the questions

Chapter 8 presented the results of the desk research, survey, and interviews in order to be able to find answers to the questions from the beginning. This chapter presents the answers.

1. **How to enhance Places and People in the use and installation of eHealth and mHealth solutions, with special focus on quality and costs?**

To enhance People in the use and installation of eHealth and mHealth solutions, the first step must be to bridge the digital gap that is still present in European society. Although smartphones and other ICT devices are widely spread and used in Europe, still there is a group of people who do not use ICT or other technological solutions in daily living. In general, it is a matter of acceptance, willingness, and capacity to learn to use these technologies, but also due to technology push strategies and solutions that might not properly address the user needs or are not affordable. Financial investments are not apparent for many countries, and the price of the necessary equipment and data packages when compared to available income are sometimes a barrier to the implementation of innovative solutions. Lifelong learning, the user-friendly and intuitive design of technology, co-creation with end-users, secured data storage and data exchange are ways to bridge this digital gap.

Broadband internet, cellular networks 3G, 4G and 5G and fibre optic cables gave a boost to the use of ICT devices in built environments and outdoor spaces. Wireless Fibre (Wi-Fi) is mostly available indoors. Mobile broadband connectivity is an issue. The enhancement of Places is a relevant question when addressing the installation of eHealth and mHealth solutions. Current living environments of the user can limit the implementation and use of ICT. It is recommended to find smart solutions that utilise existing ICT infrastructure of buildings and houses, or eventually understand how it is feasible and sustainable to renovate them. On the other hand, existing narrow houses and small rooms of older adults do not allow for sizable solutions such as robotics. Therefore, construction plans for new buildings and houses should already take into consideration guidelines and standards that allow for adequate and appropriate conditions for current and upcoming ICT demands.

Focusing on quality and costs learns that, from a technological point of view, almost everything has already been invented and that many features with the capacity to improve wellbeing, health(care) and independent living already exist. Development of new technology, therefore, should not be a priority anymore, but rather implementation and integration are now the key issues: how to make sure that ICT solutions work correctly, are interconnected and adjusted to changing needs of the user? Cost-benefit analysis and economic impact assessments need further development to identify mid- and long-term implementation of ICT-solutions, to scale-up and to guarantee the quality of service, accessibility, and sustainable affordability over a longer period.

2. **What is the current state of the art in Europe regarding e-support at home to people with chronic disease and/or impairments?**

Searching on tags such as 'eHealth', 'mHealth', 'independent living', 'age-friendly environments', 'telehealth' and 'ageing in place' with or without the combination of people with chronic diseases and/or impairments gave an overview of about 100 European projects (used European databases were CORDIS and INNORADAR.EU). These projects were or are funded in the FP6, FP7 and Horizon 2020 programmes. The search led to the categorisation of the projects into 4 main groups: Wellbeing and quality of life, Health and social care, Independent living and Efficacy and efficiency. To gain a better understanding of the projects' results we investigated the dedicated CORDIS sections and linked to the project websites. In many cases the websites gave an overview of the projects' documents and project deliverables for the final review by the European Commission however in many cases the website was not updated afterwards. Easy and accessible overviews of main findings and recommendations for further use by other projects and lessons learned were not to be found.

From the interviews and the survey, we also learned that to accomplish a broad implementation of practices, further steps have to be taken. There is the need for efficient accessibility options of all the data collected over the years in such a way that it may be re-used and integrated into future research, policy-making and societal progress.

3. **How to align technological development with the building industry for smart environments in terms of policy and funding, enhancing a more efficient health care system that adds better quality for less investment?**

To realise smart healthy age-friendly environments in Europe, it is elementary to achieve that construction industries and technology companies are aligned to jointly develop and reconstruct new and existing houses, public buildings, healthcare facilities, transportation facilities and outdoor spaces. These environments will be smart, responsive to the user's needs and demands, have low carbon use, are sustainable and are healthy. They improve mobility and participation in society, lead to active and healthy ageing and prolong independent living. Sustainable use of these environments will be improved by involving users of the environments at the start of the design and development. To achieve the required and more integral approach it is needed to encourage partnerships at a local and regional level to get a better knowledge exchange between these, namely in shared guidelines and standards.

Every European country has its own healthcare system. In general, there are two mainstream healthcare systems: Beveridge (healthcare system funded by taxes) and Bismarck (healthcare costs are covered by more or less mandatory health insurances). No matter what the system is, until now, they have in common that most expenditures go to healthcare related costs: hospitals, pharmacy, medical specialists, long-term institutional care. Preventive measures such as supporting healthy in- and outdoor environments and independent living solutions are hardly covered in any healthcare system. However, the benefits of such investments would lead to healthcare costs reduction in the long run. In this way, the efficiency of health care systems could be enhanced if it would take into account the societal and individual benefits in relation to the above-mentioned investments in preventive measures.

Concerning the initiatives that add better quality for less investment, it is essential to share good practices and not to re-invent the wheel each time. Many solutions are already available so that development costs can be diminished. The main issue is to guarantee that systems, national or regional/local do indeed integrate and implement proven innovative solutions broadly; otherwise what is the purpose of Europe's investment in research and innovation?

4. **How to bridge the main gaps between technological development and user's needs and expectations?**

To bridge the main gaps between technological development and user's needs and expectations the only solution is to involve users from the beginning when planning, designing, and constructing new or adapting living environments and technology. Only in this way technology understands and gives a solution to the real user's needs and challenges and adapts to their competences and skills in the usage of such technology. Integrating policy and funding in concern to specific societal challenges instead of having it in separate silos of knowledge areas also seem a way to provide them more pragmatic use.

11. Towards recommendations

Following the outcomes of the desk-research, interviews, and survey, the following five main areas were identified:

- Integrative approach

- Governance and coordination

- Funding, economic, and business models

- Learning and knowledge management

- Communication, people, and societal challenges

Departing from the outcomes collected for each of these areas, SHAFE identified 5 significant recommendations, that are shortly described below. This is just the "chapeau" for the Joint Statement. In consultation and discussion with the principal and associated partners and with the inputs that will be collected at the AAL Forum (September 25th, workshop 12) and during the second thematic network webinar (October 2nd), the recommendations will be further elaborated, detailed in several more targeted actions and refined. The recommendations will be formulated as calls to specific actions, enumerating the ones addressed to the European Commission and also those intended for the Member States.

The 5 recommendations areas are, therefore:

1. **Create a shared European Vision on Smart Healthy Age-Friendly Environments**

    The first step to realise smart healthy age-friendly environments is to develop a shared European vision. The European vision will be a high-level agreement of relevant actors in Europe, such as the primary and associated partners of the Thematic Network SHAFE in addition to the European Commission (DG Santé, DG Connect, DG Regio, DG Growth, DG Employment). The benefits of the vision for European citizens enables them to have more healthy life years and has a positive impact on more autonomy, well-being and quality of life while giving a boost to European ICT and construction industries and ensure sustainable healthcare systems.

    This European vision will foster local and regional stakeholders as an inspiring sketch or blueprint to be used at local and regional level everywhere in Europe. Differences in cultural aspects and values will be considered. In the near future the vision can develop into a strategy that is more detailed and concrete. EU guidelines might be needed to motivate Member States.

    Detailed actions on all of these levels (European, national, regional/local) shall be detailed for the Joint Statement.

2. Promote cross-sectoral cooperation

Crucial for the development of smart healthy age-friendly environments are the alignment of (policy) domains and an integrative approach. It is essential that politicians, policymakers and other critical societal players abandon thinking and working in pillars and open up for cross-sectoral cooperation. Cross-sectoral cooperation includes, in this sense, public services and social care, construction and ICT, urban planning and healthcare, housing and mobility. To achieve a better integrative collaboration, we propose to create national and international interdisciplinary policy and societal working groups or ecosystems at all levels that are responsible for developing joint policies of the implementation of smart healthy age-friendly environments and share experiences and values. The European vision can act as a source of inspiration. It is also important to define responsibilities and leadership.

Again, specific actions on all of these levels (European, national, regional/local) will be detailed for the Joint Statement.

3. Fund the implementation of Smart Healthy Age-Friendly Environments

Budgets for research and innovation often go to developing new proof of concepts and to install new pilots. A shift to (longer term) funding of implementation and upscaling of already existing, well-performing examples of smart healthy age-friendly environments and independent living would better enhance the roll out across Europe. In this sense, it is very important that European funding and national funding schemes be aligned, so that innovation coming from successful European projects can be integrated into national frameworks and therefore scale-up through Europe. It would also be very helpful to have a European database/guidance of proven projects and technologies that companies and investors can use to implement. Further it is recommended to bridge the existing digital gap within organisations and people: this would give a boost to implementation too.

Also, very important is to create funding frameworks that integrate different elements on SHAFE, such as Health, Social care, ICT and building environments in the same calls, allowing effective implementation of long-term solutions. These funding frameworks shall derive from the European Strategy and EU/Member States task forces on the subject.

4. Invest in research that derives from societal needs and challenges and use knowledge for prediction, prevention and implementation of solutions

To achieve more impact regarding societal needs and challenges, we recommend increasing the funding calls that support long lasting (preferably large-scale) pilots and raise the demand on the social and economic impact of projects. Also, we suggest investing more in funding for actions that include the prediction of health and social needs and challenges and are connected to the implementation of prevention measures.

We believe we have already passed the point where our healthcare and social care systems could respond to all upcoming needs forever. The better way to guarantee sustainability is to invest in prevention and predicting the upcoming challenges with enough time to address it with the minimum resources. Research is essential to guarantee this and needs to be encouraged to privilege this approach.

5. **Enhance the empowerment of citizens and the promotion of people-centred policies and measures**

Elementary in the development of smart healthy age-friendly environments across Europe is the involvement of European citizens. Citizens need to be involved from the start of each development that is concerning their living environments and their health and care. Participatory approach methods will have to be intrinsic parts of academic curricula, so policy workers and developers can use them as a current tool. Also, new professional profiles that link areas of knowledge with management and communication skills should be developed.

It is also necessary that citizens get the opportunity to initiate improvements in their living environments themselves. To enable and empower citizens more lifelong learning possibilities are needed, and higher participatory budgets are recommended. More educational activities on aspects such as digital literacy, health literacy, and political/societal mobilisation are also of extreme importance to guarantee full and conscious engagement.

Comments and suggestions regarding the framing paper and the recommendations can be sent to carinadantas@caritascoimbra.pt and willeke@afedemy.eu.

12. Annex 1: References

1. Slev VN, Mistiaen P, Pasman HRW, Leeuw IMV de, Uden-Kraan CF va., Francke AL. Effects of eHealth for patients and informal caregivers confronted with cancer: A meta-review. Int J Med Inform. 2016;87:54–67.
2. Ekeland AG, Bowes A, Flottorp S. Effectiveness of telemedicine: A systematic review of reviews. Int J Med Inform [Internet]. 2010;79(11):736–71. Available from: http://dx.doi.org/10.1016/j.ijmedinf.2010.08.006
3. Black AD, Car J, Pagliari C, Anandan C, Cresswell K, Bokun T, et al. The impact of ehealth on the quality and safety of health care: A systematic overview. PLoS Med. 2011;8(1):1–16.
4. World Health Organization. mHealth: New horizons for health through mobile technologies. Observatory [Internet]. 2011;3(June):66–71. Available from: http://www.webcitation.org/63mBxLED9
5. Bousquet J, Chavannes NH, Guldemond N, Haahtela T, Hellings PW, Sheikh A. Realising the potential of mHealth to improve asthma and allergy care: How to shape the future. Eur Respir J [Internet]. 2017;49(5). Available from: http://dx.doi.org/10.1183/13993003.00447-2017
6. Nurek M, Kostopoulou O, Delaney BC, Esmail A. Reducing diagnostic errors in primary care. A systematic meta-review of computerized diagnostic decision support systems by the LINNEAUS collaboration on patient safety in primary care. Eur J Gen Pract. 2015;21(July 2013):8–13.
7. Ratanawongsa N, Chan LLS, Fouts MM, Murphy EJ. The Challenges of Electronic Health Records and Diabetes Electronic Prescribing: Implications for Safety Net Care for Diverse Populations. J Diabetes Res. 2017;2017.
8. Kauppinen H, Ahonen R, Timonen J. The impact of electronic prescriptions on medication safety in Finnish community pharmacies: A survey of pharmacists. Int J Med Inform [Internet]. 2017;100:56–62. Available from: http://dx.doi.org/10.1016/j.ijmedinf.2017.01.014
9. Cardinaux F, Brownsell S, Bradley D, Hawley MS. A home daily activity simulation model for the evaluation of lifestyle monitoring systems. Comput Biol Med [Internet]. 2013;43(10):1428–36. Available from: http://dx.doi.org/10.1016/j.compbiomed.2013.07.007
10. Meier CA, Fitzgerald MC, Smith JM. eHealth: Extending, Enhancing, and Evolving Health Care. Annu Rev Biomed Eng [Internet]. 2013;15(1):359–82. Available from: http://www.annualreviews.org/doi/10.1146/annurev-bioeng-071812-152350
11. Heimerl K, Menon A, Hasan S, Ali K, Brewer E, Parikh T. Analysis of smartphone adoption and usage in a rural community cellular network. Proc Seventh Int Conf Inf Commun Technol Dev - ICTD '15 [Internet]. 2015;1–4. Available from: http://dl.acm.org/citation.cfm?doid=2737856.2737880
12. Gabriël M, de Schietere De Lophem C, Van Bavel C. State of the smart Consumer usage patterns of the smartphone Global Mobile Consumer Survey Belgian edition 2017. 2017;40. Available from: https://mobile-consumer-survey.deloitte.be/2017_state-of-the-smart
13. Wass S, Vimarlund V. Challenges of Stimulating a Market for Social Innovation-Provision of a National Health Account. Stud Health Technol Inform. 2015;210:546–50.
14. Christopoulou SC, Kotsilieris T, Anagnostopoulos I. Evidence-based health and clinical informatics: a systematic review on randomized controlled trials. Health Technol (Berl) [Internet]. 2017;137–50. Available from: http://link.springer.com/10.1007/s12553-016-0170-2
15. Vorrink SNW, Kort HSM, Troosters T, Lammers J-WJ. A Mobile Phone App to Stimulate Daily Physical Activity in Patients with Chronic Obstructive Pulmonary Disease: Development, Feasibility, and Pilot Studies. Eysenbach G, editor. JMIR mHealth uHealth [Internet]. 2016 Jan 26;4(1):e11. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4748139/
16. Kenealy TW, Parsons MJG, Rouse APB, Doughty RN, Sheridan NF, Harré Hindmarsh JK, et al. Telecare for diabetes, CHF or COPD: Effect on quality of life, hospital use and costs. A randomised controlled trial and qualitative evaluation. PLoS One. 2015;10(3):1–21.
17. Lane ND, Lin M, Mohammod M, Yang X, Lu H, Cardone G, et al. BeWell: Sensing sleep, physical activities and social interactions to promote wellbeing. Mob Networks Appl. 2014;19(3):345–59.
18. Huguet A, Rao S, McGrath PJ, Wozney L, Wheaton M, Conrod J, et al. A systematic review of cognitive behavioral therapy and behavioral activation apps for depression. PLoS One. 2016;11(5):1–19.
19. Gagnon M-P, Breton E, Courcy F, Quirion S, Côté J, Paré G. The Influence of a Wound Care Teleassistance Service on Nursing Practice: A Case Study in Quebec. Telemed e-Health [Internet]. 2014;20(6):593–600. Available from: http://online.liebertpub.com/doi/abs/10.1089/tmj.2013.0287
20. Wildenbos GA, Peute L, Jaspers M. Aging barriers influencing mobile health usability for older adults: A literature based framework (MOLD-US). Int J Med Inform [Internet]. 2018;114(September 2017):66–75. Available from: http://linkinghub.elsevier.com/retrieve/pii/S1386505618302454
21. Sheikhtaheri A, Kermani F. Telemedicine in diagnosis, treatment and management of diseases in children. Stud Health Technol Inform. 2018;248:148–55.
22. Arnold K, Scheibe M, Müller O, Schmitt J. Grundsätze für die Evaluation telemedizinischer Anwendungen – Ergebnisse eines systematischen Reviews und Konsens-Verfahrens. Z Evid Fortbild Qual Gesundhwes. 2016;117:9–19.
23. van Egmond MA, van der Schaaf M, Vredeveld T, Vollenbroek-Hutten MMR, van Berge Henegouwen MI,

Klinkenbijl JHG, et al. Effectiveness of physiotherapy with telerehabilitation in surgical patients: a systematic review and meta-analysis. Physiother (United Kingdom) [Internet]. 2018;104(3):277–98. Available from: https://doi.org/10.1016/j.physio.2018.04.004

24. Tucker KL, Sheppard JP, Stevens R, Bosworth HB, Bove A, Bray EP, et al. Self-monitoring of blood pressure in hypertension: A systematic review and individual patient data meta-analysis. PLoS Med. 2017;14(9):1–29.

25. Tomasic I, Tomasic N, Trobec R, Krpan M, Kelava T. Continuous remote monitoring of COPD patients---justification and explanation of the requirements and a survey of the available technologies. Med Biol Eng Comput [Internet]. 2018 Apr;56(4):547–69. Available from: https://doi.org/10.1007/s11517-018-1798-z

26. Treskes RW, van der Velde ET, Barendse R, Bruining N. Mobile health in cardiology: a review of currently available medical apps and equipment for remote monitoring. Expert Rev Med Devices [Internet]. 2016;13(9):823–30. Available from: http://dx.doi.org/10.1080/17434440.2016.1218277

27. McLean S, Sheikh A, Cresswell K, Nurmatov U, Mukherjee M, Hemmi A, et al. The impact of telehealthcare on the quality and safety of care: A systematic overview. PLoS One. 2013;8(8).

28. Dumit EM, Novillo-Ortiz D, Contreras M, Velandia M, Danovaro-Holliday MC. The use of eHealth with immunizations: An overview of systematic reviews. Vaccine [Internet]. 2018; Available from: https://doi.org/10.1016/j.vaccine.2018.06.076

29. Oosterveen E, Tzelepis F, Ashton L, Hutchesson MJ. A systematic review of eHealth behavioral interventions targeting smoking, nutrition, alcohol, physical activity and/or obesity for young adults. Prev Med (Baltim) [Internet]. 2017;99:197–206. Available from: http://dx.doi.org/10.1016/j.ypmed.2017.01.009

30. Murdoch T.B. DAS. THe inevitable application of big data to health care. Jama [Internet]. 2013;309(13):1351–2. Available from: http://dx.doi.org/10.1001/jama.2013.393

31. Schmidt C. M. D. Anderson Breaks With IBM Watson, Raising Questions About Artificial Intelligence in Oncology. J Natl Cancer Inst. 2017;109(5):4–5.

32. Ogilvie LA, Kovachev A, Wierling C, Lange BMH, Lehrach H. Models of Models: A Translational Route for Cancer Treatment and Drug Development. Front Oncol [Internet]. 2017;7(September):1–7. Available from: http://journal.frontiersin.org/article/10.3389/fonc.2017.00219/full

33. Ogilvie L a, Wierling C, Kessler T, Lehrach H, Lange BMH. Predictive Modeling of Drug Treatment in the Area of Personalized Medicine. Lib Académica. 2015;14:95–103.

34. Maksimovic M, Vujovic V, Perisic B. A Custom Internet of Things Healthcare System. In: 2015 10th Iberian Conference on Information Systems and Technologies (CISTI). 2015. p. 653–8.

35. IERC Cluster SRIA 2014. European Research Cluster on the Internet of Things [Internet]. [cited 2018 Aug 23]. Available from: http://www.internet-of-things-research.eu/about_iot.htm

36. Miorandi D, Sicari S, De Pellegrini F, Chlamtac I. Internet of things: Vision, applications and research challenges. Ad Hoc Networks [Internet]. 2012;10(7):1497–516. Available from: http://dx.doi.org/10.1016/j.adhoc.2012.02.016

37. Lake D, Milito R, Morrow M, Vargheese R. Internet of Things: Architectural Framework for eHealth Security. J ICT Stand [Internet]. 2014;1(3):301–28. Available from: http://www.riverpublishers.com/journal_read_html_article.php?j=JICTS/1/3/3

38. Niewolny D. How the Internet of Things Is Revolutionizing Healthcare. White Pap [Internet]. 2013;October:3–5. Available from: http://cache.freescale.com/files/corporate/doc/white_paper/IOTREVHEALCARWP.pdf

39. Dobrev A, Jones T, Stroetmann K, Vatter Y, Peng K. Report on The socio-economic impact of interoperable electronic health record (EHR) and ePrescribing systems in Europe and beyond. Synthesis (Stuttg) [Internet]. 2009;(October):54. Available from: http://www.ehr-impact.eu/downloads/%5Cndocuments/EHRI_final_report_2009.pdf

40. Currie WL, Seddon JJM. A cross-national analysis of eHealth in the European Union: Some policy and research directions. Inf Manag [Internet]. 2014;51(6):783–97. Available from: http://dx.doi.org/10.1016/j.im.2014.04.004

41. Rioux L. The well-being of aging people living in their own homes. J Environ Psychol. 2005;25(2):231–43.

42. Oswald F, Wahl HW, Schilling O, Nygren C, Fänge A, Sixsmith A, et al. Relationships between housing and healthy aging in very old age. Gerontologist. 2007;47(1):96–107.

43. Hillcoat-Nallétamby S, Ogg J. Moving beyond "ageing in place": Older people's dislikes about their home and neighbourhood environments as a motive for wishing to move. Ageing Soc. 2014;34(10):1771–96.

44. Wong JKW, Leung J, Skitmore M, Buys L. Technical requirements of age-friendly smart home technologies in high-rise residential buildings: A system intelligence analytical approach. Autom Constr [Internet]. 2017;73:12–9. Available from: http://dx.doi.org/10.1016/j.autcon.2016.10.007

45. Demiris G, Hensel BK. Technologies for an aging society: a systematic review of "smart home" applications. Yearb Med Inf [Internet]. 2008;(August):33–40. Available from: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=18660873

46. Jennett PA, Andruchuk K. Telehealth : ' real life ' implementation issues. Comput Methods Programs Biomed. 2001;64:169–74.

47.   Scott RE, Mars M. Principles and Framework for eHealth Strategy Development. Eysenbach G, editor. J Med Internet Res [Internet]. 2013 Jul 30;15(7):e155. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3742409/

48.   Gholamhosseini L, Ayatollahi H. The design and application of an e-health readiness assessment tool. Heal Inf Manag J. 2017;46(1):32–41.

49.   Martin AB, Probst JC, Shah K, Chen Z, Garr D. Differences in Readiness Between Rural Hospitals and Primary Care Providers for Telemedicine Adoption and Implementation: Findings From a Statewide Telemedicine Survey. J Rural Heal [Internet]. 2011 Mar 18;28(1):8–15. Available from: https://doi.org/10.1111/j.1748-0361.2011.00369.x

50.   Liu L. Mental Wellness in Seniors and PersMental Wellness in Seniors and Persons with Disabilities ons with Disabilities. 2012; Available from: https://www.albertahealthservices.ca/assets/info/res/mhr/if-res-mhr-crgi-seed-liu.pdf

51.   Hulfish G. This Smart House Could Keep Track of Your Health Like a Live-In Nurse | Digital Trends [Internet]. Digital Trends.com. 2017 [cited 2018 Aug 2]. Available from: https://www.digitaltrends.com/home/ku-smart-house/

52.   Hamine S, Gerth-Guyette E, Faulx D, Green BB, Ginsburg AS. Impact of mHealth chronic disease management on treatment adherence and patient outcomes: A systematic review. J Med Internet Res. 2015;17(2):1–15.

53.   European Commission report. Towards a common European data space. 2018;

54.   Oremus W. Facebook was designed to be addictive. Does that make it evil? [Internet]. [cited 2018 Aug 23]. Available from: http://www.slate.com/articles/technology/technology/2017/11/facebook_was_designed_to_be_addictive_does_that_make_it_evil.html?via=gdpr-consent

55.   Kuss DJ, Griffiths MD. Social networking sites and addiction: Ten lessons learned. Int J Environ Res Public Health. 2017;14(3).

56.   Richards D, Caldwell PHY, Go H. Impact of social media on the health of children and young people. J Paediatr Child Health. 2015;51(12):1152–7.

57.   Gibbs S. Facebook admits it tracks non-users, but denies claims it breaches EU privacy law | Technology | The Guardian [Internet]. 10th of April. 2015 [cited 2018 Aug 27]. Available from: https://www.theguardian.com/technology/2015/apr/10/facebook-admits-it-tracks-non-users-but-denies-claims-it-breaches-eu-privacy-law

58.   Kocieniewski D. Adobe Announces Security Breach - The New York Times [Internet]. 3rd October. 2013 [cited 2018 Aug 27]. Available from: https://www.nytimes.com/2013/10/04/technology/adobe-announces-security-breach.html

59.   Gibbs S. Dropbox hack leads to leaking of 68m user passwords on the internet | Technology | The Guardian [Internet]. 31st of August. 2016 [cited 2018 Aug 27]. Available from: https://www.theguardian.com/technology/2016/aug/31/dropbox-hack-passwords-68m-data-breach

60.   Keane J. 427 million Hacked Myspace Passwords Get Dumped Online | Digital Trends [Internet]. 2016 [cited 2018 Aug 27]. Available from: https://www.digitaltrends.com/social-media/myspace-hack-password-dump/

61.   Hackett R. LinkedIn Data Breach: 117 Million Emails and Passwords Leaked | Fortune [Internet]. 18th of May. 2016 [cited 2018 Aug 27]. Available from: http://fortune.com/2016/05/18/linkedin-data-breach-email-password/

62.   Munro D. Data Breaches In Healthcare Totaled Over 112 Million Records In 2015 [Internet]. 31st of December. 2015 [cited 2018 Aug 27]. Available from: https://www.forbes.com/sites/danmunro/2015/12/31/data-breaches-in-healthcare-total-over-112-million-records-in-2015/#2a89cd047b07

63.   Cerrudo C. Why Cybersecurity Should Be The Biggest Concern Of 2017 [Internet]. 17th of January. 2017 [cited 2018 Aug 27]. Available from: https://www.forbes.com/sites/forbestechcouncil/2017/01/17/why-cybersecurity-should-be-the-biggest-concern-of-2017/#6ad46e085218

64.   Mineo L. Over nearly 80 years, Harvard study has been showing how to live a healthy and happy life – Harvard Gazette [Internet]. 11th of APril. 2017 [cited 2018 Aug 27]. Available from: https://news.harvard.edu/gazette/story/2017/04/over-nearly-80-years-harvard-study-has-been-showing-how-to-live-a-healthy-and-happy-life/

65.   Banerjee A, Drumright LN, Mitchell ARJ. Can the NHS be a learning healthcare system in the age of digital technology? BMJ Evidence-Based Med [Internet]. 2018;0(0):bmjebm-2018-110953. Available from: http://ebm.bmj.com/lookup/doi/10.1136/bmjebm-2018-110953

66.   Felle P. Medical Informatics. Med Informatics [Internet]. 2005;8:363. Available from: http://link.springer.com/10.1007/b135955

67.   Mans RS, Aalst WMP Van Der, Vanwersch RJB. Process Mining in Healthcare Evaluating and Exploiting Operational Healthcare Processes. Alexandria.Tue.Nl. 2015. 99 p.

68.   Nakamoto S. Bitcoin: A Peer-to-Peer Electronic Cash System. WwwBitcoinOrg [Internet]. 2008;9. Available from: https://bitcoin.org/bitcoin.pdf

69. Burniske C, Vaughn E, Shelton J, Cahana A. How Blockchain Technology Can Enhance EHR Operability. Gem | Ark Invest Res [Internet]. 2016;1–13. Available from: http://research.ark-invest.com/blockchain-and-healthcare

70. Sharma R. BLOCKCHAIN: the magic pill to alleviate the pain points of the healthcare industry? [Internet]. FRANCE CANADA CHAMBER OF COMMERCE ONTARIO. 2018. Available from: https://www.coindesk.com/blockchain-healthcare-2017s-successes/

71. Bauer AM, Thielke SM, Katon W, Unützer J, Areán P. Aligning health information technologies with effective service delivery models to improve chronic disease care. Prev Med (Baltim) [Internet]. 2014;66:167–72. Available from: http://dx.doi.org/10.1016/j.ypmed.2014.06.017

72. Buntin MMB, Burke MMF, Hoaglin MCM, Blumenthal D. The benefits of health information technology: A review of the recent literature shows predominantly positive results. Health Aff [Internet]. 2011;30(3):464–71. Available from: http://content.healthaffairs.org/content/30/3/464.short

73. de la Torre-Díez I, López-Coronado M, Vaca C, Aguado JS, de Castro C. Cost-Utility and Cost-Effectiveness Studies of Telemedicine, Electronic, and Mobile Health Systems in the Literature: A Systematic Review. Telemed e-Health [Internet]. 2015;21(2):81–5. Available from: http://online.liebertpub.com/doi/abs/10.1089/tmj.2014.0053

74. Elbert NJ, Van Os-Medendorp H, Van Renselaar W, Ekeland AG, Hakkaart-Van Roijen L, Raat H, et al. Effectiveness and cost-effectiveness of ehealth interventions in somatic diseases: A systematic review of systematic reviews and meta-analyses. J Med Internet Res. 2014;16(4):1–23.

75. Lapão LV, Dussault G. The contribution of eHealth and mHealth to improving the performance of the health workforce : a review. Policy Pract. 2017;(2):463–71.

13. Annex 2: Survey questionnaires

As an essential part of the Thematic Network 2018 SHAFE, the coordinators prepared an online survey using EUSURVEY. The questionnaire was open from June 4th until August 6th. The answers are stored at the EU Survey database of DG Digit of the European Commission. Answers were given anonymously unless respondents specifically provided their email in the last question.

To reach potential respondents, we asked the principal and associated partners of TN SHAFE to spread the survey to their networks and to fill in the survey themselves. Also, we used social media such as LinkedIn to draw attention to the survey.

Before participating in the survey, respondents were asked to best describe their interest in smart healthy age-friendly environments and to choose one category. Their choice was linked to the appropriate questionnaire.

SHAFE designed the survey with a common framework but adapted the questions to 11 specific target groups:

- Person (or partner, family, informal care) with limiting chronic disease(s) and/or physical and/or sensory impairment(s)
- ICT – development, provision, installation
- Construction and building
- Healthcare/social care
- Citizens representation/advocacy
- A public authority (local, regional, national, European administration)
- Financing/investment
- Insurance
- Regulation (standards, norms, codes of practice)
- Research (universities, applied science university, research centres)
- Architecture, urban planning

14. Annex 3: Interviews documents

14.1. List of interviewees (in alphabetical order)

- Agnieszka Cieśla
- Aleksander Nicał
- Alexander Peine
- Ana Garcia
- Andy Bleaden
- Anne Berit Rafoss /Tom van Benthem
- Anne-Sophie Parent
- Bogusława Urbaniak
- Brian O'Connor
- Campania Digital Union
- Christantoni Ilia
- Elísio Costa
- Elizabeth Martinez
- Felip Miralles
- Francisco Rivas
- Giulio Gallo
- Horst Kraemer
- Joan Martin
- João Apóstolo
- John Farrell
- José Pereira Miguel
- Klaus Niederländer
- Lea Bouwmeester
- Lucio Meneses de Almeida
- Maddalena Illario
- Marc Lange / Diane Whitehouse
- Marta Fernandez
- Franco Mercalli
- Nicola Bryant
- Pablo Coca
- Paula Santana
- Silvia Pérez
- Silvia Urra Uriarte
- Wiesława Borczyk
- Ylenia Sacco

14.2. Interview template

Thank you for your interest and willingness to actively collaborate in this interview as an opinion leader, towards the creation of a Joint Statement by November 2018, through the Thematic Network Smart Healthy Age-Friendly Environments (TN SHAFE).

The specific aim of SHAFE is to enhance two main aspects of Age-Friendly Environments – Places and People – in the creation of eHealth and mHealth solutions - especially focused on quality and costs. These smart environments need to align technological development with the building industry in terms of policy and funding, in order to make smart homes available, affordable, and large-scaled in Europe. This broad adoption may be the keystone to a more efficient health care system that adds better quality for less investment. You may consult all the details at: https://www.caritascoimbra.pt/en/shafe/what-is-shafe/

Cáritas Coimbra and AFEdemy are leading this TN and expect to collect a high-policy vision on this theme, so we will propose you to relate Digitalisation, Health and Age-Friendly Environments with relevant strategic documents of the European Commission and World Health Organization.

Your views and insight will be essential to frame the final content of the Joint Statement.

---

1 – European Commission Health priorities give emphasis on creating synergies that will increase quality, innovation, and sustainability towards the implementation of better health and care, economic growth, and sustainable health systems. But how to accomplish it in Europe and how do we achieve better quality for less investment?

The European Commission's role is to support the efforts of EU countries to protect and improve the health of their citizens and to ensure the accessibility, effectiveness, and resilience of their health systems. This is done through various means, including by:

- Proposing legislation
- Providing financial support
- Coordinating and facilitating the exchange of best practices between EU countries and health experts
- Health promotion activities.

In your opinion, how shall the European Commission support EU countries on public health aiming at better quality for less investment? Could you select what you consider to be the 3 strategic actions that could lead to these outcomes?

---

2 - The Blueprint Digital Transformation of Health and Care for the Ageing Society states that: "Given the diversity of initiatives at EU, regional, national and local level and by industry, that relate to the digital transformation of professional and informal health and social care, the Blueprint will "connect the dots" between policy, health governance and R&I, between demand and supply, across health, social care and wellbeing, across technology, solutions and services platform (e.g., data). It will support the development of a broader and more compelling political vision on digital innovation for ageing well and the silver economy that will strengthen the societal dimension of the Digital Single Market and the digital society portfolio of the European Commission."

In your opinion, has this objective already been achieved with policy and concrete measures?

If yes, can you give us 1-3 examples on eHealth or mHealth?

If not, what are the main issues or initiatives you believe should be put into action to have a true implementation of a broader political vision for ageing well?

3 – The World Health Organization defines Age-friendly environments as those that foster health and well-being and the participation of people as they age. They are accessible, equitable, inclusive, safe and secure, and supportive. They promote health and prevent or delay the onset of disease and functional decline. They provide people-centered services and support to enable recovery or to compensate for the loss of function so that people can continue to do the things that are important to them.

Do you know a true AFE? Where and why?

What are the main features you believe a Smart Healthy Age-Friendly Environment should include regarding People (as in people-centered) and Places (as in building environments) so it could integrate digitalisation in the best way possible?

4 - Sustainable Development Goal number 3 aims to "Ensure healthy lives and promote well-being for all at all ages".

How can we progress in terms of policy, both from EU and as from Member States, to implement Smart Healthy Age-Friendly Environments?

14.3.   Guidelines to the interviewer

- Start by contacting your participant by email and be sure to have the consent form signed before making the interview.
- Inform the participant that he may ask all questions necessary and place him/her in contact with SHAFE coordinators if necessary.
- Inform on the estimate time of the interview – between 30 to 45 minutes.
- Ask permission to record the interview and keep the audio recording in your possession until the end of the TN (November 2018).
- Make a summary (**not more than 1 page**) of the interview (in English or native language, as previously agreed with the participant) in the period of 1 week maximum after the interview.
- Send the summary to the participant for acceptance or revision, for maximum a period of 10 days.
- Send the consent form and the summary of the interview to carinadantas@caritascoimbra.pt and willeke@afedemy.eu in the maximum period of 30 days after engagement as interviewer.

A Successful Interviewer is:
1. *Knowledgeable*: is thoroughly familiar with the focus of the interview.
2. *Structuring*: gives purpose for interview; rounds it off.
3. *Clear*: asks simple, easy, short questions; no jargon.
4. *Gentle*: lets people finish; gives them time to think; tolerates pauses.
5. *Sensitive*: listens attentively to what is said and how it is said; is empathetic.
6. *Open*: responds to what is important to interviewee and is flexible.
7. *Steering*: knows what he/she wants to find out.
8. *Critical*: is prepared to challenge what is said, for example, dealing with inconsistencies.
9. *Remembering*: relates what is said to what has previously been said.
10. *Interpreting*: clarifies and extends meanings of interviewees' statements, if needed.
11. *Balanced*: does not talk too much or too little.
12. *Ethically sensitive*: ensure the interviewee appreciates its purposes and legal compliance.

The Interview as an Interpersonal Encounter – use ORCS:
- Use **O**pen questions, as opposed to closed questions which you can answer with 'yes' or 'no'.
- **R**eflect, to what you see or hear, 'It seems you find this important, is that true?', 'It seems you put emphasis on ..., may I ask why?'
- **C**onfirm, 'so I can state that your opinion on this is...', which can be used to clarify.
- **S**ummarize, can be used during the interview or at the end, not only to make an overview for yourself but also for the person being interviewed. To check if you have everything.

Then you can always end with 'Is there anything else you would like to add, or did I miss anything?'.

Also:
- Use social skills of empathy, warmth, attentiveness, and humour.
- Do not use judgmental attitudes, neither of shock or discomfort.

- Never answer a question for the respondent.
- Be completely engaged with the respondent, keeping track of the questions one needs to ask.
- Use every active listening technique at your disposal:
- Repeating back or saying, "That is really interesting."
- Don't be afraid of silence; you can use it to prod the respondent to reflect and amplify an answer
- Don't follow the interview guide—follow the respondent. Follow up new information that he or she brings up - BUT without losing the sense of where you are in the interview.

Thanks for your work!

14.4. Consent form

Smart Healthy Age-Friendly Environments (TN SHAFE) is a Thematic Network approved by the European Commission, towards the creation of a Joint Statement by November 2018.

The specific aim of SHAFE is to enhance two main aspects of Age-Friendly Environments – Places and People – in the creation of eHealth and mHealth solutions - especially focused on quality and costs. These smart environments need to align technological development with the building industry in terms of policy and funding, in order to make smart homes available, affordable, and large-scaled in Europe. This broad adoption may be the keystone to a more efficient health care system that adds better quality for less investment. You may consult all the details at: https://www.caritascoimbra.pt/en/shafe/what-is-shafe/

Cáritas Coimbra (Carina Dantas) and AFEdemy (Willeke van Staalduinen) are leading this Thematic Network and, along with the network partners, will collect different stakeholders opinions and visions on the theme, in order to produce the Joint Statement. These opinions will be collected by personal interviews and an online survey. The answers collected will help our investigators understand main trends, difficulties, and best practices around Europe, although SHAFE cannot assure that all the opinions collected will be represented in the final document.

You may contact carinadantas@caritascoimbra.pt or willeke@afedemy.eu for any information.

ID		NAME		SURNAME	
ADDRESS					
EMAIL				PHONE	

Please tick all the boxes you fill appropriate:

	I hereby declare voluntarily that I'm willing to take part in SHAFE's interview
	I declare that I have been properly informed about the Thematic Network SHAFE and I understand the explanation that was given to me, either written and verbally.
	I was given proper time to reflect on the participation proposal; I had the opportunity to make the necessary questions and I received satisfactory answers.
	I authorize audio/video recordings which will only be used for analyzing the data from the interview and further technical development.
	I know that the data from the interview will be analyzed and summarized by my interviewer; I will have the right to review this summary before it is shared with the research team for integration in the Joint Statement document.
	I was informed that the data will only be stored until the end of the Thematic Network (2018), after which it will be deleted and that I can access or change/delete it at any time.
	I understand I won't be quoted and my name will only be displayed with my express consent.
	I understand I can withdraw my participation at any time, without having to give a reason and will have no penalties because of it.

Please, select ONLY ONE option:

	I would like my name to be used as a participant in SHAFE's interviews and I understand it can be used in different reports and publications within the scope of this project.
	I do not allow my name to be used

PARTICIPANT   RESEARCHER
Name: Name:
Date: Date:
Signature: Signature:

TO KEEP YOU WELL INFORMED ON CURRENT LEGISLATION

How Informed Consent is described in the General Data Protection Regulation
http://ec.europa.eu/justice/data-protection/reform/files/regulation_oj_en.pdf

Article 4. Definitions
(11) 'consent' of the data subject means any freely given, specific, informed and unambiguous indication of the data subject's wishes by which he or she, by a statement or by a clear affirmative action, signifies agreement to the processing of personal data relating to him or her;
Article 6. Lawfulness of processing
1. Processing shall be lawful only if and to the extent that at least one of the following applies:
(a) the data subject has given consent to the processing of his or her personal data for one or more specific purposes;

Article 7. Conditions for consent
1. Where processing is based on consent, the controller shall be able to demonstrate that the data subject has consented to the processing of his or her personal data.
2. If the data subject's consent is given in the context of a written declaration which also concerns other matters, the request for consent shall be presented in a manner which is clearly distinguishable from the other matters, in an intelligible and easily accessible form, using clear and plain language. Any part of such a declaration which constitutes an infringement of this Regulation shall not be binding.
3. The data subject shall have the right to withdraw his or her consent at any time. The withdrawal of consent shall not affect the lawfulness of processing based on consent before its withdrawal. Prior to giving consent, the data subject shall be informed thereof. It shall be as easy to withdraw as to give consent.

4. When assessing whether consent is freely given, thorough account shall be taken of whether, inter alia, the performance of a contract, including the provision of a service, is conditional on consent to the processing of personal data that is not necessary for the performance of that contract.

15. Annex 4: Mapping the interviews

Name	Sources	References
Question 1	31	95
Connecting ambitions & initiatives	10	17
bring willing actors together	1	1
connect ambitions between sectors as they can have a similar beneficiary strategy	1	1
connect initiatives	1	1
cross-border activities	1	3
by facilitating and supporting cross-border mobility of care professionals	1	1
cross-border coordination in saving resources	1	1
facilitate cross-border accommodations of EU patients	1	1
Cross-sectoral activities	1	1
cross-sectoral collaboration outside of public health	1	1
focus on the further integration of systems	1	1
identify different local problems public health is not homogenous in EU	1	1
incorporate and involve all the involved or close sectors and municipalities	1	1
Involve cities not only member states; local level knows what is needed	1	1
know the existing initiatives and national realities	1	1
launch more Coordination Support Actions (CSA) (Nodes)	1	1
launch more CSA	1	1
Link and integrate currents systems instead of creating a new one	1	1
Overcoming the barriers between sectors	1	1
still too many separate initiatives	1	1
Ensure and envision	11	18
Co-responsibility of each citizen and community by your health and well-being	1	1
create healthy environments in general	1	1
define a long-term follow-up selection of the most promising initiatives	1	1
does the service provide value and benefits to the end-user	1	1
ensure a long-term focus	1	1
Ensuring common objectives and progress	1	1
focus on a holistic approach	1	1

Name	Sources	References
focus on health promotion activities	1	1
focus on more specific interventions and let it be known	1	1
focus on reducing health inequalities	1	1
focus research on the needs and preferences of people	1	1
Important to invest in the health of working aged people to remain active and healthy	1	1
keep people in good health up to old age	1	1
make services more homogenous, guarantee the opportunity to live in good health	1	1
promotion and improvement of the public health of citizens is needed	1	1
specific research and innovation	1	1
strengthen prevention by promoting healthier lifestyles	1	1
To improve the health literacy of EU citizens	1	1
Facilitate and support	24	45
Better data to promote research, disease prevention, and health and care	1	1
by enabling - empowering public health services	1	1
Citizens secure access to and sharing of health data	1	1
develop guidelines for public authorities	1	1
enabling - empowering public health professionals concerning health promoting capacities - resources	1	1
engage stakeholders in shaping actions and measures	1	1
exchange of practices	4	5
exchange good practices	1	1
facilitate networks and the exchange of good practices	1	1
facilitate the exchange of good practices, promoting and supporting international meetings	1	1
facilitate the exchange of good practices	1	1
Support the implementation of good practices	1	1
Facilitate knowledge transfer, bring member states together and share the experience	1	1
facilitate capacity building of leaders	1	1
facilitate communication and coordination between sectors and municipalities	1	1
facilitate coordination the exchange of best practice	1	1
facilitate the translation of global knowledge to national initiatives	1	1
focus on proper support and not implement	1	1
Funding	7	7

Name	Sources	References
impose universal accessibility and design principles in EU funding programs	1	1
More funding for innovation and pilot projects - housing and e or mHealth remote projects	1	1
provide funding	1	1
provide funding for small testing and adopting initiatives	1	1
providing financial support to foster innovative solutions	1	1
stimulate a focus on upscaling and return of investment during funding projects	1	1
To invest in programs that improve digital and health literacy	1	1
investment in physical and mental health promotion to all ages	1	1
offer appropriate funds to citizens to design and re-built their house	1	1
promote synergies at EU level	1	1
promote the increasing role of standardisation and harmonisation of technical advances	1	1
Provide showcase examples and focus on scalable solutions	1	1
stimulate a structured communication strategy in the clinical world	1	1
Stimulate a holistic vision for age-friendly environments	1	1
stimulate cross-sectoral exchange learning and practical tools	1	1
stimulate health promotion activities	1	1
stimulate the quadruple helix approach via funding	1	1
strengthen data on the effectiveness of public health	1	1
Support member states	4	4
facilitate countries in executing their strategies	1	1
provide homogenous context to all EU countries to facilitate nation-specific policy	1	1
To help member states exploiting the full potential of Health Technology Assessment by fostering cooperation	1	1
trigger a strong dialogue on government level between EU commission and member states	1	1
support new approaches and frameworks	1	1
support stocktaking of success factors and pitfalls on all levels	1	1
To invest in sustainable health systems through reforms and innovation	1	1
understand and know the decision makers	1	1

Name	Sources	References
update training and education for lifelong learning	1	1
use role models	1	1
improve coordination	8	8
by establishing effective health literacy strategies at a European and national level	1	1
coordinating and facilitating the exchange of best practices between EU countries and health experts	1	1
coordination between different system to achieve better efficiency	1	1
Digital tools for citizens empowerment and person-centred care	1	1
focus on real deployment of usage out of funding projects	1	1
gather data and evidence of a small proof-of-concept	1	1
involve doctors in public private partnerships	1	1
Reinforce communications strategies	1	1
Regulation and standardisation	6	7
allow for technical improvement, don't restrict with rules	1	1
define standardisation and homogenisation to destroy national barriers	1	1
define standards for future work	1	1
invest in setting requirements for whole life policies and universal design standards	1	1
regulate better qualities at a national level	1	1
regulate public services to serve the needs of the public	1	1
To implement a lifecycle approach with interventions at an early stage	1	1
Question 2	30	111
authorities and public services	6	7
allow for the difference between countries regarding adoption of new technologies	1	1
the blueprint should involve SME's to involve local government	1	1
ensure regional and national authorities are using EU guidelines	1	1
public interest services like banks should follow accessible design principles	1	1
public services are obliged to use accessible design	1	1
Sharing of visions and homogenisation of service	1	1
strong national programs for health but not for social or wellbeing purposes	1	1
be aware of fragmented digital developments	1	1
Electronic health record and health data	5	6

Name	Sources	References
accurate data on prevalence could allow for specific targeting	1	1
collective health database through EU funds is key	1	1
increased use of electronic health records	1	1
more attention should be put on the privacy of sensitive data	1	1
more data could help to form better policies	1	1
standardising electronic health records	1	1
Good examples	11	21
early identification of cognitive decline	1	1
Electronic health records are good examples	1	1
Electronic health records implementation would be enough to achieve the blueprint	1	1
e-prescription and exchange of patient's summaries between countries	1	1
European reference framework for age-friendly housing	1	1
facilitate role models for the EC	1	1
Frailsurvey	1	1
gamification for education and behavioural interventions	1	1
genomic health data to improve medicine resources	1	1
good examples but still too slowly	1	1
high replicability of Denmark's strong mHealth solutions	1	1
interoperability data platform	1	1
medication in closed loops - automatic medication dispenses	1	1
medicine reminder	1	1
patients do self-measuring, which is integrated into the care pathway	1	1
physical activity rehabilitation tool	1	1
Platform for knowledge exchange (PKE)	1	1
predictive models for diabetes patients when they have hyper of hypo	1	1
Silver Economy awards are good examples	1	1
single point entry for citizens health data	1	1
Sunfrail EU project	1	1
Implementation and practicalities	5	8
develop a shortcut for procurement processes	1	1
focus on realisation and implementation rather than development	1	1
focus on what comes after pilot studies	1	1
improvement in outcome measures and hard outcome indicators	1	1

Name	Sources	References
lack of communication and dissemination of results	1	1
needs testing on the ground	1	1
pilots are biased	1	1
provide more CSA's	1	1
include the environment	2	2
develop appropriate environments	1	1
improvement of physical and built environment	1	1
intergenerational understanding	1	1
Involve sectors and actors outside of healthcare	14	19
attention for all in economic, personal, and territorial terms	1	1
Collaboration between the region's and their own member states and or other member states	1	1
collaborative health through all policies - progressive standards	1	1
the construction sector is relevant for scale-up, and so it the housing sector	1	1
Cooperation with WHO	1	1
the designer should have specific training in accessibility and universal design	1	1
facilitate incubators	1	1
form a network that includes all social groups	1	1
healthcare seems to lack behind other sectors	1	1
holistic leadership	1	1
include the social component in digital innovation	1	1
involve regional stakeholders like care providers	1	1
measures that foster better collaboration between social protection and health	1	1
More collaboration from European innovation partnerships relevant to (smart) active and health age-friendly environments	1	1
organise the quadruple helix	1	1
smart cities - use data from other sectors for healthcare purposes	1	1
the building industry is missing from the conversation	1	1
transport and accessibility into cities	1	1
work with incubators and start-ups	1	1
involve the end-user	8	10
attention required by the person served	1	1
empower citizens to become active	1	1
end user not systematically involved in the process	1	1
increase digital literacy of citizens	1	1

Name	Sources	References
increase the health literacy of citizens	1	1
involve the service providers	1	1
let practitioners take ownership for long-term effect	1	1
listen to the citizens	1	1
more citizens measures are needed	1	1
use a bottom-up approach, start with the citizens	1	1
maintain the rights	1	1
objective achievement	24	27
achievement needs time; commitments are starting to have results - collaboration and best practices	1	1
blueprint is working but could be much stronger	1	1
blueprint needs clear leadership and ownership from involved parties	1	1
blueprint not yet able to demonstrate what it delivers	1	1
blueprint not yet achieved	1	1
cannot see the results from the blueprint	1	1
do not think objective achieved	1	1
don't think we have achieved the objectives	1	1
first steps of the blueprint have been achieved, but there is much more to be done	1	1
i do not know if the objective is achieved	1	1
it is time-consuming before results are seen or can be used	1	1
maybe blueprint too ambitious	1	1
not achieved	1	1
not sure if it is a joint approach or who is driving the initiatives	1	1
objective achieved, yes and no	1	1
objective achievement not clear due to missing information	1	1
the objective has not yet been achieved	1	1
objective maybe partially achieved	1	1
objective not achieved	1	1
objective not achieved from a local point of view	1	1
objective not achieved on both	1	1
objective not achieved yet	1	1
objective not completely achieved	1	1
objective not fully achieved	1	1
objective not yet achieved	1	1
objective still a long way to go	1	1
objectives partially achieved	1	1

Name	Sources	References
Support and facilitate	6	7
currently lack of interoperability and consistency, and compatibility of current regulations	1	1
dedicated funding program including various DG's	1	1
develop one model for the exchange of health data to facilitate operability between healthcare models	1	1
Financially encourage industry for innovation of eHealth and mHealth for lower prices	1	1
initiatives must take gender and socio-economic dimensions into account	1	1
strengthen the social care and wellbeing via specific actions	1	1
support for planning discharge for chronic disease patients	1	1
there is growing attention for ageing and technical development	1	1

16. Annex 5: About the authors

Mrs Carina Dantas – Innovation Director, Cáritas Diocesana de Coimbra

Has a degree in Law, postgraduate studies in Psychoanalytic Psychotherapy, graduate in Addictions Intervention and is a certified trainer. She is Director of the Innovation Department of Cáritas Coimbra since 2011 - responsible for strategic planning; projects; research; and communication areas - media, digital platforms, internal communication, partnerships, and networking; she is project Reduz Internal Evaluator and Member of the technical and pedagogical council of CEARTE.

She is also the representative of Cáritas Coimbra in Ageing@Coimbra, Caritas Portugal network and GrowMeUp; UE Digital Skills and Jobs Coalition, Strategic Council and also member of group 4 in RIS3 Centro - smart specialization strategy, in ECHAlliance, in the Delphi panel of experts and she is a member of the Organising Committee of AAL Forum 2018.

Since January 2016 she has been elected Vice-President of the European Covenant on Demographic Change, and she is the Main Coordinator of group D4 – *Age-friendly Building, Cities and Environments* of the EIP_AHA. Carina also coordinates the 2018 Thematic Network SHAFE - Smart Healthy Age-friendly Environments, approved by the EC and is a Member of the Standing Committee of Policy and Advocacy in the International Health Literacy Association.

**Mrs Willeke van Staalduinen (MSc), Co-founder AFEdemy**

Since 2013 is Willeke actively working on research and implementation of age-friendly environments in Europe and founded AFEdemy in 2017. She is the coordinator of the Action Group D4 on age-friendly buildings, cities and environments of the European Innovation Partnership on Active and Healthy Ageing. She is assigned by the municipality of The Hague to maintain international relations with Europe and the World Health Organization and to deliver support with the development of age-friendly policies. She supported the Age-friendly Cities Conference of The Hague (2-4 October 2017) and Joint Action of the cities of The Hague, Bangalore, Suzhou, Frankfurt, Manchester, and New York. Also, for the municipality of The Hague in 2017, she led a performance audit on the efficiency and effectivity of public services of the municipality.

Willeke started her career as a nurse in mental healthcare. After she graduated as a political scientist, she worked in the Dutch parliament. As personal assistant of an MP of the First Chamber and as policy advisor health care policies of the social liberal democratic party D66. Then she continued her career as a policy advisor at the Netherlands Board for Healthcare Institutions and as a researcher at research institute TNO.

Mr Melvin van der Mark (Bsc.), intern – AFEdemy and student at the Utrecht University
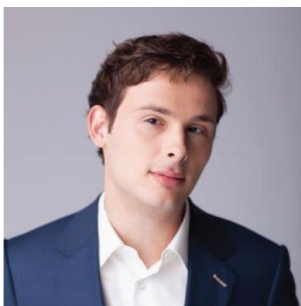
Ever since 2014 is Melvin captivated by the raising challenges from the demographic change. During his physiotherapy studies, he conducted a European study on dementia-friendly housing facilities, commissioned by the city of Rotterdam. In its succession, he continued advising the municipality in other regional projects with similar themes. Soon after he commenced in FP7 and AAL EU research & innovation projects during his internship at Vilans, Dutch National centre of expertise on long-term care. After graduating with an honour's degree in physiotherapy, he supplemented his knowledge in Healthcare Technology at the Rotterdam University of Applied Science for a year. Before he extended his studies into the master degree Innovation Science at Utrecht University. Where he is still at.

Melvin is no newcomer to international collaboration in research and education. He has held a board position at the European Network for Physiotherapy in Higher Education and was a co-founder of the Honours Student Association Rotterdam. In addition, he initiated international collaboration at the institute of healthcare in Rotterdam, which resulted in an annual international exchange program for all second-year students, accredited with ECTS and part of all paramedic curriculums. He took part in the launch of the Covenant on Demographic Change: towards an age-friendly Europe. Furthermore, he is active in the action group D4 "Age-friendly Environments" of the European Innovation Partnership on Active and Healthy Aging.

Currently is Melvin working in the areas of healthcare technology and innovation management. Where he is most interested in analysing innovation models and assessing adoption rates. Also taking into account the fields of health economics, user-centred design, and technical quality evaluation.

Ms Ana Luísa Jegundo – Project Manager

Has a degree in Economics and a Master degree in Management from the University of Coimbra. Since 2015 she is working for Caritas Coimbra as a project manager of the Innovation Department, giving support on elaboration and execution of national and international projects that Caritas Coimbra carries out like the GrowMeUp project. She supports the project's coordination, contributes to the deliverables, articles, and also performs the administrative, financial, and technical control of projects. She is responsible for planning, organising and monitoring of several pilot initiatives to assess ICT acceptance for Active and Healthy Ageing by the end users, also doing some scientific research. She is also stand-in coordinator of EIPonAHA - group D4 "Age-friendly buildings, cities and environments", promoting several partnerships and networks at the regional and international level. She was a speaker in some relevant international events like WorldCist'17 - 5th World Conference on IT and Technologies, AAL Forum 2017 and the Conference of Partners EIP-AHA 2018.

Mr Javier Ganzarain, **Co-Founder AFEdemy**

Holds a Computer Science Degree, Basque Country University (Spain), and a Master of Science (MSc) in Design and Management of Communication Systems, Centre d'Ingénierie des Technologies de la Communication (France and Spain). He has gained extensive international experience within various project management and IT areas while working in Germany, first in the European Space Agency as a telecommunications engineer, then in a multinational consulting company (Atos Origin) as Senior IT-Specialist and in a German research company as a senior software engineer and project leader. He was over the last 13 years the leader of the R&D Department within tioman & partners, SL, which he co-founded and was dedicated to promoting and facilitate innovation for better ageing. He was in 2016 and 2017 Promoter of the Action Group C2 "Interoperable independent living solutions" of the European Innovation Partnership (EIP) on Active and Healthy Aging (AHA). His research areas of interest include Human-Centred Innovation, Design and Creativity.

Currently, he is also Research Project Officer at AGE Platform Europe and R&D Director at INNJOY and collaborates as a teacher of the module "Technology to the service of elderly people necessities" of the Master of Science (MSc) in Social Gerontology at the University of Barcelona. He is fluent in German, English, French and Spanish.