Chapter 2
Integrating Social and Health Services for People, Communities, Homes, and Places

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ABSTRACT

The challenge of an ageing population requires a paradigmatic shift in the way we provide social and healthcare services, demanding the need to prioritize the functionality and independence of older adults. The risk and subsequent fear of falling is one of the most high-risk states for older adults, as it generates a destabilizing effect on their health that is often hard to recover. It is essential to thoroughly address their risk factors and mitigators. This discussion needs to be made in light of a person-centered perspective that goes beyond fragilities to capitalize on the strengths of the older adults. The chapter provides examples of how to connect assessment, interventions, and monitoring to a coherent framework approach that mitigates the risks and the impact of falls on an ageing society. The authors explore how technological innovation, urban planning, and regional policies that are culturally relevant can be incorporated in creating a circular economy while meeting the needs of an aging population and preventing falls and cognitive decline.

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SUMMARY

The current challenge of an ageing population requires a paradigmatic shift in the way we provide social and health care services, demanding the need to prioritize the functionality and independence of older adults to improve their quality of life and ensure sustainability of systems. The risk and subsequent fear of falling is one of the most high-risk states for older adults, as it generates a destabilizing effect on their health that is often hard to recover. In order to set up a system that is capable of managing falls, it is essential to thoroughly address their risk factors and mitigators. Furthermore, this discussion needs to be made in light of a person-centred perspective that goes beyond fragilities to capitalize on the strengths of the older adults. The present chapter provides examples of how to connect assessment, interventions, and monitoring to a coherent framework approach that mitigates the risks and the impact of falls on an ageing society. We will explore how technological innovation, urban planning and regional policies that are culturally relevant can be incorporated in creating a circular economy while meeting the needs of an aging population and preventing falls and cognitive decline.

1. THE CHALLENGE OF AGEING IN EUROPE: AN OVERVIEW OF SOCIODEMOGRAPHIC CHANGES IN THE EU

The Ageing Report published by the European Commission in 2021 (European Commission, 2020) highlighted the total population in the EU is projected to shrink by 5% between 2019 (447 million) and 2070 (424 million), with differences in national population trends, that show in 11 Member States and falls in the others. Further reading of the Report highlights that the EU's demographic old-age dependency ratio (i.e. the ratio between people aged 65 years and over and those aged 20-64) is projected to increase significantly in the coming decades: From about 29% in 2010, it had risen to 34% in 2019 and is projected to rise further, to 59% in 2070. This will result in a shift from less than four working-age people for every person aged 65 years and over in 2010 to below two in 2070.

Life expectancy at birth for males is expected to increase by 7.4 years over the projection period, from 78.7 in 2019 to 86.1 in 2070 in the EU. For females, it is projected to increase by 6.1 years, from 84.2 in 2019 to 90.3 in 2070, implying continued convergence between males and females. the EU population is projected to decline from 447 million people in 2019 to 424 million in 2070, with a dramatic ageing process whereby the median age would rise by five years over the next decades.

The total cost of ageing (public spending on pensions, health care, long-term care, education and unemployment benefits), is expected to increase by 1.7 percentage points to 26.7% of GDP between 2016 and 2070. Within this scenario, long-term care and health costs are expected to contribute the most to age related spending rising by 2.1 percentage points between 2016 and 2070 (United Nations, 2019).

Demographic changes in the next 50 years not only mean that the population is getting older but also there will be less people contributing to the economic and financial prosperity of European countries, and State support to retired people will substantially increase. These demographic trends represent a multifaceted sustainability challenge for our societies: indeed, in Europe current policies will be faced with an increase by 4.1 percentage points of GDP between 2010 and 2060, from 25% to 29% that are age-related (pensions, health, and long-term care), with significant differences between countries (United Nations, 2019), thus threatening health equity. Raising the labour market participation of women and older workers could neutralise the effects of population ageing on the weight of pensions in the GDP.

Currently, the COVID-19 crisis is still running and its full medium/long-term consequences are uncertain, with the need to adapt economic policies to mitigate its short-, medium- and long-term impact.

In order to meet these challenges, it is pivotal supporting longer working lives by providing better access to lifelong learning, adapting workplaces to a more diverse workforce, developing employment opportunities for older workers and supporting active and healthy ageing.

Whilst this may address fiscal pressures it may not in itself decrease the burden and additional cost on health and social care systems in addressing age-related illnesses and diseases. Indeed, it may place additional burdens on the health and care systems as it looks to ensure older workers are fit and able to work. After all, they may also have age-related health needs, as well as any caring responsibilities that they can no longer provide if they are working longer.

Addressing these twin pressure points on society (age-related health and care needs, and fiscal gaps) will require Governments and Health and Care Providers to change the way health and care is planned and provided, by developing new models of social and health services. The 2021 Ageing Report interestingly outlines a "healthy ageing scenario", based on the relative compression of morbidity hypothesis and mimics improving health status in line with declines in mortality rates and increasing life expectancy. According to such scenario, future gains in life expectancy are spent in good health, reducing the morbidity rate and healthcare expenditure (European Commission, 2017).

A person's health and well-being will need to be considered in a holistic way, from prevention to treatment. We need to consider the social impacts as a key determinant of a person's health and well-being, from their living and leisure environment to their working lives. We will need to make greater use of health data, not just the individual's, but also other data collected at population level by health and social systems, so that health providers are better able to predict needs and trends. This approach engages individuals and society to prevent and better manage ill health, age-related diseases and social needs (Liotta et al, 2018a).

Joining up health and social services is critical: for example, if we want to address obesity it may be insufficient to focus on nutrition and food intake only, we may need to consider broader health and well-being plans covering physical activity that are tailored to specific socio-cultural contexts. We also may need to consider if there are any underlying conditions or potential causes (respiratory, cardiovascular etc) that could inform the types of physical activity a person could safely undertake. All this requires health providers to make greater use of the information it holds on a person, and how it uses and shares that information at the different levels (citizen and professionals across settings) to develop integrated care plans. This to allow the person to better self-manage their condition; to develop integrated treatment plans which will engage the right health and care professionals, as well as informal caregivers at the right time, providing the right treatment for the person (Clack & Ellison, 2019; Kickbusch et al., 2005)

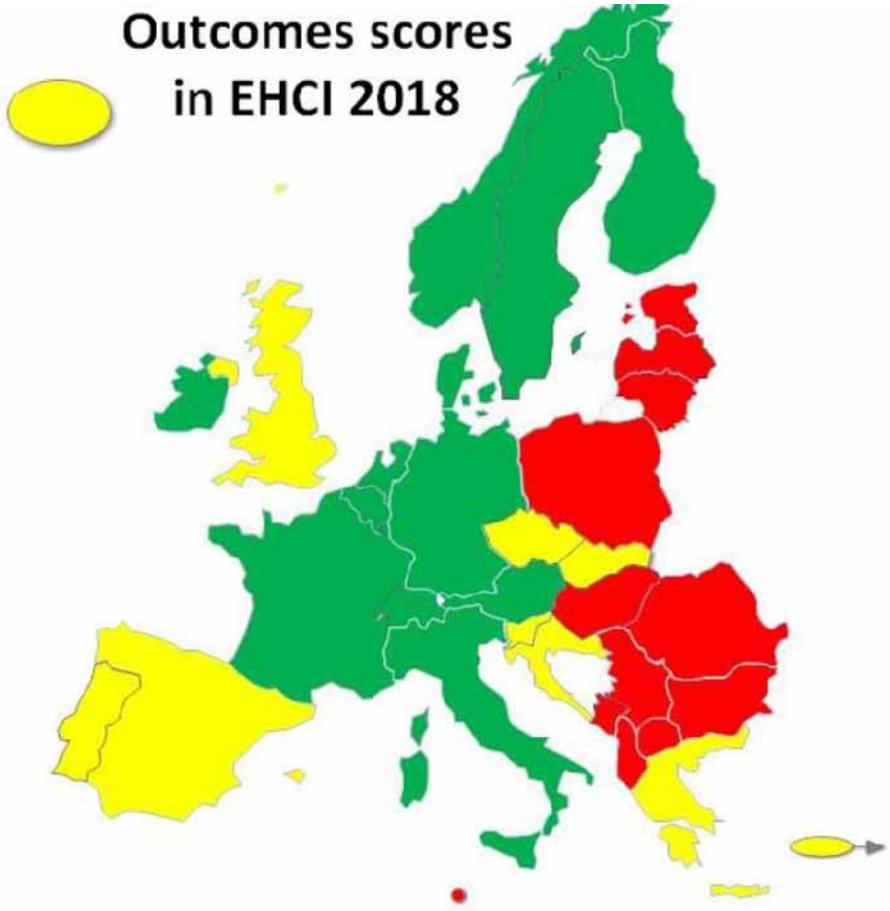
2. EMERGING ECONOMIC AND HEALTH INEQUALITIES IN EU COUNTRIES

Although the financial crisis generated restrictions on healthcare spending (Schrecker & Bambra, 2015), survival rates of heart disease, stroke and cancer are all improving, in spite of increasing NCCD linked to worsening lifestyle factors (McNamara et al., 2017).

Such health inequalities are present in all countries, by gender, and across different age groups (Mackenbach et al., 2016; Beckfield et al., 2017), with a gap in life expectancy at age 25 between individuals with high level of education and low level of education around 2011 being—on average—7.7 years for

men and 4.6 years for women (Organisation for Economic Co-operation and Development [OECD], 2017). The Health Inequality Report identifies three major determinants for this: health systems; economic policy; and the wider social determinants of health. The estimated cost of health inequalities in the EU is €980 billion per year, (Mackenbach et al., 2011). For example, increasing the health of the lowest 50 percent of the European population would improve labour productivity (Suhrcke et al., 2008).

Figure 1.



Life expectancy of people with low income and education is shorter than that of people from higher social classes in the EU (World Health Organisation [WHO] Europe, 2013; Commission on the Social Determinants of Health [CSDH], 2008). Supportive environments and disease prevention has been implemented by the partners of the EIP on AHA in the Blueprint for the Digital Transformation of Health and Care, where 2 of the 4 identified priorities focus on the use of digital solutions in supporting a proactive approach to health interventions:

- Data analytics for predictive risk stratification and prevention

- Proactive prevention through empowerment, self-management, monitoring and coaching.

2.1 From Reactive Disease Management to Proactive and Anticipatory Care

A paradigmatic shift from reactive disease management to anticipatory care, and early identification of risk for adverse health outcomes along the lifecourse is an effective and sustainable approach to address health inequalities (Forster et al., 2018). Besides the social determinants of health, also environment and community conditions play a role in outcomes, together with availability, accessibility and quality of health services (Beckfield et al., 2017; Eikemo et al., 2017; Huijts et al., 2014).

Engaging the community to identify needs, developing partnerships that are multilevel and multiorganization allow to carry out analysis, as well as to implement and evaluate evidence-based innovative interventions, thus ensuring sustainability. Artificial Intelligence provides the opportunity to extrapolate risk strata using big data from multiple datasources: the challenge we currently face is now to make datalakes interoperable, to allow correlation analysis and data sharing between professionals and inform citizens. This is reflected in 1 of the priorities of the Blueprint on Digital Transformation of Health and Care: Digital support for integrated care.

Digitally supported approaches that engage at risk individuals in the adoption of healthier lifestyles stimulate self-reported monitoring, as well as for communication between professionals and citizens (Jylhä, 2009; Norman & Bambra, 2007), while supporting interventions that are tailored to the different risk strata. Coherently, the Blueprint also identified the 4th priority: Digital solutions for connected health.

2.2 People at the Center: Meet the Personas of the Blueprint for the Digital Transformation of Health and Care

The European "Blueprint on Digital Transformation of Health and Care for the Ageing Society " (European Commission, 2017) reflects the common policy vision of European policy makers, civil society, professional organisations and industry guiding the efforts of the EIP on AHA Action Groups and Reference Sites to mobilise investments and ensure the commitment of all actors.

The Blueprint has been focusing four key areas of work:

- Data analytics for risk stratification and prevention;
- Proactive prevention through empowerment, self-management, monitoring and coaching;
- Digital solutions for connected health;
- Digital support for integrated care.

The demand-side perspective has been analysed through the set-up of 12 personas, representing "population segments" with different conditions, grouped into a range of categories, along a matrix of age frames and intensity of health needs. There are different time points along a person's life-course (pre-perinatal-childhood/young adulthood, working age, retirement and age under 80, and aged 80+), and several groups of needs intensity (generally well/good wellbeing, chronic conditions and/or social needs, and complex needs). Personas were developed along such matrix, in order to capture behavioural characteristic to take into account psycho-social forces and health choices influencing outcomes that could be improved by the adoption of digital solutions. The personas descriptions and their conditions were pivotal to extrapolate unmet needs and identify possible ICT solutions and categories targeting those

needs, identifying and specifying key ICT enabling technologies and high-impact use-case scenarios for active and healthy ageing.

3. THE OPPORTUNITY OF THE DIGITAL TRANSFORMATION OF HEALTH AND CARE

3.1 Privacy Concerns for Data Analytics

The advent of new IT technologies applied to the health sector has introduced profound changes in healthcare processes:

- The technological evolution in healthcare provides new and powerful tools to support the redefinition of organizational-clinical processes, new diagnostic-therapeutic paths and new models of assistance to citizens / patients (Smart Health, eCare, etc);
- The evolution of the Medical Devices has led to the transition from single (stand-alone) medical devices to integrated and interconnected systems where sensitive data is exchanged and which could always be accessible (IT-MD Networks, MD sw, etc);
- The evolution of the management of systems and services in the health sector has opened up new scenarios for the data operability and usability, from Cloud Computing to the Internet of Think, from Mobile Health to Virtual Health.

At the same time, we realized the objective difficulty of allowing the data accessibility and while ensuring security and respect for privacy rights.

Indeed, new technologies introduce new risks for the operators and the end-user. These risks must be identified, assessed and managed both from an IT point of view (data and system security) and from a Medical Devices point of view (safety).

It is therefore necessary to apply new risk management models (identification, evaluation, measures and control) based on responsibility, and on the implementation of "system security" that is no longer only implicit in the device / technology.

Moreover, the entry into force of EU Regulation 679/16 (GDPR) has introduced important changes in the approach to Data Security.

This new approach, based on the concepts of accountability and risk management, pushes towards the implementation of a business management system based on Protection by default and by design, and on the adoption of adequate safety measures such as training, preventive maintenance and predictive, cybersecurity, business continuity, disaster recovery.

It is necessary, then, the healthcare companies are able to design and manage IT systems that:

- reduce the redundancy of information and the storage of data not strictly necessary for the purpose for which they are acquired, as required by the GDPR (protection by default);
- allow interconnection and interoperability between systems and with devices;
- guarantee safety and data security, but also the maximum usability of the information.

Therefore it is desirable to define a common Data Protection Strategy based on a process and systems standardization program at regional and national level, in which GDPR compliance is taken for granted.

3.2 Proactive Prevention Through Empowerment, Self-Management, Monitoring and Coaching

Technologies in health care will be a critical tool to transform health systems and services towards emancipatory models of person-centered and integrated care, adequate to older adults and aligned with the Health Ageing agenda (WHO, 2015). To promote a proactive prevention of poor health outcomes in geriatric care, older people should be included in the set up of their own therapeutic care planning. Specifically, the translation of person-centredness into practice needs to consider their personality, social networks, lifestyle, beliefs, interests and satisfaction with life (Smith & Gerstorf, 2006).

The significant increase of technology in health care has the potential to improve older adults' quality of life (Hamm et al., 2016). For example, technology might assist to bridge communication between older adults living at home with their healthcare team, as well as with the community and social services. Such connections have shown impact on reducing loneliness and isolation, supporting independence, facilitating self-management of illness and social conditions. Concerning their health, older adults are empowered trough technology to use wearable devices to monitor their health parameters and make changes towards improvement of their health status with the support of health professionals coaching. Such a process their awareness of healthy behaviors, supports health literacy and promotes their engagement in actives that can promote a successful ageing in place (WHO, 2015).

For these examples to become a reality, usability challenges of technological solutions in older adults have to be overcome. To accomplish the wished goals in fall prevention through technological interventions, designers should have a co-creation approach from early-design stages of intervention development. One possibility might be the creation of personas to assist in the co-design of person-centered interventions for community-based fall prevention. Personas portray older adult experiences and are an asset to communication and tailoring of individual needs and preferences. Such co-construction is expected to enhance acceptability of technological solutions among older adults (Bianco et al., 2015).

3.3. Digital Solutions for Connected Health

Health enabling technologies and sensor enhanced health information systems can innovate the way we live and manage our health, influencing interactions, and exchange of information. This is especially true when they are paralleled by adequate ICT and health literacy initiatives empowering citizens.

An active social life can slow health decline and improve physical fitness. Even if social activity is not considered to be formal exercise, socialization stimulates people to get up, and move out of the house. The development of a community of citizens/patients, supported by IT, may allow to share experiences of disease management and increase participation in social activities that improve their physical fitness and psychological condition. PERSSILAA (PERsonalised ICT Supported Service for Independent Living and Active Ageing) is a multimodal service model, focusing on nutrition, physical and cognitive function, supported by an interoperable ICT service infrastructure, utilising intelligent decision support systems and gamification. PERSSILAA, offered to older adults (> 65 years) through local community service, has proved effective in frailty prevention when been seamlessly integrated with health care services (O'Caoimh et al., 2017). PERSSILAA has been engaging older adults by personalized offer

of a gamification layer. Serious games indeed can help patients to improve their health by enhancing physical fitness and coordinative abilities by combining increased motivation, game experience like fun and game flow and training. Serious games, particularly adventure and shooter games, already play an important role in health education, prevention and rehabilitation, e.g. to enhance health-related physical activity, improve sensory–motor coordination, change nutrition behaviour and prevent smoking (Wiemeyer & Kliem, 2012).

Studies trialling multi-domain interventions targeting at risk populations show that cognitive stimulation when deployed with other lifestyle measures and cardiovascular risk-factor assessment and treatment may reduce progression to dementia (Ngandu et al., 2015).

Cognitive training typically involves guided practice on a set of standardised tasks designed to reflect particular cognitive functions. Technology-based cognitive training and rehabilitation have demonstrated promising beneficial effects on various domains of cognition with moderate to large effect sizes (Ge et al., 2018). Neuropersonal Trainer® is a web-based platform for cognitive telerehabilitation through personalized gamified treatments for patients with neurological afflictions (brain damage, MCI, dementia, Alzheimer's, mental health, intellectual disability, etc.) (Solana et al., 2015). Game mechanics are mainly adapted to engage and motivate patients by transforming them into players by highlighting the skills acquired through scores and thus making the therapeutic process clear and funnier than usual. Further social dynamics borrowed by games can facilitate the development of networks between patients creating social connections and virtual communities that could be powerful clinical resources for elderly patients (Ascolese et al., 2016).

3.4. Digital Support for Integrated Care

There is no commonly shared understanding or definition of what the concept of integrated care means in more practical terms. In fact, integrated care schemes have been tried in different forms in several health systems around the world (WHO, 2016). It may thus not come as a surprise that there are challenges in interpreting the available evidence for integrated care. As a health intervention, integrated care does not easily lend itself to scientific evaluation and analysis. For instance, integrated care is not a single intervention that can be isolated from other elements of practice. In fact it can only be practiced in the "real world" rather than in controlled study environments. From a purely scientific perspective the validity of clinical trials on integrated care is thus bound to be questioned, and it has been argued that the scientific quality of the evidence base remains limited (WHO, 2010). Nevertheless, the evidence base that is now beginning to emerge from good practice in the field, albeit scattered, suggests a "value case" for integrated care, especially when underpinned by a context-sensitive implementation strategy and a carefully tailored digital support infrastructure (Kubitschke et al., 2017). Case studies evidence has shown, for instance, that reduction in the number of emergency admissions as well as in hospital length of stay for older people can be achieved (Local Government Association [LGA], 2016; Dorling et al., 2015). Further EU project evaluations have shown that care recipients, informal carers and service providers seem to value integrated services when compared with disjointed and patchy care delivery (Kubitschke et al., 2014). Also, it has been shown that - beyond care practitioners - informal carers and third sector organizations can be successfully brought into the information loop with the help of ICT. There are also indications that there might well be an "economic case" for integrated e-care, as also highlighted during the Covid-19 pandemic. But here again, much seems to depend on how solutions are put into practice. Digital solutions can facilitate the implementation of approaches to service integration

that are tailored in terms of type, levels and form, as outlined by VIGOUR project (VIGOUR Project Consortium, 2021). Simply adding ICT to existing service delivery processes will not automatically generate sustainable e-care services. A context-sensitive and multi-dimensional innovation approach needs to be adopted, paying equal attention to the ICT applications to be employed and to the working models to be supported by the latter (Lindner et al., 2020).

4. OUTLINING RISKS AND MITIGATORS FOR FALLS

4.1 Multimorbidity and Polypharmacy as Mitigators for Falls in Older People

Multimorbidity is defined as the "the coexistence of two or more chronic diseases" in one individual, and is increasing in prevalence globally. Multiple chronic diseases are often resulting in polypharmacy (Afshar et al., 2015). Additionally, geriatric syndromes, including falls, diminished cognitive capacity, socio-economic deprivation, such as loneliness and/or missing informal assistance occur, all which have a strong impact on peoples' quality of life as well as the quality of health care offered to this group of patients (Roller-Wirnsberger et al., 2020). It seems that certain diseases may be associated with increased risk of falling, whereas multimorbidity per se could be correlated to chronic recurrent falling (Tchalla et al., 2014). Risk factors for injurious fall tend to aggregate, representing different levels of risk for falls. Multimorbidity and polypharmacy with fall risk inducing drugs (FRIDs) have been shown to increase the level of risk of falling with a hazard ratio (95% confidence interval) to 12.67 (7.38–21.75) (Ek et al., 2018).

When examining drug-induced risk of falls in the elderly not only how many but also which drugs are prescribed should be carefully considered (Woolcott et al., 2009; de Jong et al., 2013). Drugs differ, indeed, in their propensity to cause falls being benzodiazepines, antipsychotics, antidepressants, anti-convulsants and, though more controversial, opioids linked to a high risk. Also antihypertensive drugs may cause falls but with different level of danger among different classes being, for instance, 1 blockers more dangerous than ACE inhibitors. Remarkably, by interacting the one with the others different drugs may reciprocally potentiate their ability to cause falls. Other drugs may worsen the risks related to medication-induced falls by causing bone loss and increasing fracture susceptibility (Nguyen et al., 2018). As recommended by Centers for Disease Control (Centers for Disease Control [CDC], 2017a) a careful medication review is mandatory in older people to make sure that dangerous drugs are not prescribed and dangerous drug interactions are avoided. Specific tools such as Beers criteria (American Geriatrics Society, 2015), the STEADI Initiative resources (CDC, 2017b) and the many cholinergic burden calculators available online may help in this process.

The Patient Safety 2030 report (Mair et al. 2017) suggests that polipharmacy management could be addressed by developing a holistic systematic approach that extends across the professional, cultural, technological and procedural boundaries. To this purpose, the SIMPATHY (Stimulating Innovation Management of Polypharmacy and Adherence in The Elderly) consortium explored how healthcare management programmes can improve medication safety and prevent patient harm by addressing the appropriate use of multiple medications (polypharmacy), involving patients to enable shared decision making. This improves patient adherence and medicines related outcomes.

4.2 Physical Inactivity

Active and healthy ageing requires the promotion of physical activity and the encouragement of healthy towards exercise with a life-course approach, and an effort targeted to older adults (Vollenbroek-Hutten et al., 2016). Being Physical activity a life course approach of an healthy lifestyles, it is clear that it needs to be promoted and facilitated by the environment at each point in life. School, workplaces, cities, should be environments were people could exercise on a regular basis. It is of course necessary to create a culture that can include the need of promoting physical activity in each manifestation. In order to put this in motion, there is the need of a cultural revolution that allow to design our environments with this particular view in mind. Universities represent a key actors in the starting this revolution by the creation of educational programs that can help include the physical activity in the every day life. A3 group developed a common vision on how physical activity can be defined and measured in older adults, providing an insight into future directions for promoting physical activity among older citizens at an EU level. A checklist of 10 important criteria has been developed to achieve this goal (Apóstolo et al., 2018; Marcucci et al, 2019). In addition, this group has worked on the development of an interoperable, scalable ICT infrastructure to support screening, monitoring and trainings programs to encourage older adults to become more aware of their health status and support them in staying active (Jansen-Kosterink et al., 2019). In A3 partners experiences, technologies aimed at supporting aging in place must target health literacy, allow personalization in the design and in the use of the technology (Cataldi et al., 2019; van Velsen et al., 2015; De Luca et al., 2019a). This to overcome resistance from older adults towards new technologies. Further research should investigate the effect of these strategies on the adherence to technology to be used in daily life. A3 partners have indeed outlining a set of recommendations focusing on acceptance, barriers, and ethical concerns (Cabrita et al., 2019). Gamification layers can stimulate the adherence to innovative approaches to health promotion (de Vette et al., 2015).

4.3 Food Poverty and Malnutrition

Food intake is a key component of health that can contribute to prevent adverse health outcomes, especially related to a number of chronic diseases (Magni et al., 2017). Appropriate food intake influences the nutritional status and health: in order to outline and implement effective approaches, we need a joint effort for the translation of scientific information into practical interventions that have a tangible and measurable impact at both individual and population levels.

A3 group has been involving multiple stakeholders to outline a common vision (Illario et al., 2016) of the food and nutritional approaches to frailty prevention and management. Their objective is to carry out coordinated, inter-sectorial, multi-modal interventions to approach food and nutrition-related determinants of frailty and improve the health condition and outcomes of older adults in Europe. The common vision that they developed focuses on an integrated nutritional approach, “Nutrilive”, that is represented by a structured Screening -Assessment- Pyramid - Model (SAM-AP) where the stratification of the nutritional needs of older adults are linked to assessment, self-monitoring and interventions supported by innovative Information and Communication Technologies (ICT). To date, partners have deployed several experiences where innovative approaches are validated, to manage malnutrition for active and healthy ageing with a lifecourse approach (Di Furia et al., 2016). Indeed, partners have been setting up a new hospital screening tool for malnutrition, shared with Styria Reference Site; an evidence-based nutrition documentation tool for transfer processes of patients across setting fully validated and implemented in

ICT structure- ready for scale up across regions; a Web-based platform to ease malnutrition screening programme implementation, and includes freely available:

- Validated screening tools
- iPhone & iPad app
- Videos and guidebooks (translated into major languages).

The platform is being considered by the medical Delta Reference Site.

Tailored support for Parkinson disease patients, freely available in google store, supporting an intervention based on these exer games from a personalised games suite, and also supporting personalised nutritional approach.

4.4 Dental Occlusion and Posture

The relationship between the dental occlusion and body posture represents a worldwide discussed issue. The ideal balanced posture allows the higher effectiveness of movement in absence of pain and in maximum muscle energy savings. Conversely, a "faulty posture" involves a greater effort on the support structures and the loss of efficient body balance. This clinical condition can become, over time, the cause of a symptomatologically active alterations in both static and dynamic equilibrium with myofascial pain in the neck and orocraniofacial areas (Ministry of Health of the Italian Republic, 2017).

The influence of dental occlusion on posture at different internal or external disorders has been widely explored in literature. The human body, in fact, can be considered a biomechanical system with different functional units deeply interconnected among them.

Postural control is a complex function that involves different sensory inputs from the visual, somatosensory and vestibular systems. These sources of sensory information must be integrated at the central nervous system to regulate the orientation and stabilization of the body segments.

An example of relationships between static body balance and occlusion is that in young adults with a normal functional occlusion the static plantar pressure is influenced by the maximum mouth opening. An improved postural stability was recorded in maximum intercuspation, during swallowing, in comparison to mandibular postural position, when relaxing the masticatory muscles after functional moments (Amaricai et al., 2020).

Thus, the examination of postural disorders must provide a pathway in the cranial-caudal sense and requires not only medical history and clinical evaluations but also specific instrumental investigations to identify its nature and extent through signs and symptoms of tension and pain in specific functional areas.

Specifically, an objective diagnosis of postural dysfunction related to occlusion is mainly based on the evaluation of mandibular asymmetry, dentoskeletal malocclusions and temporomandibular joint disorders as well as other perturbations that might modify the sensorial inputs for balance control (Julià-Sánchez et al., 2015).

Some investigations suggested that there is a plausible evidence between the masticatory and cervical muscles, with a reciprocal connection between the trigeminal and vestibular nuclei, hence supporting the influence of the stomatognathic system on body balance (Julià-Sánchez et al., 2019). The modification of mandibular position in the occlusion seemed to affect body posture, and vice-versa (Sakaguchi et al., 2007). An occlusal reequilibration may provide a beneficial effect on paired postural muscles as sternocleidomastoid, erector spinae, and soleus in young adults (Bergamini et al., 2008).

However, recent overviews showed that, even if some associations have been found between occlusal factors and postural alterations, there is not enough scientific evidence to predict cause-effect relationship between these two elements alone. (Michelotti et al., 2011; Manfredini et al., 2012; Perillo et al., 2008).

A widest range of elements interconnected with body balance should be taken into account instead of separate evaluations. So, patients from infancy to the elderly suffering from postural, occlusal, osteopathic or orthotic disorders should follow a wide screening for other possible associated pathologies which may make side effects worse with time (Silvestrini-Biavati et al, 2013).

Novel technologies have been recently used to assess static and dynamic occlusion and body balance and smart devices are spreading to remotely investigate and manage the individuals' muscle activity and pain via biofeedback.

The development of a homogeneous and evidence-based program for early diagnosis, monitoring and interdisciplinary treatment of occlusal and temporomandibular joint disorders related to orofacial pain and postural/gait imbalances from a young age should be considered mandatory by policy makers (Perillo et al., 2011). Finally, the creation of integrative and innovative health care framework in this field perfectly fits with the expected aims of the EIP on AHA to improve quality of life in an ageing society.

4.5 Cognitive Impairment

Falls and cognitive impairment (CI) are related and increase commensurate with age (Rebenstein, 2006). Both dementia (Meuleners et al., 2016) and its prodromal state, i.e. mild cognitive impairment (MCI) (Delbaere et al., 2012) are associated with an increased risk of falling. Between 40-80% of persons with dementia fall each year, twice the rate of those without CI (Tinetti et al., 2015). Falls increase the risk of institutionalisation in persons with CI (Myers et al., 1991) and reduce quality of life (Delbeare et al., 2010). While many aspects of cognition are implicated, impairment in executive function, leading to a slowing of gait speed, is most strongly associated (Kearney et al., 2013) with even subtle deficits in healthy older adults found to increase fall's risk (Mackenbach et al., 2016). Other risk factors include poor balance and reduced reaction times in those with established CI. Multiple intrinsic and extrinsic risks including psychosocial factors, poor vision, functional impairment and centrally-acting medications are also implicated (Mikkelsen et al., 2012). CI reduces awareness and insight into their deficits and those with more established CI often exhibit unsafe behaviours (Fernando et al., 2017). Neuropsychiatric symptoms including agitation, restlessness and disruptive or aggressive behaviours, are also factors that potentiate the risk. Not only is CI a risk factor for falls, falls may also accelerate cognitive decline such that a fall can lead to impaired mobility, delirium and consequently worsening CI. Screening for risk of falls could identify those likely to experience recurrent falls (Meuleners et al., 2016). Similarly, cognitive screening is essential to promptly identify CI and intervene to prevent falls.

Instruments sensitive to early cognitive changes such as the 6CIT (six-item cognitive impairment test) (Danielsen et al., 2016; Brooke & Bullock, 1999), the Q*mci* (Quick Mild Cognitive Impairment) Screen (Apóstolo et al., 2017; O'Caoimh et al., 2012; Carpinelli-Mazzi et al., 2020) and MoCA (De Luca et al., 2019a), are appropriate for screening for CI in busy clinical practice. These help target more detailed person-centred evaluations, such as comprehensive geriatric assessment and a multi-factorial falls risk assessments. Early diagnosis allows prompt pharmacological and non-pharmacological intervention. Traditional falls prevention measures, such as the Otago programme, which are known to reduce falls, are less useful in those with CI (Nasreddine et al., 2005). Instead both cognitive and physical interventions tailored to those with CI such as cognitive stimulation and tailored physical exercise programmes can

reduce the risk of falls from the outset (El-Khoury et al, 2013), enabling the person to prevent their own falls (Lipardo & Tsang, 2018). Data is as yet limited but there are ongoing trials examining combined physical and cognitive training in early CI. Falls prevention measures are more likely to be successful in those with MCI as awareness of their limitations (Apóstolo et al., 2016) and the ability to learn and/or train is usually preserved. Improvements in integrated care pathways specifically for people with CI who fall, which are currently fragmented are needed to improve outcomes for this important subgroup of older adults (Wheatley et al., 2019).

4.6 Falls and Visual Impairment

A significant increase in the prevalence of impaired vision with age, especially in subjects 75 years of age and older (Klein et al., 2001), is a well documented phenomenon (Klein et al., 1998). It has been demonstrated that the risk of accidental falls is higher for individuals with visual impairment compared with those with normal vision (Coleman et al., 2007; Freeman et al., 2007; Wood et al., 2011). It was estimated that globally, at least 2.2 billion people have a vision impairment or blindness, of whom the majority of people are over the age of 50 years (WHO, 2019).

Falls are the second leading cause of accidental deaths after road traffic accidents worldwide (Saftari & Kwon, 2018). The increased risk of falls in older patients is mainly due to a physical, sensory and cognitive decline expected with aging. The ability of balance and gait control (Cho et al., 2004), musculoskeletal functions (Horling et al., 2008; Pijnappels et al., 2008), cardiovascular functions (Heitterachi et al., 2002; Ooi et al, 2000; Klein et al., 2013), vestibular functions (Ekvall Hanson & Magnusson, 2013; Menant et al., 2012), somatosensory functions (Craig et al., 2016; Lord et al., 2002) and visual functions (Saftari & Kwon, 2018; Black & Wood, 2005; Broman et al., 2004; Coleman et al., 2007) have been suggested to be the important factors responsible for the increase in fall risks in older adults.

The consequences of a fall can cause serious injury, physical deterioration and institutionalization (Iglesias et al., 2009). The majority of patients with a hip fracture do not return to the level of activity of daily living, which they showed before the fracture (Abdelhafiz & Austin, 2003). The high mortality rate for individuals in the first year after a hip fracture is also well described, with rates of 20–35% (Goldacre et al., 2002).

Many visual functions deteriorate gradually during the normal aging process (Owsley, 2001). This may be due to optical media abnormality, age-dependent neuronal morphological modifications and/or a neurotransmitter system imbalance in the visual processing pathway, especially in the primary visual cortex or even the higher cortical loci (Zhang et al., 2008). In addition, eye diseases such as age-related macular degeneration, retinal dystrophy, diabetic retinopathy and glaucoma can independently be the cause of vision impairment. Visual loss is a broad term and is not only represented by measure of visual acuity and visual field. In fact, other components of vision such as contrast sensitivity and depth perception may affect the risk of falling and of hip fractures (Dhital & Stanford, 2010).

Vision loss is able to influence person's balance, movement and the strategies used to interact with the environment (Brundle et al., 2015). The most falls occur while walking or doing routine tasks (Talbot et al., 2005) - 60% at home, 30% in public places and 10% in healthcare institution (Scott, 1990). Hip fractures have been linked to visual impairment to subjects measures of vision such as reduced visual acuity, contrast sensitivity and visual field (de Boer et al., 2004).

Although there is considerable epidemiological evidence that older individuals with visual impairment are more likely to fall than those without, a Royal College of Physician audit showed that 50% of sites did not employ a standardized visual acuity assessment in these patients (Royal College of Physicians, 2009).

In conclusion, although the association between visual loss and falls would seem to be intuitive, it has remained a relatively understudied phenomenon until the last two decades (Dhital & Stanford, 2010). The development an efficacious and cost-effective multi-disciplinary intervention is desirable to act on the relevant factors associate with high risk of falls.

4.7 Falls and Vestibular Diseases

A significant increase in the prevalence of vestibular diseases with aging, especially in subjects over 65 years of age and more is a well-documented phenomenon. The risk of accidental falls is higher for people with vestibular diseases. Moreover, in recent years in the Western countries, the average life span has increased due to the improvement of sanitary conditions and the greater effectiveness of medical and surgical therapies, and so the survivor of over-aged subjects are more than it used to be before. Of course, as a result of the above mentioned considerations, we appreciate to an increase in traumatic episodes, in old age, linked to dysfunctions of the vestibular apparatus. The vestibular apparatus has an essential role in maintaining the erect posture and in movement's harmonious execution. Talking about balance disorders, the vertigo can be defined as a disturbance of spatial sensitivity with an incorrect sensation of movement of the body or of the surrounding environment, as well as the imbalance that is characterized by upright position sensation of oscillation of the upright position or instability / insecurity in walking (Goebel, 2000; Shepard & Salomon, 2000). Symptoms can frequently coexist or be sequential. Based on the characteristics of the symptoms, we can have two types of vertigo **subjective** or **objective**. With **subjective** vertigo, one feel like as actually moving. It has frequently a peripheral origin. In some cases, one may actually be swaying slightly. If a patient has **objective** vertigo, he feels like his/hers surroundings are moving. This phenomenon has generally a neurological origin. Causes of peripheral vertigo include: benign vascular (labyrinthine microcirculation) paroxysmal positional vertigo, labyrinthitis, Meniere's disease (this condition causes objective vertigo, hearing loss, pressure in the ear, and tinnitus. Meniere's disease can come and go, and you may experience symptoms for several weeks or months), trauma, ototoxic drugs. (Barbara et al., 2007; Marcelli, 2011; Haynes et al., 2002). The causes of central vertigo can include: vertebrobasilar vascular, demyelination, drugs (anticonvulsants, hypnotics), neoplasms, alcohol. (Migliaccio et al., 2004; Rinne et al., 1998). In the peripheral forms, vertigo can also be associated to hearing loss or tinnitus due to the proximity of the two sensory systems unlike the central forms, and to vegetative symptoms such as nausea and vomit. Frequently, especially in the elderly, we recognize non-specific disturbances of balance with instability conditions, movement uncertainty, syncopal episodes and falls. These symptoms are also justified by cervical pathologies. The most frequent symptom is paroxysmal positional vertigo suddenly arising, with unknown etiology that can frequently be the cause of falls (Kim & Zee, 2014; Brandt & Daroff, 1980; Yacovino et al, 2009). Most causes of vertigo are benign, but potentially disabling. In conclusion, the ratio of falls and dysfunctions of the vestibular apparatus is very high, especially in the elderly. A careful study of such organ function is required to improve its performance.

4.8 Environmental Challenges Requiring Design Modification in the Different Settings

Housing and outdoor spaces and buildings impact people's health and wellbeing, no matter how old people are. Improved housing conditions can increase quality of life, reduce diseases and prevent people from falls (WHO, 2018). Inclusive and safe outdoor spaces and buildings further foster social inclusion and participation in society. While constructing or retrofitting houses and public spaces, it is elementary to include people's needs and demands on the built environment. Functionality, mobility, visual and hearing issues demand the attention of the building industry to aspects such as width, surface, cleanness and signage. It is also essential in built environments to offer room to user-centred smart solutions for integrated care, independent living and participation, such as eHealth, falls detection and social connectiveness.

The theme of the safety of the built environment in relation to the aging of the population is articulated on the basis of many aspects concerning the quality of life and the quality of internal and external spaces. The risks of falling linked to the conditions and use of the spaces are associated with intrinsic risks - due to inadequate organization, construction and conformation but also to the sensorial aspects and those of using the spaces - and external risks due to specific impacts such as climatic (wind storms, heat waves), hydrogeological (floods, landslides) or seismic (collapses) risks. In these conditions, the risks of falling of the elderly population are accentuated starting from the known difficulties in normal operating conditions and from those of unexpected extreme dangers, to which it is more and fatally exposed than other user groups (Ulrich, 2001). From this point of view, political and technical-administrative decision-makers like designers must pursue an effective technical policy for a profound adaptation of spaces to the conditions of prevention and mitigation of the multiplicity of risks. An important goal must be identified in improving the accessibility and usability of spaces, escape routes, sensors for smart and "drop-proof" environments, but also the humanization of spaces (living spaces and care spaces). Those listed required interventions in a less performing built environment compared to old and new conditions of risk and exposure of the elderly population. Among many methods of intervention, it is necessary to grasp in advance the current transition towards operational digitalization in the phases of knowledge, design, construction, control, management and monitoring for the conception and use of spaces (Mincolelli et al., 2018). The digital approach foresees evolutionary processes in planning and design, in which the way of considering people health and the tools used to guarantee it are changed, also taking into account the psycho-emotional and social nature of people for an expansion of the requirements in references framework.

4.8.1 Home and Family

Research shows that fall risks can be prevented through home modification. Home modification is adapting the environment to the normal changes that age brings, in order to make everyday life easier, independent and safe, reducing accidents. This involves the manipulation of many environmental factors, that in literature are reviewed under four categories: spatial organization, interior characteristics, sensory characteristics, and use of the environment. Useful changes can be increasing lighting throughout the house, putting in night lights, moving the furniture around, uncluttering the floors, adding lower level shelves, adding supports such as handrails, and changing how or where activities occur. **Assistive devices** and gadgets are a smart way to make activities easier and reduce the chances of falling. Families need to be involved in individualized home fall-prevention and safety plan.

4.8.2 Hospital

New "therapeutic architectures" of hospitals must be characterized as agile and particularly equipped structures, which are related to nature and which have welcoming indoor spaces. In this way, the place of treatment should not be characterized as a space of discomfort and disease, but as an environment where comfort and humanization components of the treatment spaces is maximized (Morandotti, 2008). In this way, human body prepares itself for a health process in which the use of green spaces with a curative function is not secondary (Palombo, 1993). Each space must be considered taking into account its peculiarities, the purposes of visual (signage, color codes, graphics) and physical accessibility, of creating an atmosphere of trust and security, of reducing stress, of relaxation, of providing energy (Boccaccini & Lenzi, 2002). The favorable conditions for treatment require that also medical and paramedical personnel be put in a position, through the design of appropriate spaces, to carry out diagnostic and medical procedures through a human centered design: in this case is fundamental the activity of industrial design and design thinking (Paolini et al., 2017). Finally, with the development of the smart environment, smart objects and Internet of Things (Dohr et al., 2010), in each hospital it is possible to obtain objects interconnected with the network to cope with many critical issues.

4.8.3 Nursing Homes

The health care residences, introduced in Italy in the mid-90s, are non-hospital structures that have a strong health imprint, which - for a period ranging from a few weeks to an indefinite period - host people who are not self-sufficient, who cannot be cared for at home and who need specific multi-specialist medical care as well as comprehensive healthcare (Auser Nazionale, 2011; Arbizzani & Di Giulio, 2002). From this point of view, rest homes must make a qualitative leap in providing for a modification of indoor spaces in therapeutic terms, also with potential physical separation for the purpose of preventing conditions of possible infection or for specific hospital stays. This entails new concepts in the social and health organization, from hygiene to assistance, from management to technical-health equipment (Morena, 2014; Scarcella et al., 2014).

4.8.4 Co-Habitation Housing

The first experiences of co-habitation housing date back to the 1960s, when the multiple advantages of cohabitation were focused especially for self-sufficient elderly people. In the first instance, the ability to cultivate one's sociality and hobbies should be carried out in one's own home with appropriate indoor environment design solutions (Ahrentzel & Tural, 2015). Unfortunately, this is not always possible for multiple reasons including that of high costs. The reduction in costs that each user would have to bear to maintain his private home, can be invested in forms of co-habitation that have a return from social and health services up to the preparation of food (Chan & Ellen, 2017).

The co-habitation conditions offer elderly users the opportunity to be able to carry out their favourite activities, to use the most advanced technological devices and services, also in relation to the territory and the community to which they belong (Chan & Ellen, 2017). A dwelling is determined where one can grow old within a proximity or community welfare that responds to growing social needs (Roversi et al., 2018). New technical policies are necessary to create innovative housing structures (WHO, 2007), also starting from the public and state property to be redeveloped. In any case, the housing units should

be conceived in an innovative key with common spaces for collective and relational activities and more reserved spaces for the private sphere, using refunctionalization and building and urban recovery procedures (De Giovanni, 2014).

4.8.5 Protected Housing Complex

The Protected Elderly Housing Residential Complexes (APA) offer housing possibilities for elderly people with planimetric solutions of reduced surface but characterized by high flexibility of the spaces, to better support the autonomy of those who live there. One-room and two-room apartments are designed taking into account the functional ergonomic characteristics for living even when users experience slight reductions in psychophysical capacities. The characteristics of the structure, with telematic, assistance and health services, represent the basic requirement for facilitating personal lifestyles (Fondazione Cariplo, 2014).

The typological scheme of the apartments must necessarily be simple, with a mainly open living area that determines a living room, as well as the sleeping area consists of a bedroom and a private bathroom. Each accommodation must be free of architectural barriers and equipped with technical and ICT devices that allow the elderly to lead a life in autonomy and in total safety (Housing Learning and Improvement Network, 2007). The protected accommodations are intended for the elderly, singles or couples, with limited frailties, with a sufficient degree of autonomy but who need a controlled and protected environment, programmatically adjacent and connected to the Health Care Residences who can provide specialized services in conditions of particular needs. Among the best known models, the Continuing Care Retirement Community, specific in the experience of the United States, should be mentioned, which offers quality housing solutions integrated by proximity, home and light residential services (Lombardo, 2007).

4.8.6 Community

To define the conditions of expanded usability of urban open spaces, going beyond the first experiments conducted by Ronald Mace in 1997, Universal Design (UD) has extended its field of action to products and services studied with the methodology of Design for all (Preiser, 2017). More recently, these design approaches are referred to the development of smart solutions for information systems, for the security and control of spaces and for the management of services and flows. The design of the common spaces determines the accessibility conditions for a correct interaction between the person and the environment, in order to completely eliminate architectural barriers and the introduction of security measures for the use of urban spaces (Lauria, 2017). Older people with greater self-sufficiency must be able to use the spaces of relationship to improve their living conditions, while weak or non-self-sufficient users must be able to have the necessary spaces to manoeuvre the various walking aids as well as socialization activities.

The usability requirement must be understood in a broad sense, as the possibility of physical and visual access to spaces, of the possibility of being able to intervene independently on some environmental factors, of immediate identification of places and routes (Baratta et al., 2019). The care of outdoor spaces, including green spaces and urban parks, takes a particular value for elderly citizens as the landscape with which they relate daily, becoming a place of stay, recreation and contact with nature (Pineau et al., 2014).

The "wellness paths" represent an element of the quality of community spaces, based on mindfulness, on the innovation of technologies to help break down physical and sensorial architectural barriers and to support the functions of the person. With reference to Active Aging, there is a need for permeable

and accessible spaces, for "streets for people", to raise the conditions of "well living" in the city, to be together, participate, share and cooperate (WHO, 2014).

5 INNOVATIVE APPROACHES TO PREVENT POOR HEALTH OUTCOMES AND INCREASE INDEPENDENT AGEING

5.1 Technological Innovations

The global market is witnessing the growing development of new technologies and devices that have the potential to assist older adults in their daily living, while preventing or delaying institutionalization (Kim et al., 2017). Technological innovations such as Assistive Technologies and Information and Communication Technologies are resources that may improve aging in place for older adults and decrease the caregivers burden (Blaschke et al., 2009). The development of new technologies including Robots, Internet of Things (IoT), Smart Home and Ambient Assisted Living (SHAAL) and Sensors (wearable sensors or incorporated in smart homes) enable the provision of assistance, companionship, health and behavior monitoring. Such technological solutions have shown the impact in the improvement of mental and physical health, and quality of life. Technologies can be used to promote successful ageing in older adults in both the health and social domains (Task Force on Research and Development for Technology to Support Aging Adults, 2019).

5.2 Urban Form and Social Isolation

Since the introduction of agriculture, men abandoned the nomadic life: technological development, innovations and infrastructural improvements enhanced productivity and started to grow residential settlements that continued to be centers of innovation. Staying together imposed profound changes the social life of our ancestors, giving rise to class-structured society, formalized systems of laws, and a hierarchical territorially-based government, that led to increased child mortality and high levels of disease. Cohen and Armelagos in 1984 suggested that was largely caused by malnutrition consequent to the switch from a mixture of meat, grains, and fruit to a diet dominated by grains. Communicable diseases like malaria, tuberculosis, leprosy, influenza, smallpox and others existed during humankind's hunter-gatherer days, but it was only when the number of people in a given place became large enough that it was able to sustain direct life cycle bacterial and viral infections. Overcrowding, lack of clean water, lack of organic waste disposal, scarce personal and public hygiene, large number of people moving, poverty, famine war. For roughly 2500 years, cities have suffered powerlessly the devastating scourge of major epidemics and pandemics, which are "democratic" as they do not distinguish between rich and poor, with their dramatic social, economic and demographic effects changed history. From The Athens[1] typhoid fever to Ebola today, it's easy to see how civilizations are shaped by diseases. Only in the nineteenth century reformist movements, with the avant-gardes of a particularly attentive middle class, together with emerging disciplines such as public health and urban planning, sharing the goal of improving the physical and social conditions of urban populations, supported the need for integrated public interventions that quickly reduced the incidence of infectious diseases and overpopulation. During the 1870s, in fact, a series of new laws led to improvements in public health and hygiene. These included the provision of clean water, proper drainage and sewage systems and the appointment of a Medical Officer of Health in

every area. In 1875 the Artisans Dwellings Act allowed councils to clear slums and build better homes for working families. In 1876 the Sale of Food and Drugs Act banned the use of harmful substances in food, eg chalk in flour and Laws against pollution of rivers were introduced. In 1878 Epping Forest in London became a protected open space for local people to enjoy.

Current demographic trends outline a worsening of quality of life for older adults in the most settings, be them urban or rural, as there have been no policy to adapt the built environment, for example in terms of accessibility.

Once the health crisis was over and with the introduction of new drugs, public health focused on the treatment of specific diseases, and the relationship between urban planning and health was loosened and then completely lost. At this time, cities are facing the "rising tide" of non-communicable diseases such as obesity, diabetes, hypertension and cancer. The increase in non-communicable diseases is in part due to the constant increase in the average life, which leads as a natural consequence to the increase in chronic diseases, but also to wrong lifestyles imposed also by the shape of the places. The best-known example is the obesity pandemic, and the consequent increase in cardiovascular diseases, associated worldwide with the decrease in physical activity, discouraged by the shape of the places, with the separation of the functions of urban spaces, urban sprawl and the inefficiency of public transport. The new massive urbanization which in 2007 for the first time in history has seen the population living in the city exceed that of the rural areas is another important element that has powerfully conditioned the shape of the places in recent years. Unprepared to deal with the aging population and to address the new mass exodus, the great urban centers are growing poorly. Schizophrenic cities where imaginative and fascinating "art objects" are proudly placed, meanwhile public space are non-existent or abandoned and neglected, where rapidly growing suburbs are rapidly transforming into slums and "informal settings", where poor quality of the urban form turns into poor quality of life. If the form of the city reflects our idea of us, at this time it appears a sad, gray, and, above all selfish, idea. Cities become ugly, but above all bad and inhospitable, where people collides but never meets, where knowing each other and exchanging knowledge that generates sharing and care is in fact prevented by the barriers imposed by the places. The poor quality of a place generates a sense of estrangement, places to which nobody feels to belong. Lost the sense of a life rooted in a place, traveling, wandering, moving is the new life project of adults and young people, the obsessive dream of an elsewhere where something can happen, where there is still a possibility and a hope.

Above all, the "bad" city steals time, the time of our life, wasted, spoiled, subtracted, fragmented and dilated at the same time. At the end of the day, the list of activities carried out is such as to fill more hours than a day contains. The time to think, to reflect, to elaborate the meaning of the things that are being done and the experiences that are being lived is stolen from us. A hostile environmental context, where every aspect of life is difficult and tiring, isolates, separates and causes stress. The price of a poor urban form is social isolation. There are strong evidences that high level of social isolation negatively impact on health outcomes and disease management (Singer, 2018). Lack of social connection, whether perceived or actual, induces a stress response within the body, removing energy and resources to the physiological processes maintaining body homeostasis, with a powerful impact on the cardiovascular and the immune systems. Thus, poor social connection can elicit negative physical responses e.g., high blood pressure, insomnia) and mental distress (e.g., anxiety, depression) (Cacioppo & Cacioppo, 2018). A poor urban setting (i.e. lack of transportation, dangerous suburbs) is conducive to social isolation particularly in the older adult. Urbanization rates and increase longevity has indeed created a dilemma regarding healthy aging (Gusmano & Rodwin, 2011). The World Health Organization reports that "at the same time as

cities are growing, their share of residents aged 60 years and more is increasing." City planners must recognize the increasing trends of population ageing and urbanization, and respond accordingly to the needs of older people, particularly the most vulnerable cohort: persons of 85 years and older. The impact of urban planning on poor health, social isolation, physical inactivity is now well document (Carmichael et al., 2019; Thomas & Sanderson, 2013). Urban form can also help to create a sense of place, sense of belonging and emotional connection. Disruptions of this sense of belonging by, for example, removal, relocation or other dislocations have been found to have adverse physical and psychological health consequences Taske et al, 2005). Specifically, in lower socioeconomic neighbourhoods (Tesch-Römer & Wahl, 2017) where green space is lacking and environmental pollution is highest, as well a lack of integrity of walking infrastructure, road and traffic safety, personal security and lighting (Kerr et al., 2012; Brownson et al., 2009; Ben Noon & Ayalon, 2018; Rowles, 1981). Neighbourhoods that enable informal social ties and social support networks that encourage and enable people to help each other can reinforce positive health behaviours (Greenshtein et al., 2020; Shaw, 2004). Thus, urban planning for healthy aging and fall prevention and maintenance of cognitive function are essential elements to be taken into consideration for wellbeing throughout the life span. For example, exposure to green environment seen from home was found also related not only to lower levels of depression/anxiety but also less stress level as reflected was related lower cortisol levels (Pun et al., 2018).

5.3 Social Connectivity in Culturally Appropriate Venues

In this view, a urban form that reduce meaningful "place in-between" where people can meet, talk, laugh, and make difficult access to leisure activities, induces social isolation thus influencing health. In search of strategy to counteract social isolation and its consequences on health, the role of leisure activities was investigated and results indicated that cultural and social engagement can be an important tools to increase and to maintain social connection. The existing evidence show that cultural participation may have strong and significant effects on life expectation, and more recent research seems to suggest that the impact is equally strong in terms of self-reported psychological well-being. In particular, it turns out that cultural participation is the second predictor of psychological well-being after (presence/absence of) major diseases, and in this respect has a significantly stronger impact than variables such as income, place of residence, age, gender, or occupation. The effect is particularly strong for the seriously ill and the elderly, where psychological well-being gaps between subjects with cultural access and subjects without cultural access is huge. Thus, an urban setting facilitating and encouraging cultural and social participation helps to fight social isolation and improves health. In this light, we need to rethink the connection between urban environment and public health.

Although the shape of places is recognized as an essential element for the maintenance and achievement of well-being and the topic is debated all over the world, cases of concrete application of the determinants of health in the design of the "environment" remain sporadic exceptions. In Europe and worldwide material and immaterial cultural heritage are driving Renovatio Urbis and development processes, Bilbao, Rouen, Paris, Berlin, Rome, Buenos Aires are well known examples of this strategy. Culture has the dimension that organizes social form, contributes to the well being of individuals and society by supplying a significant social identity, a sense of community. Thus, the cultural strategy of development goes far beyond the "sole" esthetic dimension, it is a fundamental part of a cultural welfare strategy and as such profoundly impacting on economic and social dimension.

Despite the fact that more than 20 years have passed since the Ottawa declarations and scientific data clearly demonstrate the opposite, health remains, in the view of politicians and administrators, fundamentally a problem of "illness" to be addressed with the use of health care services and to the consumption of drugs, therefore of health competence. The resources for the promotion and protection of health remain in fact very scarce compared to those engaged more or less accurately in health systems. On the one hand, this myopic vision does not alleviate, but rather constantly aggravates the economic and social weight of health, on the other hand it effectively denies the value of the person in its entirety. The motivations and causes of this "cultural" attitude go beyond the purposes of this reflection, however, a "cultural" change is the necessary premise to face the problem of health today. Because the challenge is exceptional: on one hand to understand the "organized complexity" of the organism and the place and on the other their interaction to identify risk and protection variables and their causal relationships with respect to the final results. In order to face the current health crisis, 21st century medicine, despite its extraordinary progress, needs to re-establish relations with other disciplines that help it to draw reliable conclusions on the health of the population and on the methods required to guarantee it within a complex environment often characterized by uncertainty.

6 FROM STRATEGY TO IMPLEMENTATION

6.1 Regional Policies to Create Culturally Relevant Sustainable Communities to Support Aging in Place

Regions play a crucial role in the development and implementation of policies regarding active and healthy ageing. This is particularly true when competencies on health issues (public health and healthcare policy, planning, management and provision) are at regional level. This is the case of several Member States in the European Union and is reflected in the results of the las process of the European Innovation Partnership on Active and Healthy Ageing Reference Sites recognition. In most cases, social welfare and social care policies are regional too.

Regions represent an ideal environment for the consolidation and maintenance of these fundamental social welfare pillars. In addition to public authorities and its institutions, a wide range of partners from academia, research institutions, private and voluntary sectors, as well as civil society contribute to foster innovation to boost personal autonomy, prevent dependency, improve sustainability and efficiency of health and care services, and back entrepreneurship supporting employments in the field of AHA.

Working together in innovative ways helps to achieve the expected aims of the EIP on AHA: to enable citizens to live longer and healthier; while improving the quality, efficiency and sustainability of social and health care systems, contributing at the same time to economic growth through the development of innovative and competitive products and services in Europe.

6.2 Creating Supporting Community-Based Networks for Persons as They Age Including Their Family and Formal Caregivers

The elderly need the support of their informal caregivers, healthcare providers, and community groups in order to reduce falls and falls risks. In fact, these stakeholders can assist older adults in self-management of fall prevention, based on individual preferences, local resources, and community based interven-

tions. For this reason, it is necessary to disseminate falls prevention knowledge, expertise and resources through forums and meetings, promoting a comprehensive and systemic approach to falls prevention and to injury reduction. It is also necessary to promote cost-effective population-based interventions. In fact, targeted and evidence-based community programs have been shown to prevent falls as well as to provide a positive return on investment.

6.2.1 The "Long Live the Elderly!" Program Experience Could Be an Example to Overcome the Division Between Social and Health Services

The "Long Live the Elderly!" program (Comunità di Sant'Egidio, 2021) was born in Rome in 2004, as a response to the heat wave that in the summer of 2003 had caused thousands of unexpected deaths in Europe, in an attempt to prevent summer mortality. The philosophy of the program is that the emergency intervention in response to the heat wave is effective only if it is part of an active program throughout the year, which can thus, during an emergency, leverage procedures and relationships already established; in fact, the main risk factor that affects heat wave mortality is not only the psycho-physical condition of the subjects, but also social isolation. In fact, the main objective of the program is to counteract social isolation through active monitoring of the situation of older people over 80 (those most exposed to the impact of social isolation) and the creation of a network of individual and collective relationships that involves, in addition to the elderly over 80, all those who voluntarily make themselves available to collaborate.

The intervention model is based on:

a) contacting all over-80s in order to offer them a periodic assessment of their social and health needs, health promotion campaigns (eg "Tips for the heat"), assistance in handling bureaucratic issues or seeking formal assistance or informal and provide details of the office, active from 8:00 to 17:00, from Monday to Friday, to be contacted in case of need;
b) strengthen the network of communities around sick and / or socially isolated people by involving people who live or work close to them in voluntary assistance actions;
c) increase community awareness of the needs of the elderly.

The "Long Live the Elderly" program promotes a proactive approach to reach the entire targeted population, so as to prevent some individuals from being overlooked due to a lack of awareness of their care needs. Based on a list provided by the Municipality, all over-80s receive a letter and then a phone call to obtain their consent to be part of the program; the percentage of refusal is less than 5%. If the citizen accepts, a multidimensional assessment of his/her care needs is performed and the service begins. Based on the risk of a negative event, sized for each through a multidimensional assessment of frailty, an Individualized Care Plan (ICP) is drawn up and the citizen is included in the list of periodic telephone calls: the greater the risk of negative events, the more frequently it will be call the person, with a maximum frequency of once every two weeks, unless specific actions are required. In the event that an ICP is drawn up, the achievement of the objectives is periodically checked. The ICP can include the most different types of intervention (from planning structural adjustments to the apartment to reduce the risk of falls, to developing a treatment path that had been so far deficient; from identifying a paid assistant to completion of the paperwork necessary to obtain the disability allowance etc..). The program generally plays the role of the case manager, activating other formal services (for example home care) or informal

(a volunteer who takes care of accompanying the person at a medical examination), although in some cases it can intervene directly.

The activities of the program intensify when a heat wave occurs: all over-80s assisted by the program are tracked by phone and, if necessary, the staff intervenes with a visit to the house, bringing food and / or medicine according to need, or by involving the citizen's network of relationships. Throughout the year, the operators act as a link between the older adults assisted by the program and the community, in order to increase the social capital of both. Healthy over-80s, however, are also contacted at least three times a year and during climate emergencies to monitor their situation.

The activities of the program have recently been enriched by integration with the community nurse. It is a nursing figure who mainly provides for the evaluation and monitoring of specific aspects of daily life (degree of frailty, nutritional status, risk of falling, adherence to polypharmacotherapy, quality of life). It also performs a health promotion function by addressing specific issues such as, for example, anti-flu and pneumococcal vaccination. Finally, it represents a support to the General Practitioner, with whom he relates directly, improving the effectiveness of his action through attention to clinical aspects collateral to the prescription of therapies or diagnostic tests. This approach allows to overcome the division between social and health interventions which constitutes the main obstacle to the creation of effective care services at community level for the older population.

The program is currently operational in several Italian cities (in addition to Rome, Novara, Genoa, Civitavecchia, Amatrice, Naples, Brindisi, and Cagliari) and has around 14,000 subjects with an age equal to or greater than 80 years. In Rome, the Program was able to limit the increase in mortality during the heat waves of 2015 and 2017 by about 50% compared to other areas of the city where the program was not operational, with a reduction in expected mortality by 13% (Liotta et al., 2018b; Liotta et al., 2018c). Furthermore, the "Long Live the Elderly" program appears to be able to reduce the hospitalization rate in a sample of the elderly by about 10% in the first six months of follow-up by around 40% the institutionalization rate (Marazzi et al., 2015).

It is worth of note to underline that the program can represent an entrance door for the taking in charge of people over the age of 80, in order to assess their need for assistance and direct it to the most appropriate services. On the other hand, the participation of many older adults in the social protection networks implemented by the program itself highlights how it also involves people of a younger age or in any case willing to give a part of their time to others, thus creating an important drive towards active aging (Golinowska et al., 2017).

A further element of interest is represented by the costs saved in terms of hospitalizations or in avoided residential structures which are overall higher than the cost of the program (equal to € 81 per elderly person per year) (Liotta et al., 2018c). Although these are initial evidence that require further checks on larger samples of the population, a promising prospect is foreseen for the implementation of innovative services.

6.3 Integrated Policies and Implementation Practices Under the Concept of Smart Healthy Age-Friendly Environments

To live and participate in society, it is necessary that working and living environments are usable, accessible and reachable for all people, either they walk, drive, use a walker or wheelchair, have hearing or vision problems. With the ongoing digitization of society, digital solutions could assist to better prevent non-communicable diseases, promote independent living, thus favouring health and wellbe-

ing. However, single digital solutions are not the panacea to all issues. Citizens need to improve their digital skills, health literacy, citizenship engagement and democratic participation. Environments face challenges: house retrofitting, digital infrastructures, public spaces and transport and climate neutral solutions. Finally, health and care need reliable and accessible big data, integrated and person-centered solutions (new pathways) and solid business models. All these challenges are interconnected and need a holistic approach.

In 2018, Caritas Coimbra and AFEdemy delivered a Joint Statement to the European Commission and Member States, defining 5 policy priorities to broaden the shared vision on the digital transformation of health and care - SHAFE – Smart Healthy Age-Friendly Environments. To create this shared vision in all its facets, achieving goals of healthy living, social inclusion and participation, the SHAFE network wants to draw the attention of policy makers, organisations and citizens to better align ICT with the built environments. This alignment must focus on an enhancement of the user-centred design of the major concept areas of People (e.g. citizenship, long-life learning, social interaction) and Places (as houses, built environments, community spaces and outdoor facilities). The reasons for this pledge are multiple (such as lack of real cooperation between policy pillars of health, infrastructure and digital innovation, unclear return on investment or business case, (digital and health) illiteracy and lack of funding and coordination), however it could be summarized as a pledge to realise SHAFE by focusing on better coordination and implementation and to involve (end)users from the beginning. From origin, SHAFE has its roots on the holistic age-friendly environments concept, developed by the World Health Organization in 2007, however further developed now into the new era of digitalization and health. This joint approach could assist to better prevent people from noncommunicable diseases, promote independent living, and thus favouring health and wellbeing. SHAFE needs a multi-faceted approach and multiple stakeholders to become really implemented. Single players are not enough to realize social inclusion and healthy lives for all. Therefore, it involves a broad network of stakeholders: varying from older and younger citizens, to businesses, financers and public authorities. With the start of the Thematic Network in 2018, it already laid ground for the integral approach of multiple stakeholders; it is now evolving to additional organisational and individual pledges aiming to continuously grow the network. Thus, in 2020, the Stakeholders Network on SHAFE aims to achieve mainly Coordination and Implementation, specifically the following higher-level goals:

- Promote training of formal and informal caregivers (communities) on SHAFE, creating a toolkit and implementing training actions in multiple countries;
- Raise awareness on the need to enhance social care, building infrastructure and environment conditions in order to move Health and wellbeing provision to the home and towards prevention – to a Health and Wellbeing value-based approach;
- Jointly develop sustainable business cases with insurance companies and investors to foster future investments on smart healthy environments;
- Modernise education of urban planners, architects and ICT-developers in general to focus on PEOPLE and PLACES and focus research on lifelong learning, evidence-based design, smart healthy environments and empowerment;
- Support public authorities and health and social care providers on implementing SHAFE, especially regarding building or restructuring the built environment to include ICT solutions with integrated health and care provision.

6.4 The relevance of accessibility for an age-friendly environment

6.4.1 Accessibility: Framework and Definition

Accessibility means being able to be reached or obtained easily: the usability of a product, service, environment or facility by people with the widest range of capabilities. Every aspect of society, knowledge, motion or rest, culture, should have no limits for people of every health's degree: disable and non disable people need to be considered in a framework of inclusion and equality, in order to reach and produce social value and community empowerment (University of Cincinnati, 2021). Having an affordable approach means to make products and services easy and enjoyable in their features and interfaces. Removing physical and mental obstacles is pivotal to ensure to everyone the right to participate in cultural life, recreation leisure and sport, in political and public life as well as in placement and during the entire life-course.

6.4.2 Culture and environment: leisure and work

Closely related/linked to accessibility is the idea of universal design, and retrofitting the built environment to improve it. An environment should meet the needs of an entire population. Thinking about something accessible could be misunderstood: if you have no stairs, a place is reachable for a large number of people — no matter in what type of diversity they are living (Agenzia per l'Italia digitale, 2021). So, it is truly required to architects and designers to think about "different shapes of humanity", but it is equally important to have a person-centered perspective in designing things. It is a question of open-minded vision, where culture and education lead human growth.

6.4.3 Education, Media and Web

Learning should have no limits. To develop a user-friendly learning system, accessible contents need to be optimized for simply mental process — it is useful for every smart involvement. Information is more accessible and likely to be assimilated by learners when it is presented in a way that primes, activates, or provides any pre-requisite knowledge (National Center on Accessible Educational Materials, 2021).

According to The guidelines and Success Criteria of Web Content Accessibility Guidelines (WCAG) 2.1, anyone who wants to use the Web must have content that is:

- Perceivable: information and user interface components must be presentable to users in ways they can perceive. This means that users must be able to perceive the information being presented (it can't be invisible to all of their senses);
- Operable: user interface components and navigation must be operable. This means that users must be able to operate the interface (the interface cannot require interaction that a user cannot perform);
- Understandable: information and the operation of user interface must be understandable. This means that users must be able to understand the information as well as the operation of the user interface (the content or operation cannot be beyond their understanding)
- Robust: content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies. This means that users must be able to access the content

as technologies advance (as technologies and user agents evolve, the content should remain accessible) (World Wide Web Consortium, 2021).

If any of these are not true, users with disabilities — or ageing, will not be able to use the Web. Assistive technology can help and compensate every type of human need, with customization of interface (United Nations, 2021). Content creators should clarify vocabulary and symbols, syntax and structure, support general contents with explanations and examples; guide information processing and visualization; encourage the use of multiple media for communication and of multiple tools for construction and composition (Center for Applied Special Technology [CAST], 2018; United States Department of Justice, 2021). This kind of procedure will undoubtedly be appreciated by both small kids and elderly people (Piaget, 1972; Piaget et al., 1974).

Governments, public organizations, associations and foundations, enterprises and citizens can collaborate to enable people to live independently and give them the opportunity to participate in every aspect of life: education, arts & crafts, leisure; culture, fun and amusement. Accessible transportation, technologies facilitate access to environment, both in urban and rural areas. Intellectual environment and knowledge have structure and rules that still need to be expanded.

6.4.4 Physical Accessibility Enabled by New Technologies

Human is, by his intimate nature, not self-sufficient at birth, his lack of self-sufficiency if not compensated by maternal care would preclude the continuation of life. Over time a homeostasis is established between endogenous and exogenous factors that allow to maintain an adequate level of autonomy. Diseases are one of the factors that most seriously undermine the physical integrity of the humans, leading to the emergence of disability. We can defend ourself from the diseases with prevention and improvement of care but despite all the technological advances, including those of regenerative medicine, to date the return from any disease to healing accumulates in our body an impairment of different degrees but in any case never absent. Over the course of life, each person accumulates impairments which, depending on the severity, affect his physical and mental abilities, progressively increasing his disability until he reaches, in extreme degrees, complete non self-sufficiency. In this process of individual's health level potential decline, more than prevention and medical treatment, plays a fundamental and extraordinary role the possibility of intervening on the external living environment in which people live. The environment in which each person lives constitutes another variable that determines, to various degrees, their disability. The degree of obstacle that the environment represents, for the expression of their potential, it represents the handicap. It has long been understood the importance of acting on this factor to help to preserve as long as possible the residual abilities of the person. In the first instance the reduction of the Handicap was almost exclusively reserved to the removal of architectural barriers and to the adaptation of the safety characteristics of the life and working places. New technologies have subsequently introduced the possibility to intervene directly on the human body, by artificially reproducing structural parts or entire organs of it. The last frontier of this Handicap reduction process is the one offered by artificial intelligence that allows the production of a new generation of prostheses such as exoskeletons that applied to an individual can assist his movements. Another extraordinary example of the use of technology is the one of augmented reality applied to eye communicators that allow particular categories of patients, such as those suffering from motor neuron diseases (e.g. ALS), to be able to communicate and act with the outside world at an unthinkable level until recently. 5G, the latest breakthrough in information

technology, allows users to take advantage of augmented reality through eye communicators and the extraordinary interconnection not only between devices but also between simple household appliances. The patient with ALS will be able to interact with the outside in many ways: at a communicative level, by converting the words written through the eye pointer into voice, or by sending emails. From a prassic point of view the user, through the eye communicator, with a lift connected to a rail system, can move around his home and maintain a minimum of self-sufficiency. In conclusion, while waiting for medical progress, the use of new technologies is a valuable aid in the fight against non self-sufficiency.

7 EMERGING ENABLERS AND BOTTLENECKS

7.1 Training and Education to Enable the Adoption of Digital Solutions

The European Commission has adopted on 17 January 2018 the Communication on the Digital Education Action Plan (European Commission, 2018). The Action Plan outlines how the EU can help individuals, educational institutions and education systems to better adapt for life and work in an age of rapid digital change by:

- Making better use of digital technology for teaching and learning;
- Developing relevant digital competences and skills for the digital transformation;
- Improving education through better data analysis and foresight.

7.2 Data Sharing and Interoperability

While facing the challenge of how to provide modern healthcare, novel ICT solutions and devices for prevention, monitoring, home and cross-border health management are fast spreading and evolving. Many of these innovative tools also offer the opportunity of enriching the overwhelming amount of available information that may further contribute to support health management, research, policy makers and innovation in the associated sectors.

Notwithstanding these opportunities, data resources, when conceived and made available as additional deliverables, have restricted access and interoperability, limiting the full exploitation of the potential outcomes, as well as integrative efforts and long-term reusability.

Several steps have already been undertaken, which include: (i) the adoption of new guidance on interoperability and standards for digital health and care, (ii) the strengthening of cross border health data (through the Connecting Europe Facility (CEF)), and (iii) new investments in large scale implementation of in digital health and social care programmes, both at national and regional levels.

Notwithstanding these efforts, there are still challenges that need to be addressed for maturing an interoperable eHealth environment considering all concerned levels and necessary competences. Among the main issues to be tackled there are the complexity of the overall information to manage, the project implementation plans which are not necessarily required for digitalized information sharing, the limited rules and standards to organize the varied data. Therefore, in the BIG Data era and in a “digital” world, the establishment of suitable standards for data and metadata collections still represents an *open* challenge for *open*, accessible resources.

Fortunately, these aspects are not being left out of consideration for future action plans, as also mentioned in the European directives, since they are the keys for data integration and interoperability. A sustainable healthcare management, going from the transition from a hospital-based health care model, to personalised medicine, independent living or integrated health and social care, favouring early diagnosis, prevention of diseases and proactive re-design of working and living environments will favour citizens, as well as policy makers and enterprises, offering still underestimated social and economical opportunities.

7.3 Assessment and Change Management of ICT Adoption

According to the World Health Organization (WHO), e-health is a very broad and multidimensional concept, including the offer of technologies for diagnosis, care and assistance; the technical infrastructure and IT equipment necessary for the provision of these services; but also the cultural aspects related to the emergence of this technological innovation (WHO, 2005). Digital transformation in health and care needs adequate tools that offer decision-makers sufficient knowledge about the potential, advantages and costs associated with its introduction and use of innovative ICT solutions. It is already established that innovative solutions adoption varies among different countries (Currie Seddon, 2014) and the needs for effective business models to implement and adopt them are increasing (Kimble, 2015). An one-size-fits-all implementation strategy for all of the health systems will most likely not succeed without either changing the technology and services or differentiate in the business models according to cultural and social contexts differences. E-Health solutions impact the patient's health outcomes and lifestyle, the quality of the service provision and the professionals' work, the equal accessibility to care by the citizens and data security. Underestimating the impact that the use of technology has on the system, without a change management planning, determines the failure of adoption processes. The main failure factor of innovation in healthcare is given by the underutilization from end-users (professionals and patients) of the new IT systems, leading to the so-called "IT productivity paradox", for which there is a lack of return on investment against very high costs (Jones et al., 2012). IT can only contribute to the care path if the innovative solutions are adequately integrated into the assistance processes, work routines and daily life of end users. Knowledge of the care experience, held only by the patient, is particularly valuable. This knowledge can be enhanced through participatory design, in which the customer is no longer the passive recipient of a new product but is an integral part of the design and of the innovation process as a whole (De Luca et al., 2019b). The EU agenda for effective, accessible and resilient health systems (European Commission, 2014) indicates Health Technology Assessment (HTA) (Gabbay & Walley, 2006) and ICT as priorities to contribute to innovation, efficiency and sustainability of health systems. The Model for Assessment of Telemedicine (MAST) is an example of declination of the HTA methodology to evaluate the efficacy and contribution to the quality of care of telemedicine applications (Kidholm, 2012). The integration between healthcare and citizens' well-being has been addressed by the EIP on AHA in recent years. The update of the Blueprint for the Digital Transformation of Health and Care provided a methodology to develop persona types, representing citizens needs in a matrix developed along life-course and complexity. Persona types share some unmet needs, related to dependency and caregivers stress, adherence to more or less complex treatment regimens, including healthy lifestyles, often safety and accessibility concerns and diverse degrees of social isolation. This approach facilitate the identification of organizational, digital and sociocultural elements requiring customization to ensure adoption at a specific loco-regional level (European Commission, 2017). MAFEIP is an analytical decision-making model that integrates data from multiple sources to evaluate the impact of an innovative interventions,

with broader aims of telemedicine, on the years of life acquired, on the quality of life related to health and on the costs of health and social care (Boehler et al., 2015). It is clear that further development of the assessment methods is necessary. This aspect is crucial for the development and adoption of innovative approaches and technologies for effective and sustainable contribution to citizens' health and social innovation.

8 CONCLUSION

In the framework of an ageing population, we are being faced with multiple challenges that include chronic conditions, as well as the increase of related acute events. Falls are one of the events occurring at older age with the highest impact, in terms of health outcomes, as well as of health care resources, that could be effectively prevented and managed implementing a proactive, interdisciplinary approach supported by innovative solutions.

Indeed, falls in older adults are linked to several elements, such as polypharmacy, sarcopenia, inadequate food intake, built environment that could be helpful in early identification of the risk of fractures and ri-fractures. Addressing all these elements requires interdisciplinary and multi-organization collaborations, to identify the indicators than we need to assess for timely and personalised interventions. Collecting and sharing the data underlying risk stratification is the first step to implement tailored interventions that can be personalised and allow, for example, the detection of behavioural patterns capable of influencing health outcomes and prevent falls, and mitigate falls consequences.

Fall prevention represents a paradigm of policy interventions for public health that are implemented at a level and intensity of action that also tackle health inequalities. They are an example of how innovative, multilevel approaches can ensure economic benefits at a national level, as well as the right of all citizens to the highest attainable standard of health, irrespective of place of birth, gender, ability, or socioeconomic background.

The use of health impact assessments applied to fall interventions might be one of the frameworks through which the potential health impact of a shared policy might be evaluated to assess its health consequences.

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