



“Healthy Ageing” Work Package 5

**Final report from two Scientific Workshops held in
Newcastle upon Tyne (UK) on 15-16 March 2010 and
12-13 July 2010**

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October 2010

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1 Introduction

This report presents the results of consultations on the priorities and process for future research on healthy ageing from two workshops held in Newcastle upon Tyne, UK on 15-16th March 2010 and 12-13th July 2010. Three further sections follow: the first presents the context and rationale for the theme of Healthy Ageing within an agenda for future ageing research, stressing the need for an interdisciplinary approach at all levels. The overall philosophy and structure of the workshops is then described in terms of the key topics which framed the sub-themes:

- Monitoring and resolving inequalities in healthy ageing
- Prevention and promotion to maintain healthy ageing
- Interventions for Improved Health and Wellbeing with Ageing and Co-morbidity
- Psychosocial factors and healthy ageing
- Methods and infrastructure

The section following takes each of the sub-themes in turn and details the broad priority areas. A brief summary of findings concludes the report.

2 Context and rationale for Healthy Ageing theme

Europe is already the oldest region in the world and, as with other regions there is no evidence that the trend for rising life expectancy will not be sustained for the foreseeable future. That greater numbers of people are reaching retirement and well beyond should be celebrated, but there are far-reaching implications for individuals, society and governments unless the extra years of life lived are predominantly healthy ones.

Not only are our populations as a whole ageing with premature mortality being reduced but mortality rates even in the oldest old, a category commonly used to describe those aged 85 years and over, are also decreasing. Indeed the oldest old are the fastest growing section of the population in many countries. Moreover there has been an even more rapid increase in the number of centenarians and supercentenarians (aged 110 years and over), these individuals being relatively rare 50 years ago. The rising numbers of the oldest old are a particular issue for health and social care policy since multiple chronic diseases, frailty, disability and the need for care are particularly high in this age group. However older people are heterogenous and some will still be able to function and live independently even at extreme ages and with multiple medical conditions. Though there is some evidence in a few selected European countries (Denmark, Sweden, France, UK) on the health of the oldest old, not all can conclude whether newer cohorts are more or less healthy and even in Denmark where newer cohorts appear healthier, social inequalities in health persist.

Healthy ageing is a well-used term that is understood on a general level to encapsulate the ability to be socially engaged, productive and to function independently both at a physical and cognitive level. However definitions between studies vary and there is no consensus across different countries. The European Union (EU) provides a unique opportunity as a 'population laboratory' where we can document the trends in the health of the older population in countries at very different stages and trajectories of increasing life expectancy but also in countries with similarities and differences in attitudes, experiences, delivery of health and social care and family and social structures.

3 Philosophy and structure of the workshops

As for the other Futurage themes, the identification of research gaps and future priorities for the Road Map was through two workshops comprising invited experts in their research field and young researchers, mainly the Future Leaders of Ageing Research in Europe (FLARE) Fellows. Both workshops took place over 1.5 days and comprised plenary and working group sessions. Recognising the enormous breadth of the topic of healthy ageing and with reference to previous presentations as part of Era-age, four sub-themes were initially identified: Monitoring and resolving inequalities in healthy ageing; Prevention and promotion to maintain healthy ageing; Interventions for improved health and wellbeing with ageing and co-morbidity; and Psychosocial factors and healthy ageing. Mental health was not specified explicitly as a sub-theme but featured strongly in the Psychosocial factors sub-theme. Indeed, mental health arose in discussions on inclusivity of those with cognitive impairment in design of technology and research study participation. Moreover in this document health and function are implicitly understood to include both mental and physical health and function.

The first workshop concentrated on extracting the gaps in knowledge in each sub-theme. Leads for each theme were identified prior to the first workshop. Each lead introduced issues in their area in a plenary session to all participants with further debate in working groups. A further plenary session introduced participants to specific issues based on geographies: current and past European research priorities on healthy ageing, overviews of the agenda for healthy ageing in the US, Canada and Japan, the latter with an emphasis on the oldest old.

In the second workshop, the four sub-themes again formed the basis for the first set of working groups with a brief to prioritise research topics, taking into account two new and important topic areas introduced in the preceding plenary: medication and quality at end of life. A second set of working groups was formed around cross-cutting themes of research methods and infrastructure, user engagement, and future generations of older people and researchers and together these formed the fifth sub-theme on Methods and Infrastructure.

It was unsurprising that some of the topics considered within the Healthy Ageing theme would overlap with topics in Social and Economic Resources and Environment and Ageing. For example, as well as agreeing a working definition of healthy ageing, this process should also be applied to measures of socio-economic status and education since these would be core within-country factors that could help explain differing trends between countries. Similarly environment inside and outside the home, can impede or expedite disability and may also have a role in decision making about whether or not to change health behaviours, for example increasing physical activity. It is also important to emphasise that the focus of this theme and the workshops is health and ageing. No attention or priority has been given to so-called “anti-ageing” approaches, interventions or practice.

The first Healthy Ageing workshop held in March 2010 was attended by 33 people and 30 people attended the second workshop in July 2010 with around half contributing to both workshops. Despite numerous attempts to enlist researchers from as many European countries as possible, participants predominantly came from Western Europe with only one from Eastern Europe (Poland). This is further discussed in the fifth sub-theme on Methods and Infrastructure. The workshops were attended by up to 4 FLARE Fellows and several young scholars thereby ensuring representation of younger/early stage researchers in the road map process. Table 1 of the Appendix shows a list of participants in the workshops and their affiliations.

4 Outcome of the workshops: the contribution of Healthy Ageing to the Road Map

The research priorities identified within the five sub-themes are detailed below. Although the working groups based around the four initial sub-themes discussed issues on research methodology and infrastructure, these are brought together under the fifth sub-theme on Methods and Infrastructure.

4.1 Monitoring and resolving inequalities in healthy ageing

Five broad areas were highlighted where there was either a lack of basic comparative work on the underlying concepts or that further comparative research was needed:

- Understanding the underlying dimensions of healthy ageing
- Measures to underpin monitoring healthy ageing
- Links between disease and functioning over the life course
- Healthy ageing, work and retirement
- The interrelationship between health and functioning in the oldest old

Broad research areas

1. Understanding the underlying dimensions of healthy ageing

Building a coherent conceptual framework that included the major dimensions of healthy ageing was felt to be at the heart of this sub-theme. Monitoring and resolving inequalities in healthy ageing demands that the measures used are appropriate and truly comparable. However the major models of healthy/successful ageing have been developed from a researcher's perspective. There is an urgent need to explore how older people themselves define healthy ageing, including the oldest old with multi-morbidity, and how older people cope, adapt to and overcome functional limitations. Research in this area would draw on and interact with that within two of the other themes: Social and Economic Resources and Environments of Ageing, in terms of assessing how individuals interact with wider society and the environment.

This topic should be addressed by multidisciplinary teams to ensure that all dimensions are covered and would necessitate both qualitative and quantitative methods. This topic

area could be pursued immediately, would not necessitate projects of long duration and could be undertaken in a subset of countries representative in terms of geography and process of ageing.

2. Measures to underpin monitoring healthy ageing

In addition to the previous topic area focused on comparative measures of healthy ageing, there is also a need for research to produce comparability across European countries in other measures, for example socio-economic status, functioning, multi-morbidity, frailty, social engagement, and that these measures also reflect current society and its demands. For example core measures of functioning such as Activities of Daily Living, which have formed the basis for assessment of independence both at a research and policy level, were devised by the research community in the 1960s before the advent of many widely available labour-saving household appliances, items such as credit cards, mobile phones or processes such as online banking or shopping. It would also be important that studies actively involved older people as co-researchers and were inclusive of all sections of the population such that migrant and other minority populations were not excluded, which is often the case. These measures would assess the personal and societal burden of ageing and would form a basis for planning for the ageing population including organisation of services. In addition this research would deepen understanding of the huge variation that exists in healthy life expectancy between European countries, how the social gradient in healthy ageing plays out in different countries as well as to what it is related.

This research is resource intensive and high risk if not undertaken in a coordinated manner with good infrastructure. It is a long term process and will require all countries to be involved.

3. Links between disease and functioning over the life course

Although there has been varying amounts of research in this area, gaps in knowledge remain, specifically how different social groups and genders transition through disease to mental and physical functioning and through to participation in society, the role of the environment, and how these relationships will play out in future healthy life

expectancy. This area is important to inform policy makers on planning for ageing populations. Since the same level of disease may impact differentially on disability in different environments or countries and the context and indeed the transitions may differ between countries, such differences will assist in our understanding of the disablement process.

This area of research requires longitudinal studies in representative groups of countries and is potentially risky as not all the underlying science is available. An important issue is that it needs to be an iterative process so that longitudinal studies can be continuously improved as knowledge advances.

4. Healthy ageing, work and retirement

Many countries are considering extending working life and delaying the age at which state pensions are provided. We have little understanding of how health in later life and healthy ageing is affected by changes in the pension system or the current economic crisis and unemployment, how these changes are affecting social gradients in health and whether we can increase (healthy) working life. This area requires explanation of the trends in the health (physical and mental) of the young old and understanding of the relationship with the different exits from the labour market, pensions, socio-economic status, social engagement, family structures, informal care-giving and cultural expectations surrounding work and caring. With the growth in the numbers of the oldest old, decisions to retire or not may be influenced not only by the individual's family circumstances and whether they are required to provide care to an aged parent but also the cultural expectations of elder care and the health and social support systems within the society.

This topic area builds on the first two since it requires harmonization of measures and is therefore potentially risky and long term. Longitudinal studies will be required but these should be conducted in comparative countries to cover the variation in pensions and social policy.

5. The interrelationship between health and functioning in the oldest old

The oldest old is the fastest growing section of population in many countries and is also the group with the most functional limitation, heterogeneity and transitions. There is a dearth of knowledge on the patterns of complex health problems and frailty that are most prevalent in the oldest old, the phenotype and genotype of healthy ageing and its predictors and what the oldest old consider is important in terms of quality of life and wellbeing. These issues are pertinent to the Environments and Ageing theme since, although universal design of technology is an ultimate aim, in some cases this may be inappropriate for this age group. In addition, given the high degree of co-morbidity in the oldest old, this topic area links with others in the sub-theme 'Interventions for Improved Health and Wellbeing with Ageing and Co-morbidity'.

There are already a number of studies which have been or are being conducted in this age group but this should be increased to not only include countries that are geographically representative of European areas but also of life expectancy trends. The main risk in conducting studies in this age group is the problem in recruiting participants who are cognitively impaired or frail. Longitudinal studies in this age group require smaller intervals between follow-up in order that transitions are not missed through death. It was felt that time use studies could be important here to assess how this age group adapt and cope with increasing frailty.

4.2 Prevention and promotion to maintain healthy ageing

Four broad topics were identified where there is a lack of research and where further comparative research is needed:

- Identification of markers of ageing from cellular to societal level
- Life course factors as markers of early ageing
- Physical activity, diet/nutrition, obesity management
- Intervention studies to maintain healthy ageing

A fifth topic area of Implementation Research is reported in the Methods and Infrastructure sub-theme as it was identified by multiple sub-themes.

Broad research areas

1. Identification of markers of ageing from cellular to societal level

It may be useful in primary prevention to identify individuals at high risk for unhealthy ageing before disability or frailty has occurred by characterizing early markers that are associated with later disability. One crucial research question is to identify early markers of ageing which are not in themselves manifested as diseases or pathological conditions. This may be biological indicators, physiological markers, physical performance, or measures of early frailty. There are several research questions which need to be answered: Is it possible to identify markers of ageing in midlife? Are different markers of ageing interrelated or do they progress in parallel to each other? Are markers of ageing in midlife different from those which become apparent in late life? Are markers of ageing as "dangerous" in midlife as in late life? Are markers of ageing the same in men and women and do they have the same consequences? Due to large variations in factors which may influence early markers of ageing it is necessary to compare patterns of results in different cultures/countries. This topic would benefit from comparative research across several EU countries using existing cohort studies.

2. Life course factors as markers of early ageing

It has been increasingly recognized that the aging process is shaped throughout the entire life course, not only in old age. Strain in childhood, youth and early adulthood

increases the risk of early occurrence of chronic disease, which in turn increases the risk of premature disability. Life course research is primarily based on prospective studies and focuses on biological, psychological and social factors that influence the association between development and aging processes over the entire life course. There is growing evidence on the influence of early life factors on healthy ageing, especially on cognitive function, muscle physical performance in midlife. More evidence is needed on the influence of life course factors (including early life factors) on healthy aging in late life, critical/sensitive periods throughout life on healthy aging, accumulation of risk factors throughout life on healthy aging, how different life course factors interact in relation to healthy aging and on the biological mechanisms leading to these outcomes. As mechanisms for associations between life course factors and ageing may vary across different countries we propose that comparative studies in different EU countries should be undertaken, using existing cohort data.

3. Physical activity, diet/nutrition, obesity management

There is evidence that physical exercise can slow the physiological decline with aging, prevent onset of several diseases (e.g. cardiovascular diseases and diabetes), and prevent some of the consequences of disease. Further, prospective cohort studies have shown that persons who are physically active have less impairment, fewer functional limitations and less disability. However there is still a lack of knowledge of: whether the same effect is obtained depending on when physical activity is begun in life and the conditions under which it is done; whether there is a dose-response relationship between physical activity and disability in old age; what are the mechanisms for exercise affecting disability; and whether there are gender differences in the way physical activity influences disability.

Despite some studies on nutrition there is a lack of evidence as to the types of nutrition that should be recommended to healthy persons in midlife and old age to maintain health. As the number of obese persons in Western populations is growing, optimal nutrition is an important area for future studies on healthy aging.

With regard to prevention of age related disease and ill health, approaches may include population based and behavioural approaches, as well as the possibility of pharmacological preventive intervention. Targets for prevention include mental fitness, cognitive function and processes and promotional strategies for all levels of health and fitness, including disease and co-morbidity. Future research on this topic will require active collaboration with older people and other members of the public since public health messages that do not take account of the cultural and social diversity of the population are all too frequently 'top down'.

4. Intervention studies to maintain healthy ageing

There is evidence that multi-factorial interventions in older people do have an effect on postponing functional decline. However, little is known on more innovative types of intervention, e.g. group education and counselling of older people, individual educational programmes for older people, educational programmes via e-mail, facebook, cell phones, and education of staff. Bearing in mind that there are specific subgroups who are particularly vulnerable it would be important to ensure these are included, for instance the socially disadvantaged, ethnic minorities, new widow(er)s, newly discharged from hospitals. It is extremely important to tap the ideas of older people for innovative but often 'low tech' interventions in the future. To date most interventions are designed by researchers and practitioners and not the potential users. These types of interventions might be one way of creating intervention studies on early markers of ageing and on lifestyle changes.

Building on the knowledge gained on early markers of ageing the next step would be to create intervention studies. It would be important to explore whether it is possible to intervene on early markers of ageing – and whether this would have measureable effects on both cognitive as well as physical outcomes. Further, there is a need for intervention studies on lifestyle (physical activity, nutrition, obesity management). These should focus on the mechanisms of effects, gender differences in effects, strategies for health behaviour change and include how emotions, coping strategies, and physical and social environments influence lifestyle behaviour in old age.

There is a need for comparative effectiveness studies which focus on “what works best” and building on innovation in one country. It may therefore be possible to design RCTs of health behaviour interventions where different EU countries take different arms or focus on different subgroups.

4.3 Interventions for Improved Health and Wellbeing with Ageing and Co-morbidity

As population ageing progresses we will continue to see significant heterogeneity within and between the populations of older people among EU member states. It is important to recognise and celebrate diversity in the ageing population and to acknowledge that older people are not a homogenous group. As the demographic transition proceeds, relationships and interactions between health, wellbeing and disease are likely to shift so that the notion of “Ageing with Health” may become more apposite than an aspiration for ageing in the absence of disease. It is well acknowledged that older age groups experience a higher prevalence of co-morbid conditions than younger, and that these may co-exist alongside high levels of function and wellbeing.

Four broad topics were identified where there is a lack of research and where further comparative research is needed:

- Organisation and delivery of effective healthcare
- Optimal workforce for an ageing population
- Diversity and variation in health and ageing
- Healthy ageing at the end of life

As in the previous sub-theme, a fifth topic area concerning the implementation of research findings is reported in the Methods and Infrastructure sub-theme.

Broad research areas

1. Organisation and delivery of effective healthcare

As the EU populations of member states (MS) age, health services will need to evolve to meet the new needs of aged populations for health and wellbeing with co-morbidity. EU MS implement a range of health care systems, with significant heterogeneity in the distribution of service models and configurations. A basic classification is whether the older person interacts with a primary healthcare system or whether they have direct access to secondary care. Integration of primary healthcare with social care and universal access is seen as the preferred option. Secondary care should also be readily

accessible where it has been identified as appropriate. However, there are further issues to explore related to access, service configuration, delivery and organisation and relationships with social care as well as family and carer inter-relationships and carer issues. This diversity of policy and practice, and the identification of exemplars of best practice and associated research were seen as key issues.

This issue cuts across healthy ageing themes of treatments and services, prevention and population health and addresses priorities which are of great significance internationally. **Comparative and experimental studies within and between EU MS** will require concerted and co-ordinated action and co-operation but could offer the opportunity for rapid improvements in the understanding of effective, and cost effective design and delivery of interventions for health and wellbeing with ageing and co-morbidity.

At a time of economic downturn, it is imperative that the cost effective implementation of evidence based medicine is prioritised. Proper medication is the single most important medical strategy in geriatric care. Optimal drug therapy is the key to treating acute and chronic illness, maintaining health and in some cases preventing further decline. About 85% of all people aged 75 years and older receive at least one daily prescription drug. An evidence-based regimen has a proven positive effect on biological, functional, and quality-of-care outcomes. Nevertheless such evidence is often based on trials where included participants had no co-morbidity and were unrepresentative in terms of people aged 75 years and over. **Preventive medication** can provide enhanced functional ability and life expectancy with improved quality of life. Examples of the appropriate administration of preventive medication include vaccination, Vitamin D, drugs against hypertension, cardiovascular disease and osteoporosis. Research priorities in this area include handling of polypharmacy, improving compliance, monitoring effects and side effects and adverse drug reactions, tools for deciding to begin, continue and stop and alternatives to preventive medication.

One of the central components of the issue of organisation and delivery of health care for health and wellbeing with ageing and co-morbidity is the **impact of health systems as facilitators of healthy ageing**. In this regard, the relative impact of primary and

secondary care systems is seen as a priority issue for research. Further areas of key importance under this heading include access to services (and associated health impact), service configuration, delivery and organisation, particularly the relationships between the primary and secondary health care systems and social care systems and services.

New technologies hold promise for their potential impact on health and wellbeing, the effective and cost effective delivery of services for health and wellbeing and the **development of new ways of obtaining and experiencing services to maintain health and wellbeing** across the life course. Accordingly research into the roles and uses of new technologies is regarded as an important cross cutting theme for healthy ageing, and other FUTURAGE themes.

2. Optimal workforce for an ageing population

Multidisciplinary health care teams are regarded as cost effective in providing appropriate care for older people. Future delivery of effective health care for frail older people will therefore depend on close and effective working relationships between hospital and community departments, implying a need for research on implementing existing knowledge, for example about the efficacy and cost effectiveness of older people's specialist assessment and management processes.

However the majority (over 90%) of health care for frail older people (geriatric medicine) will be provided by General Practitioners. Accordingly, it is suggested that Geriatric Medicine should be part of the core curriculum in all medical schools, and form a significant dimension of postgraduate training in for primary care physicians. The implications of this for research include the development and refinement of models for service delivery based in primary care settings.

Locating the provision of health care in the community, with appropriately trained practitioners carries significant workforce training and research implications around the nature of the teaching and content of the curriculum for medical and allied health professionals working in primary and secondary care settings. This will include the so called geriatric giants but extends also to the associated and important clinical concepts such as frailty, co-morbidity and polypharmacy.

It is increasingly the case that health and social care systems for older people in some member states rely on migrant care workers from other member states. The implications of these developments for the future care of older people are unclear as economic and political factors will influence the availability of social care. The project scarcity of manpower resources for care will potentially increase the burden on families and commuters. Research will therefore need to engage more substantially with NGOs and community participation groups to ensure optimum home based care for future generations of older people.

3. Diversity and variation in health and ageing

At an individual level, the spectrum of autonomy, dependency and disability and their relationships with health was identified as a key issue within which the priorities were the effectiveness of disability prevention, the effectiveness of inclusive design (universal design) and technologies, and investing in autonomy and its link with lack of dependence. There are many groups for whom efforts can be made to promote healthy ageing with evidence that some interventions in older people are associated with improved health, for example anticipatory care systems directed towards specific groups based on risk profiles and complex interventions for which efficacy has been established. Research methodologies including implementation research are also applicable and an emerging area of targeting is based on the role of early life factors on health in later life.

Families have a pivotal role in the support of older people but there are challenges related to changes in family composition and roles with considerable variability across Europe. Key issues identified here were family and carer interrelationships and carer issues, ethno-cultural diversity, socio-economic variation and gender issues related to health, disability and care giving. Social inclusion of older people also varies and can be enhanced. It was suggested that usual health economic approaches based on QALYS may disadvantage older people because they generally have fewer years to live and these may be in poorer health. International comparisons outside Europe may provide useful comparative data related to diversity in aging and health.

4. Healthy ageing at the end of life

It is appropriate within the context of healthy ageing with co-morbidity to address research on optimal services to maximise wellbeing at the end of life. Within Europe, the majority of all deaths occur in those over 65 years and evidence, at least in the UK, suggests that older people are 'the disadvantaged dying' having less access to health and social care services than younger people. Increasing life expectancy and the growing numbers of the oldest old will only compound the situation.

It is our common fate to die but the manner and timing of our deaths vary and the meanings accorded to these deaths are culturally and historically determined. The last few decades has seen the emergence of a number of narratives that construct 'death and dying' within particular ways, for example 'medicalised deaths' that are presented as 'emotionally and spiritually empty, clinical, hospitalised, alone and dehumanised' have been compared with those taking place in the home, hospices or specialist palliative care units. Hospice movement have created a 'narrative' about the good death which comprises of the following features: aware and cognitively intact; surrounded by family members and friends; pain and symptoms controlled, emotionally controlled and 'hygienic'; dying from a clearly identifiable and 'named' disease – normally in the UK and many parts of Europe this is cancer, with a relatively predictable dying trajectory; acceptance of one's fate; autonomy and individual choice; cared for in the 'safe' surroundings of a 'nice' and 'homely' hospice.

However the reality of dying for frail older people is somewhat different: high levels of dementia, confusion which may be longstanding or transient; spouse may have already died, family geographically dispersed or out-of-touch, peers and siblings may also have died; pain may be under-recognised, other symptoms may be over or under treated; co-morbidities – living with many conditions and dying from (or with) a number of chronic conditions – may be hard to determine exactly what the person will die from; lack of awareness of diagnosis eg COPD and heart failure; prognostication difficult; general awareness that death is possible and may even be desired (some people may feel that they have been living too long); little perceived choice and often no real choice; autonomy may not be valued to the same extent as by younger people; cared for in care homes (nursing homes) which may vary in quality. The Netherland has specific medical

specialisation in this area but many other countries do not. In the UK, care homes are generally not regarded as high status or desirable places to die, and there may be concerns about the quality of end of life care.

Palliative care services have largely developed services for middle aged and younger patients with cancer, which are based on a specific type of dying trajectory and a model which prioritises awareness and acceptance, autonomy and individual choice, in the context of family engagement with the dying person. This fails to acknowledge the different experiences and preferences of older people dying in late old age.

4.4 Psychosocial factors and healthy ageing

In reflecting on the key research tasks relating to psychosocial factors in healthy ageing, the workshop considered what are understood to be the main relevant components of current European social policy, and what are likely to be the cornerstones of future European social policy on ageing, so that the research 'road map' will be able to inform that agenda. It was considered that European social policy has/will have as its core priorities the maintenance of lifelong health, and the facilitation of social participation and engagement in late life. Following this discussion, it was felt that in order to meet the policy agenda, the requirements for research on psychosocial factors in healthy ageing could be specified within seven areas:

- Developing an integrated science of behaviour change
- Refining our understanding of the 'superdeterminants' of healthy ageing
- Psychosocial processes in life course transitions
- Personal factors and healthy ageing
- Connectedness and orientation
- Successful ageing in the oldest old
- Sleep quality and sleep behaviour in healthy ageing

Cutting across each of these areas is the need for greater user involvement in the planning, designing and execution of future research

Broad research areas

1. Developing an integrated science of behaviour change

This core task involves the determination of interventions (individual/social/public health) that lead to behaviour change, the maintenance of behaviour change following cessation of intervention, and how behaviour change is moderated via social and environmental barriers and facilitators. Research here should be framed within a life course perspective, as a healthy later life is significantly determined by early- and mid-life health status, cognitions and behaviour. Our understanding of behaviour change and change maintenance should therefore be related to the following processes: how a person's cognition and behaviour develops over the life course; and, how the physical,

social and economic environments impact upon the person and influence behavioural development

2. Refining our understanding of the 'superdeterminants' of healthy ageing

Research evidence has demonstrated the main determinants of healthy ageing to be: physical activity; social 'interaction'; and diet/eating behaviour. Yet even where evidence is strong, gaps remain. With regard to physical activity, future research should be directed toward improving our knowledge of: how physical activity impacts directly and indirectly on healthy ageing; the relative merits of different forms of physical activity (habitual exercise, sustained aerobic exercise, strength and balance training); and how physical activity differentially affects physical health and psychological well-being. With regard to diet/eating behaviour, a detailed understanding of the social factors linked to healthy eating is lacking. In particular: how is dietary management and variety linked to material resources; the degree to which the impact of dietary variety on healthy ageing is moderated by age itself; and the significance of eating as a social and meaningful activity.

The weakest evidence for the impact of the three determinants of healthy ageing is that relating to social interaction. Part of the reason for this is the failure to adequately distinguish between a host of inter-related concepts: social interaction; social activity; social integration; social engagement; social participation, all of which have been linked to (or held to be a required aspect of) healthy ageing. Another reason for the failure to develop a strong evidence base is that measures of social interaction can be operationalised on a number of discrete levels: frequency; density; quality; type; purpose. There is therefore a need for research that is able to clearly conceptualise a highly complex research area and determine the exact element or elements of social 'interaction' that determine healthy ageing. Also of issue is whether any identified effects are direct or indirect. Specific topics that require further research within the broad area of social interaction and healthy ageing include: the importance of non-spousal family relationships and intergenerational ties; whether 'virtual' social networks and social networking will compensate for the decline in 'real' social networks that is

occurring as a result of demographic change; and the processes by which individuals' health and well-being are reciprocally influenced within spousal/close relationships.

The three main determinants of healthy ageing also affect healthy ageing through mutual action. There is therefore a need for research that is sufficiently resourced (both in terms of funds and expertise) to enable an integrative approach to understanding these main determinants of healthy ageing.

3. Psychosocial processes in life course transitions

The life course is broken by key events, some socially mandated and anticipated, some unexpected. These events, the manner in which they occur and are responded to, are likely to have a disproportionate impact on healthy ageing. A better understanding of the psychosocial processes involved in the following life transitions is needed: the impact of negative health events and the successful restoration of functioning/the decline into frailty; the negotiation of the transition from autonomy to dependency; work, retirement, and withdrawal from the labour force (including opportunities for life-long learning and voluntary work); migration; and widowhood and bereavement. Research that utilises available theories of life course development (e.g., Baltes model of selection and optimisation with compensation (SOC)) will allow for more informed hypothesis testing in this area.

4. Personal factors and healthy ageing

Attributes of the individual are known to have implications for healthy ageing. These range from ethnicity and gender, through to dispositions (personality characteristics) such as optimism, and stereotypes of and attitudes to ageing. However, while we may know with some certainty which particular social and personal attributes are connected to healthy ageing, the mechanisms whereby these attributes effect their influence requires clarification. In particular, research is required into: the healthy ageing of ethnic minority groups within dominant cultures (including work on the validity of constructs of healthy ageing within these minorities); the influence of gender on entry into and acceptance of ageing, the caregiving role (including the impact on carer and care-receiver health and well-being) and in access to and utilisation of health care; and

the underlying mechanisms by which dispositions and dispositional perceptions such as optimism, sense of coherence, perceived control, perceived self-reported health, and the holding of negative attitudes to one's own ageing/stereotypes of old age, exert such a profound influence on health and well-being in later life. A major part of the research programme within this area should be devoted to producing more knowledge within the field of social/behavioural genetics. There is a need to prioritise research that has sufficient breadth of perspective to disentangle the relative effects of genetic, behavioural, and environmental influences on healthy ageing, and specifically: how individuals differ in their susceptibility to physical and mental ill health; how genetic factors influence 'lifestyle' behaviours known to influence healthy ageing (e.g., smoking, alcohol use); how genetic factors influence personal 'resources' such as coping behaviours and personal attributes such as risk perception, and how these interact with social, cultural, and environmental stressors and resources.

5. Connectedness and orientation

Work on social exclusion explores the processes whereby particular groups within society are marginalised. Some important work within this field focuses on older people, and further work utilising this framework should be encouraged. However, there is a more concentrated research agenda that requires development, concerned with the connectedness of older people to everyday life, and how an individual's orientation to the past, present, or future is related to healthy ageing. Research suggests a separation of older people from mainstream social activity, in terms of the location, type, and temporal patterning of their activity relative to that of other age groups; and a failure to connect different generations within core social activities. What are the social practices and processes that lead to this separation? Some social practices, for example reminiscence activities with frail older people, are predicated on the notion that older people benefit from engagement with aspects of the social and personal history through which they have passed. Yet other research indicates that a future-orientation, with active planning for the present and future eventualities, is associated with higher levels of well-being. What should we promote in older people, in order to ensure healthy ageing – an engagement with the past, or with the present and future?

6. Successful ageing in the oldest old

Due to the fact that until relatively recently the number of individuals living to advanced old age was small, research within this group has been limited. Important research questions therefore need addressing: how do physically frail older individuals maintain high levels of well-being; how far into late life can health gains be made; is 'healthy ageing' the same for a 90 year-old as it is for a 70 year-old; and what are the physical and psychological transitions that occur in the final stages of life, including the development of concepts around a 'healthy' ageing that encompasses the dying process? As part of this research agenda, new theories, methods and tools may be required to investigate quality of life and well-being in the frailest members of our population.

7. Sleep quality and sleep behaviour in healthy ageing

Sleep quality and quantity are determinants in healthy ageing being implicated in levels of physical activity (via feelings of fatigue), eating behaviour (through impacts on appetite), and social interaction (through its effect on well-being and depression). Approximately 50% of the variability in sleep behaviour in later life develops in mid-life and migrates into old age, and so sleep is a topic for research that would fit within the required life course perspective. Sleeping behaviour is also modifiable and amenable to intervention. However, the topic of sleep has received far less attention as a determinant of healthy ageing than physical activity, social interaction, and diet/eating behaviour and this imbalance should be urgently redressed.

4.5 Methods and infrastructure.

Priorities for methods and infrastructure were covered by all four initial sub-themes in the first workshop in addition to the separate cross-cutting groups on research methods and infrastructure, user engagement and future generations of researchers from the second workshop, all of which are brought together in this section. Seven areas were highlighted:

- Central data archive and facilitating existing studies
- European Institute for Ageing
- Multidisciplinarity and interdisciplinarity
- Harmonisation
- Flexibility of funding
- Implementation research
- Making EU healthy ageing research relevant to all Europeans

1. Central data archive and facilitating existing studies

It is recognised that there are now numerous longitudinal cohort studies, many of which have recorded information in the same or similar dimensions around the EU and across the world. Prominent examples include the UK English Longitudinal Study of Ageing (ELSA), The Irish Longitudinal Study on Ageing (TILDA), the Survey of Health and Retirement in Europe (SHARE), the Medical Research Council Cognitive Function and Ageing Study (MRC CFAS) in England and Wales, the US Health and Retirement Study (HRS) and the Copenhagen Aging and Midlife Biobank (CAMB) in Denmark. The data generated by these and other studies with prospective and longitudinal waves of data collection represents an important and precious resource, which is currently under-exploited and not reaching its potential for informative analysis and comparison across the EU and between the EU and other regions. The archive could be modelled on the US National Archive of Computerized Data on Aging (NACDA) funded by the National Institute on Aging, but should also link into existing European ones, for example the UK Data Archive. This could also be a focus for running workshops and courses as the UK Data Archive at Essex University.

There are sufficient existing data in EU countries to pursue a number of the proposed research areas, particularly cross-cultural analyses of identification of markers of early ageing, for studying the importance of life course factors for markers of early ageing, and for the studies on physical activity, nutrition and obesity management. However, harmonizing these data is time consuming and there is a need for specific EU funding for this which would bring considerable added value. Similar projects have already been funded for harmonisation of phenotypes for genetic analyses, for example, BioSHaRE (Biobanking Standardization and Harmonization). Nevertheless post-harmonisation of studies does not preclude the need for newly designed and harmonised studies and this is addressed later as a separate section.

One of the issues about making the best use of data is that primary studies are not always funded to participate in comprehensive and careful archiving and there is no mechanism for harmonisation of study measures, results and reporting to facilitate international and comparative secondary analysis of these data. A similar program to the US NIA R03 program for archiving or secondary data analysis should be considered. These issues emphasise a need for a central database of results, measures and ongoing cohort studies and imply that consideration should be given to mechanisms for ensuring that investigators conducting primary studies are appropriately guided and funded to put their data into a properly documented repository to facilitate data sharing and secondary analysis. The establishment of protocols and infrastructure to enable greater sharing of data (particularly in the synthesis of previous and current longitudinal studies on ageing, which is badly needed), could learn from the US National Academy of Science reports on the value and approaches to wide data sharing whilst ensuring confidentiality. The development of reward structures for researchers and institutions to ensure secondary data analysis has greater parity with original research in terms of status should also be considered. To be most effective, such a facility would need to be funded explicitly to facilitate the combination of existing longitudinal studies/registers.

Along similar lines, there are many EU and national research council funded studies on topics of direct relevance to health and ageing and to healthy ageing. These studies are usually not designed and funded to deliver harmonised or critically structured data sets

for international comparison and data sharing. It is very possible that added value could be obtained from EU research programmes of relevance to healthy ageing if there was an EU portal for Ageing/Healthy Ageing studies. If properly constructed to take account not only of completed and extant research but also calls for tenders, such a portal could facilitate and deliver added value and link in project deliverables as they occur.

The development of a central data archive and a degree of co-ordinated harmonisation of existing and future studies on healthy ageing carries the potential for the development of international comparative and harmonised research extending beyond the EU and including the US in addition to low and middle income countries, including India and China, whose ageing may impact on the EU.

2. European Institute for Ageing

Discussion of the issues of maximising returns on existing data and harmonising current and future studies naturally raises the question of how best value can be achieved. A further question is whether there is a need for a facilitating centre or a network arrangement, including existing and new centres of excellence, to achieve the desired step change in the utility of research on healthy ageing. What is important is that in order to enable the development of 'critical mass' the structures require expertise, knowledge, and research skills.

In favour of the notion of a network arrangement is that for internationally comparative research, the cross national exchange of researchers implicit in a network arrangement would facilitate understanding and the development of international collaborations. Single research centres on the other hand, can host expert multinationals from many MS and provide high levels of expertise for concentrated and high priority research. Both a network of centres of excellence and a single EU centre would have education as a focus especially in relation to less well developed ageing countries

Other models might include the development of centres for excellence in longitudinal studies of ageing, or managing the issue of institutional development by funding for research centres on particular topics, which could be located in new MS to help develop

research infrastructure. An existing exemplar is the Max Planck Institute for demographic research.

3. Multidisciplinarity and interdisciplinarity

Research into health and ageing is an intensely interdisciplinary activity. Scientists from social and psychological sciences, economics, health, medical and biological sciences train and develop in different cultures and the interdisciplinary working that is required to generate new insights and knowledge requires support and development. For this reason the topic of interdisciplinarity (including the tools to develop interdisciplinary research and the skills that enable interdisciplinary research to be carried out and to be effective) is an important cross cutting theme.

While gerontology is an integrative science, the wings of biology/clinical medicine and psychology/sociology/economics often operate in distinct spheres. Separate research literatures have developed on concepts that need linkage – for example, the literatures on frailty and social exclusions both consider vulnerability and risk in older people, but have currently no bridge to enable cross-fertilisation of ideas. More avenues must exist to ensure that the requirement for interdisciplinary research that is implicit in the concept of healthy ageing is supported by a better integration of literatures, concepts, and methods.

Certain (sub)disciplines have developed robust theories and models to explain and predict behavioural change in later life, for example economics and cognitive ageing within psychology. However others have little to say about behaviour in later life – an example is health psychology, which has as yet shown little interest as a discipline in exploring behaviour and behaviour change in older people. The ‘opening up’ of certain disciplines to the importance of healthy ageing research, and their integration with other core healthy ageing disciplines, should be encouraged in a similar manner to the US where NIA are specifically promoting research in the fields of behavioral economics, social neuroscience, neuroeconomics, behavior genetics and biodemography.

For a scientist, a career in ageing research contains an essential paradox. To achieve excellence on one’s own cognate discipline requires a relentless focus, often on some

narrow and methodologically specific area. As a result some senior researchers, who recognise fully the intensely interdisciplinary nature of ageing research, are embedded only in their own disciplines which result in the problems highlighted above. To foster the recognition and development of methods and collaborations in interdisciplinary ageing studies, it is necessary to provide early and intermediate career researchers experience in more than one discipline and/or culture. The example of the FLARE fellowships is commended as it brings young researchers in the EU into contact with experienced ageing researchers from multiple disciplines and helps to develop their range of experience to facilitate their leadership of future interdisciplinary, cross national research on healthy ageing. However the FLARE fellowship is only one way of achieving the goal of fostering and developing multidisciplinary in ageing research across Europe. There may be other ways of achieving similar outcomes and there is a need to identify best practice in this regard, for the benefit of future researchers and research on ageing. For example funding could be made available for summer schools around specific themes or to support good practice in multidisciplinary research, and multidisciplinary could also be evaluated more in ranking research proposals for funding.

4. Harmonisation

Issues of harmonisation include the use of a common language and definitions, inclusion of different care sectors (home, institutions), methodology across quantitative disciplines, the definitions and measurement of basic concepts of wellbeing, quality of life, particularly in frail populations and the synthesis of methodologies for assessing and measuring psychosocial aspects of healthy ageing, so that only the very best tools and approaches are used.

As already indicated, further work is required to create a consensus on what exactly constitutes healthy ageing, and the respective importance of physical health and psychological well-being across the life course. Although 'social interaction' is seen as a key determinant/aspect of healthy ageing, much research is still carried out with an emphasis on the individual. There needs to be more research (with the development of new methodologies as required) that looks at the importance of relational processes in

healthy ageing, and conceptualises healthy ageing as the outcome of a system, rather than something intrinsic to an individual and his or her behaviour.

Clearly to facilitate important comparative research across EU MS, it is necessary to design research studies optimally. This may require the involvement of all European countries and a full range of characteristics of research participants, including the oldest old but, in some cases, representative groups of countries or subgroups of the population may provide more robust results.

These issues could be addressed systematically through brainstorming around specific topics, or by flexible funding of one or two meetings around particular topics.

5. Flexibility of funding

The current mechanisms for funding cross-European research give little opportunity for evaluating the impact that environmental, economic or other crises have on healthy ageing. Flexible and responsive funding within the EU should be considered so that research can be funded far more quickly than at present, in order to map the impact of social change. In addition such funding could ensure that high quality research with potential for European significance can be performed at a 'local' level (e.g., single or dual country studies) prior to 'rolling out' on a broader European stage for further evaluation.

In addition there should be greater availability of funding for theoretical/methodological innovation as well as for empirical research.

6. Implementation research

The benefits of research on healthy ageing will only become available to EU citizens if new knowledge informs changes in policy and practice in health and social care. In recent years it has become recognised that delays in translating evidence into changed health care practice represent a tangible gap in the research process. Policymakers and researchers are increasingly recognising the need to utilise the science of behaviour change at an individual and organisational level to ensure that the benefits of research are translated into effective and cost-effective practices. There is an emerging literature focused on strategies to increase implementation of research findings into evidence-

based practice and it is becoming recognised that the issue of implementation, and achieving effectiveness in the translation of research based knowledge is itself a legitimate and important focus for research. Currently implementation of research knowledge into practice is scarce and the need to synthesise and learn from existing research on implementation requires a dedicated funding stream.

Ensuring translation of new and existing knowledge not only includes implementation and comparative effectiveness research as priority areas but also economic modelling of effective interventions, particularly in relation to complex interventions and undertaking barriers to adoption by users. Many technologies exist to assist healthy ageing but their costs and benefits in comparative terms are unclear. Greater clarity should be achieved to guide future policies for investment in service development.

With regard to early prevention and to promotion to maintain healthy ageing this means translating lifestyle intervention research findings into individualised advice to older people. In short it is not known how our knowledge on risk factors for unhealthy ageing can be implemented in real life so that older people can benefit. This could be progressed via reviews of existing implementation research in the field of ageing (and others) followed by studies in different subgroups of older people: with and without chronic disease or disability, different socio-economic groups, men and women, different cultures, to determine what kind of knowledge older people are interested in getting, the method by which it should be passed and the person who should pass on the knowledge. Active involvement in the development of implementation research will be critical to the success of this strategy. These challenges to extant beliefs and behaviours which influence health and wellbeing across the life course are also necessary to the development of effective and cost effective services for health and wellbeing with ageing and co-morbidity.

7. Making EU healthy ageing research relevant to all Europeans

The vast majority of ageing research currently undertaken within Europe is based in western and northern European countries who have the longest life expectancies and many of whom have internationally known ageing research centres. Ageing research in Eastern European countries is much less well developed, highlighted by the difficulty in

accessing suitable experts for the workshops. However the life expectancy in these countries is much lower than in the rest of Europe and their current and historical social and economic structures are different. It is imperative therefore that expertise is built up rapidly in these countries and that they are fully involved in all the topic areas mentioned in this report.

At a more individual level, older people should be included at all stages of research to ensure the outcomes are relevant. Although there is a specific User Engagement theme within Futurage, this topic was also discussed under the Healthy Ageing theme. Older people are seen as passive, homogeneous, a burden on society, research 'being done to' and individuals objectified. In UK applied health research three types of patient and public engagement with research are generally identified:

- Consultation – experts with experience are asked their views about aspects of the research as part of a steering or advisory group.
- Collaboration – experts with experience are equal research partners as part of an interdisciplinary research team.
- User-led – Experts with experience define their own research agenda and invite researchers to help them achieve their objectives but lead the process.

In order to facilitate research partnerships where experts with experience are empowered and treated as equals in the research team different knowledge needs to be shared between researchers and research partners through mutual training. But equally involvement of younger generations is required. There needs to be a 'dialogue of the generations'.

5 Conclusions

The two workshops, which brought experts in many domains of ageing research together with new researchers in this field, highlighted a core set of topics on the theme of Healthy Ageing that should be included in the road map for ageing research in Europe for the next 10-15 years. Topics developed covered:

- monitoring of inequalities;
- the role of work and retirement in healthy ageing;
- identification of early markers for primary prevention and the development of interventions to promote and maintain healthy ageing in those without co-morbidity;
- optimal organisation and delivery of services to maintain healthy ageing in those with existing co-morbidity;
- the role of psychosocial factors in our understanding of healthy ageing and its determinants.

Additionally methodological and infrastructure issues were discussed in all the topic groups with the following issues highlighted:

- That research teams should be multi- and inter-disciplinary, especially in developing a comparable definition of healthy ageing across European populations;
- Healthy Ageing research funded through the EU should be relevant to all Europeans. In particular ageing research within Eastern European countries needs rapid development to ensure their active participation and this could be pursued with a variety of mechanisms;
- When developing research proposals greater thought and justification needs to be given to whether the research question can best be answered by including all European countries or a subgroup representative in terms of geography and ageing process. The former would imply data collection on a very focussed set of items requiring little complexity to collect, the latter would allow more complexity and range;

- Older people should be included in research at every level, particularly in the developing of the concept of healthy ageing;
- More flexible and responsive funding mechanisms within the EU should be considered so that the impact that environmental, economic or other crises have on healthy ageing can be evaluated in a timely manner;
- There is an urgent need for a central data archive which also provides ready access to study materials to enable researchers to design new studies to complement existing ones;
- Implementation research should have a higher profile in funding to ensure that new knowledge on healthy ageing benefits EU citizens through changes in policy and practice in health and social care;
- The similarities and diversity of health and social care and societal structures in the EU and the differing stages of life expectancy trajectories provide a unique opportunity to extend innovation in one country to others and to learn from each other on how to age healthily.

Appendix

Table 1: Workshop attendance - List of participants and affiliations

Name	Institution	Country	Workshop
Prof Ashley Adamson	Human Nutrition Research Centre, Newcastle University	UK	1
Dr Hélène Amieva	University of Bordeaux	France	2
Prof Kirsten Avlund	University of Copenhagen	Denmark	1
Prof Jean-Pierre Baeyens	Solvay Brussels School of Economics and Management at ULB and Chair of IAGG Europe	Belgium	2
Ms Angela Barnes	Age UK	UK	2
Dr John Beard	Dept of Ageing and Life Course, WHO	Switzerland	1
Prof John Bond	Institute of Health and Society and Institute for Ageing and Health, Newcastle University	UK	1,2
Prof Ian Cameron	University of Sydney	Australia	1
Dr Carlos Chiatti	Centre for Socio-economic Research on Ageing and Elder Care	Italy	1,2
Dr Joanna Collerton	Institute for Ageing and Health, University of Newcastle	UK	2
Ms Juliet Craig	Senior Research Manager FUTURAGE, University of Sheffield	UK	1,2
Prof Dorly Deeg	VU University Medical Center, EMGO Institute – LASA	Netherlands	1
Dr Rachel Duncan	Arthritis Research Campaign National Primary Care Centre, Keele University	UK	1
Dr Luigi Ferrucci	Longitudinal Studies Section, Clinical Research Branch, NIA	USA	1
Dr Sarah Forster	University of Sheffield	UK	2
Prof Rosa Gómez Redondo	Department of Sociology, UNED Madrid	Spain	2
Dr Renate Heinisch	European Economic and Social Research Committee	Germany	2
Prof Carsten Hendriksen	Institute of Public Health, University of Copenhagen	Denmark	2
Prof Susanne Iwarsson	Department of Health Sciences, Faculty of Medicine, Lund University	Sweden	1
Prof Carol Jagger	Institute for Ageing and Health, Newcastle University	UK	1,2
Prof Marja Jylhä	School of Public Health, University of Tampere	Finland	1
Prof Thomas Kirkwood	Institute for Ageing and Health, Newcastle University	UK	1,2
Dr Pentti Koistinen	City of Oulu, Association of the Finnish Geriatricians	Finland	2
Prof Diana Kuh	MRC Unit for Lifelong Health and Ageing	UK	1
Prof Susan Kurrle	University of Sydney	Australia	1
Dr Anne Martin-Matthews	Institute of Aging, Canadian Institutes of Health Research	Canada	1
Prof Kevin McKee	Dalarna University & Dalarna Research Institute	Sweden	1,2
Prof Marion McMurdo	Division of Medical Sciences, Ninewells Hospital and Medical School, University of Dundee	UK	1

Dr Anastasia Meidani	FLARE Fellow, University of Toulouse	France	1
Dr Jean-Pierre Michel	Dept. of Geriatrics, University Hospital of Geneva	Switzerland	2
Prof Gail Mountain	ScHARR, University of Sheffield	UK	1,2
Prof Marti Parker	Ageing Research Centre, Karolinska Institute and Stockholm University	Sweden	2
Prof Stuart Parker	SISA, University of Sheffield	UK	1,2
Prof Sheila Payne	International Observatory on End of Life Care, University of Lancaster	UK	2
Dr Chengxuan Qiu	FLARE Fellow, Karolinska Institute	Sweden	1,2
Ms Emma Regen	Research Fellow, Dept Health Sciences, University of Leicester	UK	1,2
Dr Caroline Relton	Human Nutrition Research Centre, Newcastle University	UK	1,2
Dr Jean-Marie Robine	INSERM	France	1,2
Prof Louise Robinson	University of Newcastle	UK	2
Ms Gill Sargeant	Age UK	UK	2
Ms Jean Smith	Working Party of the National Pensioners Convention	UK	2
Dr Blossom Stephan	FLARE Fellow, Cambridge University	UK	1
Dr Richard Suzman	Division of Behavioural and Social Research, NIA	USA	1
Prof Mats Thorslund	Dept of Neurobiology, Care Sciences and Society, Karolinska Institute	Sweden	1
Prof Beata Tobiasz-Adamczyk	Epidemiology and Preventive Medicine, Jagiellonian University Collegium Medicum	Poland	1
Prof Marjolein Visser	Institute of Health Sciences, VU University Amsterdam,	Netherlands	1,2
Prof Craig Willcox	International Public Health & Welfare and Gerontology Okinawa International University	Japan	1,2
Dr Jochen Ziegelmann	FLARE Fellow, Freie Universität Berlin and German Centre of Gerontology	Germany	1