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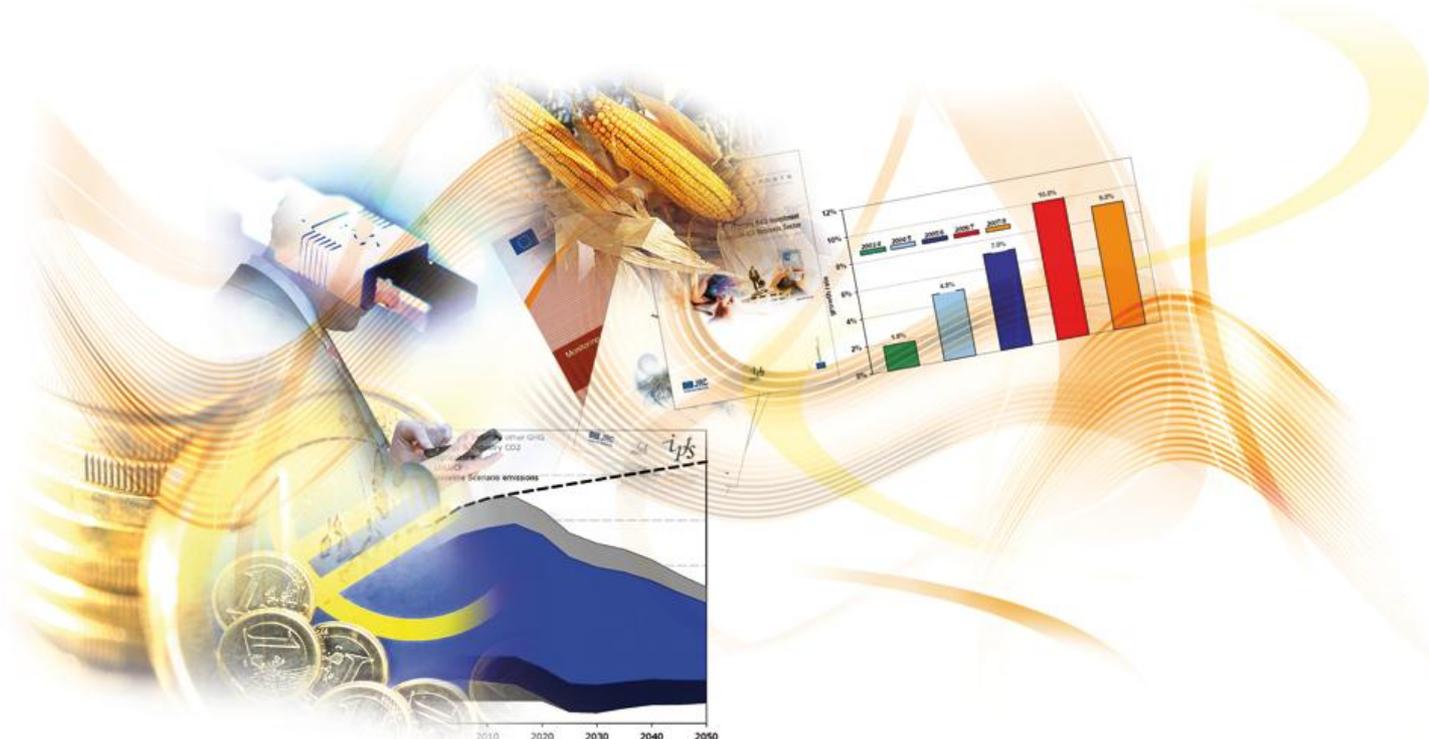
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Monitoring and Assessment Framework for the European Innovation Partnership on Active and Healthy Ageing (MAFEIP)

First report on outcome indicators

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Abstract

As the initial Monitoring Framework may not be fully relevant for the overarching objective of the EIP on AHA and the Triple Win, either because the Action Groups commitments cannot use specific indicators or because some of the indicators initially thought of may not be best suited for measuring the impacts on the EIP on AHA higher objectives, the aim of this report is to suggest a smaller set of key indicators which may allow efficient monitoring of the impact of the EIP on AHA on the Triple Win and the overarching objective, based on the combined analysis of the above exercises. Such a set of indicators ought to be general enough to be widely applicable to commitments within each Action Group of the EIP, but also specific enough to be able to capture the impact of interventions delivered within each of these Action Groups. Finally, the set of indicators chosen should support modelling the link between EIP on AHA outcomes and the Triple Win and the headline target of two additional healthy life years to the average healthy life span of European citizens. This report therefore presents the results of the analysis of the above mentioned evidence whose objective was to assess the likelihood for each outcome indicator identified to be widely applicable across Action Groups and its fitness for the purpose of measuring the overall EIP on AHA impact. The picture obtained from the data collected from the field (i.e. Reference Sites and Action Groups' good practices) has been further refined by using results from the above mentioned scientific literature review.

Table of Contents

| | |
|---|----|
| Executive summary..... | 3 |
| "Quality of life" column | 4 |
| "Sustainability of health systems" column..... | 6 |
| Issues for discussion | 6 |
| 1. Introduction..... | 8 |
| 1.1 Background | 8 |
| 1.1.1 The development process..... | 8 |
| 1.1.2 The proposed monitoring framework..... | 8 |
| 1.2 Refining and operationalization of the framework..... | 9 |
| 1.3 Aim and objectives of this report..... | 10 |
| 2. Methods..... | 11 |
| 2.1 Data sources | 11 |
| 2.1.1 Action group survey (August 2012) | 11 |
| 2.1.2 Reference site review (April 2013)..... | 11 |
| 2.1.3 Good practices clustering exercise | 12 |
| 2.1.4 Systematic review of the scientific literature..... | 12 |
| 2.1.5 Additional sources of information..... | 13 |
| 2.2 Methods of analysis..... | 14 |
| 3. Results..... | 17 |
| 3.1 Quality of life column..... | 17 |
| 3.1.1 Summary of results..... | 17 |
| 3.1.2 Primary outcome indicators for QoL | 19 |
| 3.1.2.1 <i>Legitimacy of primary outcome indicators for QoL</i> | 20 |
| 3.1.2.2 <i>Saliency of primary outcome indicators for QoL</i> | 20 |
| 3.1.2.3 <i>Credibility of primary outcome indicators for QoL</i> | 22 |
| 3.1.3 Common secondary outcome indicators for QoL..... | 26 |
| 3.1.4 Additional Action Group specific indicator-candidates for QoL..... | 29 |
| 3.2 "Sustainability of health systems" column | 34 |
| 3.2.1 Primary outcome indicators for 'Sustainability of Health Systems' | 34 |
| 3.2.1.1 <i>Summary of results</i> | 34 |
| 3.2.1.2 <i>Legitimacy of primary outcome indicators for Sustainability of Health Systems</i> | 35 |
| 3.2.1.3 <i>Saliency of primary outcome indicators for Sustainability of Health Systems</i> | 36 |
| 3.2.1.4 <i>Credibility of primary outcome indicators for Sustainability of Health Systems</i> | 38 |
| 4. Issues for discussion..... | 41 |
| 4.1 Innovation and growth column..... | 41 |
| 4.2 Action Group D4 on innovation for age-friendly buildings, cities and environments..... | 41 |

| | | |
|-----|---|----|
| 4.3 | Excluded indicators and indicators which may require further discussion..... | 42 |
| 4.4 | Data availability | 44 |
| 5. | Conclusions..... | 45 |
| 6. | References..... | 47 |
| 7. | Annexes..... | 53 |
| | Annex 1 - Overview of indicators | 53 |
| | Annex 2: August 2012 Action Group survey | 63 |
| | Annex 3: April 2013 reference site review of good practices | 64 |
| | Annex 4: Overview of results from a scientific literature review on outcome indicators to be used within MAFEIP | 66 |
| | Annex 5: Outcome indicators used within Action Group B3 | 74 |

Executive Summary

IPTS in cooperation with DG CNECT and DG SANCO is developing a monitoring framework to assess the evolution and impact of the EIP on Active and Healthy Ageing (EIP on AHA). The EIP on AHA monitoring framework initially developed in 2012 by the EC in close cooperation with the EIP on AHA Action Groups and experts needs to be operationalized. The aim is to ensure the long-term monitoring of the EIP on AHA until 2020.

In an ideal monitoring situation, standardized data would be collected from the activities to be monitored on a set of common indicators. However because of the bottom-up approach of the EIP on AHA, there is a diversity of commitments and the consequent need to monitor them in different ways since standardised data may never be fully available.

The initial framework consists of three columns, which represent the Triple Win: quality of life, sustainability of health systems and innovation and growth. Different blocks of possible indicators are mentioned under each column. The monitoring framework and its building block system have been devised in such a way that not all blocks of indicators are necessarily relevant for all Action Groups. Furthermore, not all individual actions should contribute to all building blocks. However, each individual action should contribute at least to one building block.

To refine the initial monitoring framework, in the absence of reference data, it was decided to jointly review three sources of data which provided information on outcome indicators and which were either directly or closely related to the activities undertaken by the EIP on AHA commitments, namely:

- The 2012 data that shaped the initial monitoring framework
- The data from 71 good practices submitted by EIP on AHA Reference Sites
- And the data from the 87 good practices of EIP on AHA Action Group B3

To inform the choice of outcome indicators proposed for use in the MAFEIP project, the above data sources were collated in a single database. The rationale was that each single source of information may not be adequate to inform the choice of outcome indicators for the monitoring framework of the EIP on AHA on its own, however, in conjunction the various sources may support or refute the use of particular outcome indicators. In addition, a systematic scientific literature review was used to further inform the choice of outcome indicators. Finally, we considered aspects of linking outcome indicators to the ZHLYs and the Triple Win in order to discriminate between a set of "*primary outcome indicators*" and "*secondary outcome indicators*". Primary outcome indicators are not just relevant across a number of commitments and Action Groups, but also particularly well suited to establish a quantitative link to the Triple Win and the headline target. Secondary outcome indicators require more elaborate modelling approaches to establish a quantitative link to primary outcome indicators, and ultimately to the Triple Win and the headline target.

While this report does not aim to establish this link, the intention is to ensure that the indicators selected may enable such linkage.

The above described exercise resulted in a short list of primary and secondary outcome indicators that are all deemed commonly applicable across Action Groups. However, in order to verify this initial selection of indicators, and to better reflect Action Group specific measurement requirements, we have further analysed data from 60 good practices in Action Group A1, 98 good practices in Action Group A3 and 62 good practices in Action Group D4 respectively. This resulted in good support for the indicators initially chosen, and we identified a set of additional candidate indicators which are targeted to specific Action Groups. Accordingly, we further distinguish between the initial set of "*common indicators*" that are broadly applicable across commitments in different Action Groups, and "*specific indicators*" that are targeted to commitments within particular Action Groups. All primary indicators identified are also common indicators. The secondary indicators can be common (relevant for several Action Groups) or specific (relevant for a particular Action Group).

The inclusion of an indicator was based on essential criteria for indicators influence as established in previous work undertaken by the OECD. Previous research suggests that assessments are most influential when they are credible as to their scientific methods, salient to the potential users and legitimate in the way the assessment is designed. Legitimacy refers to "*the political acceptability or perceived fairness of an evaluation*" and it is enhanced, for instance, if "*the substantive inputs of users are integrated into indicator development*". In our case, we aimed to achieve this by basing this exercise on all the information previously gathered within the MAFEIP project. By reflecting the idea of a multidimensional assessment within the EIP on AHA and the ability to map outcomes to EIP on AHA key objectives, we aimed to consider the *salience* of proposed outcome indicators, i.e. their "*ability to address the particular concerns of a user*". Finally, we tried to improve the *credibility* of our choice of outcome indicators by consulting the scientific literature. The credibility of an indicator refers to its "*scientific and technical believability to a defined user*".

"Quality of life" column

Our provisional proposal for outcome indicators in the Quality of Life column of the monitoring framework is summarised in Table 1. This proposal implies an a priori preference for primary outcome indicators for quantitatively modelling the EIP on AHA impact. If a commitment does not report data on primary indicators, common secondary indicators will be considered as an alternative. Only if neither primary nor common secondary indicators are reported would we consider the use of specific secondary indicators for quantitatively assessing the EIP on AHA impact on the Triple Win and the headline target. Further work will be required to assess the fitness of specific secondary indicators for this purpose.

Table 1: Provisional proposal for outcome indicators within the QoL column

| | Primary indicators | Secondary indicators |
|---|---------------------------|--|
| Common indicators | HrQoL Mortality | Risk Factors Physical Activity |
| Specific indicators* | n.a. | Adherence to treatment (A1) Frailty (A3) Cognitive decline (A3) Functional status (A3 / B3) Falls (A2 /C2 / to some extent A3) |
| * Some specific indicators may also apply - to a certain extent - to other Action Groups than those indicated here. However, our aim was to assign indicators to those Action Groups for which the highest number of additional commitments may be covered by the modelling proposed. . | | |

Applying the above selection criteria to the data reviewed led to the selection of **key (primary) outcome indicators** that should be general enough to be relevant across all Action Groups of the EIP on AHA, but also sufficiently specific and sensitive to capture the impact of particular interventions within each Action Group. One or both key (primary) indicators could be used depending on the needs and preferences of the different commitments and Action Groups:

- **Measures of health related quality of life (HrQoL)**, in particular instruments suited for constructing a single metric that combines the valuation of a certain health state with the time spent in this state, like the EQ-5D instrument, or instruments from the SF-family such as the SF-36 or the SF-6D.
- **Mortality rates**, stratified by major target diseases such as heart failure, stroke, COPD, dementia, falls, or suicide as applicable to each Action Group.

A set of **secondary outcome indicators**, which have emerged in one or several of the data sources reviewed, is also being proposed. Secondary outcome indicators generally require a more elaborate modelling approach via primary indicators for linking outcomes to the EIP objectives and the headline target, and they could either be relevant for several Action Groups (common

secondary indicators), or targeted at particular Action Groups (specific secondary indicators). The most important common secondary indicators are:

- **Risk factors**

Risk factors include routine clinical measures such as blood pressure, cholesterol levels, blood glucose, body mass index. A change in risk factors due to interventions delivered within different commitments may result in a change in quality adjusted life expectancy. A quantitative link could be established, for instance, through the use of validated risk stratification tools such as the Framingham risk equation (D'Agostino et al., 2008) or the QRISK-tool (Hippisley-Cox J. et al., 2007) for estimating cardiovascular disease risk.

- **Physical activity**

Physical Activity appears to be relevant across a large number of commitments and Action groups. In addition, some evidence could be found in the literature and studies exist that provide a link between changes in physical activity behaviour and respective changes in quality adjusted life expectancy using Decision Analytic Modelling (DAM). This link could be established, for instance, via the impact of a change of physical activity behaviour on risk factors. Hence, if a commitment collected data on both the change in physical activity and the resulting impact on risk factors, there would be an a priori preference for using the latter for modelling the commitments impact on QoL.

Next to those secondary indicators that are commonly supported by commitments across Action Groups, we identified a set of additional candidate indicators after the review of the good practices presented by each Action Group in their respective booklets. However, it needs to be highlighted that, for these indicators, the ability to establish a quantitative link to the EIP objectives and the headline target is generally less clear, and additional work will be required to assess whether they may be suited for quantitatively modelling the EIP on AHA impact. In particular, deliverable D.2.4 will take into account evidence from a survey conducted across commitments to learn about the outcome indicators they use and for which data is more likely to become available, whilst the modelling concept for quantitatively linking outcomes to the triple win and the headline target will be discussed in much more detail in deliverable D.3.1. Hence, the indicators below constitute a short list of potential candidates whose ability to support the MAFEIP objectives will be checked through further research. The provisional list of specific secondary indicators consists of:

- **Adherence to treatment**

In accord with the main objective of Action group A1, which is *'to improve the quality of life and health outcomes of older people living with chronic conditions, through a holistic approach, including enhanced self-care, personalized care, better adequacy of treatment, increased adherence to safe and effective care plans'*, we identified patient adherence as an additional indicator specific to Action Group A1. Health economic literature exists which could help conceptualizing a link between a change in adherence levels and its impact on EIP on AHA objectives.

- **Frailty, cognitive decline and functional status**

The main objective of Action Group A3 is *'prevention and early diagnosis of frailty and functional decline, both physical and cognitive, in older people'* and unsurprisingly we found strong support from good practices in A3 in favour of the above mentioned indicators, However, the extent to which frailty, cognitive decline and functional status are correlated, the existence of modelling studies that would inform a quantitative link to the headline target, and the consequent need to further refine our choice of indicators is currently unclear and needs to be assessed in more detail in future deliverables (D.2.4 and D.3.1).

- **Falls**

While falls related indicators were not found frequently in the Reference Sites and Action Group data reviewed, a number of scientific sources support using No. of falls, No. of fallers or rate of falls. In addition, though data was not available from respective good practices,

we consider falls to be relevant for Action Groups A2 and C2, and found 4 commitments in Action Group A3 which reported collecting falls data. As for frailty, functional status and cognitive decline, more work will be required to assess the feasibility and usefulness of incorporating falls indicators into the quantitative monitoring framework.

"Sustainability of health systems" column

We propose collecting information on the change in quantities of resources used as our primary focus of analysis for assessing the EIP on AHA impact on the sustainability of health and care systems. The most frequently mentioned outcome indicators for the sustainability of health and care systems are:

- **Health and care resource use**, e.g. no of visits to primary care; measures of hospital / emergency admission and length of stay
- **Health and care cost / expenditures** (resource use valued in monetary units) e.g. drug cost, administrative cost.

The above is supported by the scientific evidence which shows two main types of outcomes: cost related and utilisation related.

We think that commitments should be encouraged to report resource use data on any item they regard as relevant in relation to their intervention, while collecting information on health and care cost / expenditures may not always allow transferring or extrapolating information from individual commitments to other settings or to a health/care system level. The main reason is that relative prices may differ substantially between settings, so that an identical change in resource utilization in two settings may translate into completely different impact on the respective healthcare expenditures. In addition, unit costs of resources are also likely to change over time within the same setting, which may impact on respective healthcare expenditures even if utilisation remains constant. Therefore, whilst resource use data should be collected on a commitment level, we propose collecting information on unit cost for resources via desk research unless such data can be provided by EIP on AHA participants. Distinguishing between resource use and unit cost for resources also allows sensitivity analyses to be carried out with respect to a change in either cost or quantities.

Some reporting format needs to be agreed though and the type of resources affected by the intervention (both positively and negatively) as well as the relevance of specific resources should be addressed. Following the analysis of the good practices of Action Groups A1, A3, B3 and D4 we have compiled a list of the resource use items most frequently mentioned. Further evidence from the survey carried out across commitments of the EIP on AHA will help to refine this list, and this will be reported in Deliverable D.2.4. The consequences for modelling the impact of EIP on AHA activities on the sustainability of health systems will then be considered in more detail, in deliverable D.3.1

Issues for discussion

While we are confident in the soundness of our proposal with regard to the data reviewed, we would like to underline that some open issues need to be addressed such as indicators for Innovation and Growth and for Action Group D4. Analysing good practices in D4 showed that the broader aim and the diversity of interventions delivered within this Action Group somewhat limits the applicability of our proposal.

Indeed our proposal focusses inherently on health related quality of life in the first column of the framework. Whilst common indicators for QoL (HrQoL, mortality & physical activity) were mentioned by few commitments, we feel that D4 may require an alternative approach due to this broader scope. In this context we have recently been made aware of an initiative within Action Group D4 that looks into broader measures of QoL which go well beyond the health dimension (personal communication with an expert from TNO, Netherlands). However, this should be regarded as explorative work that may have the potential to capture broader QoL outcomes for D4 and

therefore may be worth learning more about, but this approach would not be compatible with our framework as both QALYs and HLY are measures which are strictly confined to health, hence not taking into account other aspects of QoL which go beyond health.

For the sustainability column, patient / user satisfaction was the most recurrent indicator within D4, and it has also been mentioned very frequently in other Action Groups. We do not think that a link between patient / user satisfaction and the sustainability of health systems (in terms of EIP on AHA impact on available healthcare resources) can be established easily within the scope of this exercise. Nevertheless, the strong support in favour of the inclusion of patient / user satisfaction from both Reference Sites and Action Groups' data, could serve as a basis for including it as an additional outcome indicator for the sustainability of healthcare systems column, in particular as patient/user satisfaction may be regarded as an important criterion for successful implementation of technological and social innovation. Hence, further discussions may be needed to decide upon the inclusion / exclusion of this potential indicator for the purposes of MAFEIP, bearing in mind the analytic resources available (or not) for carrying out this work.

Finally, we are also in the process of considering alternative modelling approaches for the innovation and growth column of the monitoring framework. More details on this, however, may become available in deliverables D.2.4 and D.3.1.

It is also important to stress that primary data from commitments activities was not available at the time of writing. This will change when survey data on the use of outcome indicators by commitments becomes available and is used to revise and refine our proposal in deliverables D.2.4 and D.3.1. The selection of indicators we propose here has been based on a proxy for data availability, by using as a starting point the frequency of occurrence of outcome indicators in the data sources reviewed. Nevertheless, to monitor the EIP on AHA activities, all commitments should ideally provide information on at least one outcome indicator per column.

1. Introduction

1.1 Background

IPTS in cooperation with DG CNECT and DG SANCO is developing a monitoring framework to assess the evolution and impact of the EIP on Active and Healthy Ageing (EIP on AHA), through the "Monitoring and Assessment Framework for the EIP on AHA" (MAFEIP) project. The main objective of MAFEIP is to define a common monitoring framework, which should facilitate and harmonise the monitoring of the process of the EIP on AHA and of the outcome and output of the Action Groups within the EIP on AHA (not the individual commitments to the six specific Action Groups). It will also seek to establish a link between the monitoring results and the EIP on AHA objectives, namely the Triple Win (quality of life; sustainability of health systems; and, innovation and growth) and the overall objective of two additional healthy life years to the average healthy life span of European citizen by 2020.

1.1.1 The development process

The input of the Action Group members together with the input from experts has been the basis for the monitoring framework developed by the EC. Experts were asked to provide input, among others, on the factors influencing the quality of life and about WHO, OECD and Eurostat data (meeting June 2012 – August 2012). In addition, in August 2012 the Action Group members were asked to provide input about the methodology and indicators they are using and the kind of data they gather. After intensive interaction between the Action Group members and the experts and following the Action Group meetings on the further fine-tuning of the framework (September–October 2012), a meeting took place with the experts and two members of each Action Group to discuss some final outstanding issues in November 2012 and to define the initial Monitoring Framework.

1.1.2 The proposed monitoring framework

The objective of the outcome indicators is to monitor the factors influencing the Triple Win, namely:

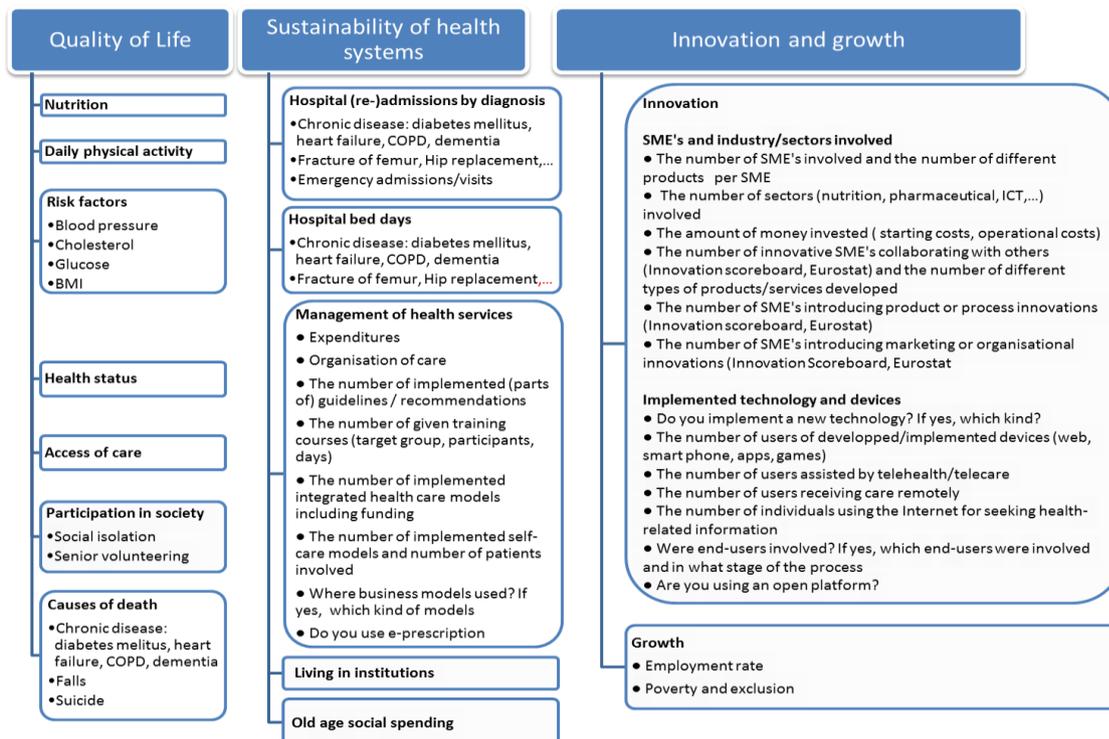
- Quality of Life of patients/users, for instance, affected by changes in risk factors, nutrition or physical activity
- Sustainability of the health systems, for instance, reflected in changes in hospital admissions, or a shift towards home care instead of institutionalisation
- Innovation and growth possibilities, for instance, reflected in the employment rate

The proposed monitoring framework consists of three columns, which represent the Triple Win as shown in Figure 1 below:

- Quality of Life
- Sustainability of health systems and
- Innovation and growth.

The multidimensional approach of the monitoring framework for the EIP on AHA entails a set of building blocks which contain different indicators. The monitoring framework and its three columns and building block system were originally devised in such a way that not all blocks of indicators are necessarily relevant for all Action Groups. Furthermore, not all individual actions should contribute to all building blocks. However, each individual action should contribute at least to one building block. As a result of that, the outcome indicators in Figure 1 may constitute a long-list of potential indicators which may not always be equally fit for linking to the overarching objective of the EIP on AHA and the Triple Win, either because the Action Groups commitments cannot be asked to use specific indicators or because some of the indicators initially thought of may not be adequate for measuring the impacts on the EIP on AHA higher objectives.

Figure 1 - EIP on AHA initial Monitoring Framework (5th of November 2012)



1.2 Refining and operationalization of the framework

In order to further develop and operationalize the EIP on AHA monitoring and assessment framework, the following exercises have been carried out within the MAFEIP project:

- A double-check of the interactive process with experts and Action Group members that led to the initial framework structure including the review of the indicators mentioned in the survey amongst Action Group participants from August 2012. This interactive process has led to the definition of the initial Monitoring Framework of the EIP on AHA (Figure 1).
- A review of Reference Sites good practices providing the EIP on AHA with best cases of comprehensive, innovation-based approaches to active and healthy ageing. This review identified outcome indicators from a self-assessment questionnaire submitted by a total of 71 good practice sites in April 2013. Some of the indicators identified in the analysis were found to be used by a number of reference sites, others were very specific to a few or even single sites. General categories of impact were thus defined under which specific indicators were further specified and the frequency of occurrence across the Reference Sites was recorded. This led to the identification and categorisation of indicators and the recording of their frequency.
- A clustering exercise which consisted of a review of commitments' good practices for Action Groups A1, A3, B3 and D4 with the aim of identifying outcome indicators used by these good practices, after grouping the interventions described into clusters.
- A systematic review of the scientific literature in each of the six Action Groups domains. While the review was done through systematic searches in specialised scientific databases, it could not be exhaustive because of the limited time resources available and the breadth of the fields concerned. However it provided some useful indication of whether targeted initiatives like those undertaken by EIP on AHA commitments lead to scientifically sound outcomes.

- A review of macro-level and intermediary level indicators with a view to assessing the possibility to establish the link between Action Groups commitments outcomes and the higher objectives of the EIP on AHA

1.3 Aim and objectives of this report

As the initial Monitoring Framework may not be fully relevant for the overarching objective of the EIP on AHA and the Triple Win, either because the Action Groups commitments cannot use specific indicators or because some of the indicators initially thought of may not be best suited for measuring the impacts on the EIP on AHA higher objectives, the aim of this report is to suggest a smaller set of key indicators which may allow efficient monitoring of the impact of the EIP on AHA on the Triple Win and the overarching objective, based on the combined analysis of the above exercises. Such a set of indicators ought to be general enough to be widely applicable to commitments within each Action Group of the EIP, but also specific enough to be able to capture the impact of interventions delivered within each of these Action Groups. Finally, the set of indicators chosen should support modelling the link between EIP on AHA outcomes and the Triple Win and the headline target of two additional healthy life years to the average healthy life span of European citizens. This report therefore presents the results of the analysis of the above mentioned evidence whose objective was to assess the likelihood for each outcome indicator identified to be widely applicable across Action Groups and its fitness for the purpose of measuring the overall EIP on AHA impact. The picture obtained from the data collected from the field (i.e. Reference Sites and Action Groups' good practices) has been further refined by using results from the above mentioned scientific literature review.

The following section describes, in more detail, the data sources used and also the methods applied to analyse the data collected. Subsequently, results will be presented and discussed in Chapter 3, whilst concluding remarks are provided in Chapter 4.

2. Methods

This section describes the methods used to arrive at a proposal about a set of key indicators for monitoring the impact of the EIP on AHA on the HLYs and the Triple Win, in particular the data sources used and the methods of analysis, including the decision criteria applied for indicator selection.

2.1 Data sources

As mentioned, the analysis presented in this report is based on data previously gathered within the MAFEIP project, in particular:

- The 2012 Action Group survey responses
- The data provided by the 2013 good practices of Reference Sites
- The analysis of outcome indicators used by good practices within Action Groups A1, A3, B3 and D4.
- A systematic literature review on potential outcome indicators to be used within MAFEIP

This data was analysed with respect to those indicators emerging as particularly relevant across different data sources and also across Action Groups within the EIP on AHA. In addition, we considered whether the outcome indicators identified may have the potential to be linked to the Triple Win and the headline target of 2HLYs. Methods of analysis will be specified further below. In brief, it was deemed necessary to base the choice of outcome indicators not just on one, but rather on several sources of data as each of them may be characterised by a particular set of caveats, potentially providing a misleading picture when analysed in isolation. This section will further specify the data used to inform our choice of proposed outcome indicators, particularly highlighting characteristics which may either support or refute the use of any single source of data for the purposes of this exercise.

2.1.1 Action group survey (August 2012)

Initial Monitoring Framework (November 2012): the framework as defined by the EC and the Action Groups in November 2012 is the result of an intensive communication process following the input from experts on the factors influencing the Quality of Life and about WHO, OECD and Eurostat data (meeting June 2012 – August 2012) and the collection of data from the Action Group members of the six Action Groups (A1, A2, A3, B3, C2 and D4) in August 2012 asking them to indicate which indicators they used (or planned to use) with respect to the applied intervention (e.g. reduced hospitalisation when implementing personalised health care management), actual data they were collecting (or planned to collect), and assessment methodologies. This data and the resulting initial Monitoring Framework provided the starting point of our analysis. The main reason for starting with this was the need to understand the rationale behind the definition of each building block (e.g. nutrition, risk factors etc.) included in the initial Monitoring Framework.

Nevertheless, as commitments have evolved since these data were collected, because most of the commitments were still starting in 2012, there was a need to contrast it with more recent data that could help inform a selection of indicators for the linkage to the overall target of the EIP on AHA and the Triple Win.

2.1.2 Reference site review (April 2013)

Reference Sites provide the EIP on AHA with examples of a comprehensive, innovation-based approach to active and healthy ageing. They can be coalitions of regions, cities, integrated hospitals or care organisations that are able to show their impact and demonstrate particular innovative practices which could be transferred to other European contexts.

Candidates for becoming Reference Sites were invited to complete a self-assessment of their good practice(s) in Spring 2013 based on a mutually agreed questionnaire. The 32 Reference Sites were assessed by their peers on the innovation, scalability and replicability and outcomes of their submitted good practice(s), and awarded a diploma with a star ranking.

The data provided in the self-assessment by the Reference Sites allowed us to identify a number of indicators used in assessing their good practices. Although this data relates to Reference Sites and not to the actual commitments participating in the EIP on AHA, because of the similarity of stakeholders and interventions and because data from Reference Sites are already available, analysing such data was deemed relevant and reliable in so far as it could help shed some light on the type of indicators used in the field and assist given the lack of data availability from the Action Groups.

2.1.3 Good practices clustering exercise

Good practices clustering: data from this exercise was considered in two waves. Because of limited data availability when we developed a first proposal for candidate indicators, we initially screened data from Action Group B3 only. This Action Group, which is concerned with “replicating and tutoring integrated care for chronic diseases, including remote monitoring at regional level” is one of the six Action Groups of the EIP on AHA. B3 members decided to compile their own good practices during the period March-August 2013. This exercise was independent from the Reference Sites exercise and it was decided to use this information to identify what indicators were being gathered by the partners. In particular the latest version available at the time of writing was used to perform an indicator clustering exercise and to identify outcome indicators, their frequencies and the main topics covered.

87 good practices were described in the mentioned document. After a thorough review, it was decided to exclude from the analysis eight of these good practices which were not relevant for the overarching objective of the EIP on AHA and the Triple Win. The remaining 79 good practices were then clustered in four groups according to the activities/type of intervention, objectives and aims that characterised them. These four groups were: Integrated care and care Pathways (28 good practices); Screening and Prevention (10 good practices); Sharing Health information (23 good practices); Telehealth, telecare and remote monitoring (18 good practices).

In the second wave, we also considered data from clustering good practices in Action Groups A1, A3 and D4. This exercise had a dual purpose. First, we aimed to verify our initial choice of indicators, which, thus far, only rested on input from the B3 clustering exercise, and secondly, we aimed to assess whether additional outcome indicators should be considered which are particularly relevant for individual Action Groups. Hence, as a result of this exercise we anticipated a set of '*common indicators*', broadly applicable across Action groups, and '*specific indicators*' to better reflect measurement requirements of each Action Group within the EIP on AHA. In Action Group A1, which is concerned with appropriate prescription and adherence to medical plans, 60 good practices were considered in total. In Action Group A3, which relates to the prevention and early diagnosis of frailty and functional decline, both physically and cognitive, in older people, we analysed 98 good practices, whilst Action Group D4, concerned with innovation for Age-friendly buildings, cities & environments, provided us with data from 62 good practices.

It should be noted that there is not always a complete overlap between the Action Group commitments and the good practices they have described; hence the outcomes should be interpreted with that caveat in mind. Nevertheless, we felt that the good practices from the Action Groups helped to shed some light on what indicators are actually being used by the stakeholders involved in the commitments in the very same field of intervention.

2.1.4 Systematic review of the scientific literature

In parallel to the analysis of data obtained from the field, it was decided to carry out a scientific literature review to further refine the proposal on outcome indicators for the monitoring of the EIP on AHA. Amongst other characteristics, we focused this review on what the scientific literature in

fields related to EIP on AHA Action Groups may tell us about potential candidate indicators in terms of their:

- validity (i.e. the ability of an indicator to reflect the phenomena being measured) and
- reliability (i.e. the ability of an indicator to produce similar results if measured by different actors but under similar conditions)

Finding that a particular indicator is (widely) used in the studies whose results are reported in the scientific articles reviewed could be used as a general indication of its validity, but the majority of the studies identified and reviewed were rather limited to micro level, local, and very delimited interventions, which limits the potential claim to generalisable reliability.

In the absence of actual outcomes - since the EIP on AHA commitments have only just started to be implemented - and in spite of the above limitations, it seemed desirable to back the selection (and future linkage) of Actions Groups indicators with the findings of the scientific literature related to the activities and objectives of the EIP on AHA and its Action Groups. If we found sound scientific evidence indicating, for instance, that 'Prescription and Adherence to Medical Plans' interventions tend to impact on bed days or length of stay, then this indicator might be adopted, if backed as well by commitments data collection, for the monitoring of activities in the related Action Group in the area of Sustainability of health systems. Furthermore, if the selection of the outcomes indicators of the EIP on AHA Action Groups is based partially on solid scientific grounds, the exercise of linking these outcomes to the 2HLYs and the Triple Win may benefit from higher scientific credibility, ultimately contributing to the perceived robustness of MAFEIP results.

The review was carried out through systematic searches of specialised databases like Pubmed, identifying over 600 relevant articles. Because of time and resources constraints, it was not possible to carry out a systematic review covering the complete breadth of the EIP on AHA commitments' interventions. The searches therefore had to be limited and it was decided to search by only using general terms corresponding to each Action Group domain (e.g. "prescription and adherence"), not specific wordings describing individual interventions within each Action Group. More particularly Meta-analysis and systematic reviews published in English in the last 5 years were reviewed. Furthermore, the focus was on evidence linking directly interventions by AGs and outcomes (i.e. impact of adherence intervention on quality of life results) and not on the impact of the interventions through intermediary indicators on other outcomes (i.e. the impact of an adherence intervention on quality of life through its impact on factors that are correlated to quality of life like blood pressure control or cholesterol levels). This is why the results cannot and should not be considered exhaustive. While the review may not reflect the full extent of the EIP on AHA interventions, because of the wide variety of interventions across all Action Groups and the limited resources available for this exercise, the scientific sources gathered have nevertheless helped us better assess the validity of indicators and thus confirm the selection of indicators with the later linkage to the EIP on AHA higher level objectives in mind. It should be noted that while the review helped refining our choice of indicators for which scientific evidence could be found, it may not be sufficient to eliminate indicators for which sources are lacking since this may relate to gaps in our method just as much as to actual gaps in the literature.

2.1.5 Additional sources of information

The scientific literature review brings us one step closer to the ultimate goal of MAFEIP, which is to establish the link with the HLYs and the Triple Win. This report does not aim to establish this link, but it follows the clear intention to ensure that the indicators selected may enable such linkage. While not explicitly modelling such links, this report is, however, being complemented by a thorough discussion on potential modelling strategies to link between the proposed candidate indicators and the higher EIP on AHA objectives. In addition to the scientific literature review, another dimension to be considered here is intermediary or higher level indicators. We have not analysed macro indicators in detail, rather we have considered them in our final decision about which indicators to include in our proposal, checking whether data at macro level could support linkage between

outcome indicators and the HLYs and the Triple Win. A full list of macro indicators is presented in Annex 1 of MAFEIP Deliverable D1.1 "Inception Report".

2.2 Methods of analysis

After identifying the above mentioned data sources to inform the choice of outcome indicators proposed for use in the MAFEIP project so as to support the linkage between the HLYs and the Triple Win, we collated this information in a single database. The purpose was to obtain a picture of the frequency with which different indicators have been mentioned by different respondents in the 2012 Action Group survey and the review of 2013 good practices of Reference Sites. Initially, the analysis of outcome indicators was complemented with data obtained from the clustering of B3 good practices, but after compiling a provisional list of potential outcome indicators, we also used good practices data from Action Groups A1, A3 and D4 and we re-visited B3 clustering data to verify our provisional choice and consider the selection of additional candidates for Action Group specific, outcome indicators.

The rationale behind this approach was that each single source of information may not be adequate to inform the choice of outcome indicators for the monitoring framework of the EIP on AHA on its own, however, in conjunction the various sources may support or refute the use of particular outcome indicators within the MAFEIP project.

The resulting dataset was further complemented by evidence from the systematic literature review. Precisely, if scientific literature was found to support the use of a particular outcome indicator within the monitoring framework, we considered this as relevant for our choice within this exercise. Likewise, if the scientific literature depreciated the use of a particular indicator for whatever justified reason, this information was utilised to further inform the choice of outcome indicators for monitoring the impact of the EIP on AHA on HLYs and the Triple Win.

Finally, we considered aspects of linking outcome indicators to the headline target and the Triple Win in order to discriminate between a set of "*primary outcome indicators*" and "*secondary outcome indicators*". Primary outcome indicators are not just relevant across a number of commitments and Action Groups, but also particularly well suited to establish a quantitative link to the Triple Win and the headline target. Secondary outcome indicators require more elaborate modelling approaches to establish a quantitative link to primary outcome indicators, and ultimately to the Triple Win and the headline target.

As mentioned above, this exercise initially resulted in a short list of primary and secondary outcome indicators that are all deemed commonly applicable across Action Groups. However, in order to verify this selection, which was initially based on B3 clustering data only, and to better reflect Action Group specific measurement requirements, we have further analysed data from 60 good practices in Action Group A1, 98 good practices in Action Group A3 and 62 good practices in Action Group D4. This resulted in good support for the indicators initially chosen, and we identified a set of additional candidate indicators which are targeted to specific Action Groups. Accordingly, we further distinguish between the initial set of "*common indicators*" that are broadly applicable across commitments in different Action Groups, and "*specific indicators*" that are targeted to commitments within particular Action Groups. All primary indicators are also common indicators, and all specific indicators identified through reviewing clustering data from Action Groups' good practices in A1, A3, B3 and D4 are secondary indicators. Some of the secondary indicators, however, are also common across Action Groups (i.e. 'risk factors' and 'physical activity').

Following the procedure described above, we aimed to base our selection of proposed outcome indicators on a set of pre-defined choice criteria. Precisely, the inclusion of an indicator was based on essential criteria for indicators influence as established in previous work undertaken by the OECD (Lehtonen, 2008). Previous research suggests that assessments are most influential when they are credible as to their scientific methods, salient to the potential users and legitimate in the way the assessment is designed (Clark and Dickson, 1999; Eckley, 2001).

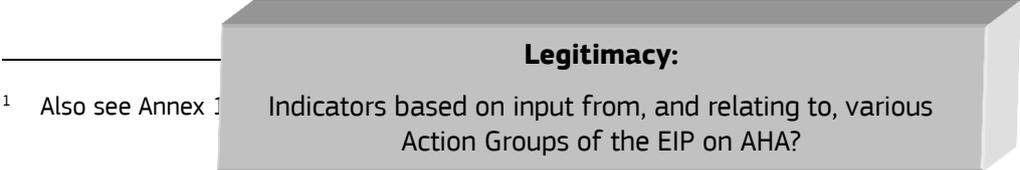
First, we considered it as a key priority for the choice of outcome indicators that participants involved in the EIP on AHA could see *ownership* through their involvement in the process of defining a set of key indicators, and also that they regarded the indicators chosen as *sufficiently relevant* to their particular action. This is what Lethonen (2008) refers to as the *legitimacy* of an indicator. According to Lethonen (2008), Legitimacy means "*the political acceptability or perceived fairness of an evaluation*". Legitimacy is enhanced, for instance, if "*the substantive inputs of users are integrated into indicator development*" (Lethonen, 2008). In our case, we aimed to achieve this by basing this exercise on all the information previously gathered within the EIP on AHA and the MAFEIP project (in particular previous surveys and reference site reviews). Furthermore, by dividing the outcome indicators proposed into a set of primary indicators, which allow linking impact across actions to the Triple Win and the headline target, and secondary indicators, which may generally require more elaborate modelling approaches via primary indicators, we aimed to increase the legitimacy of the proposed list of outcome indicators. One of the key challenges, however, was to choose a set of outcome indicators which may be regarded as sufficiently general to be relevant across all Action Groups, but also sufficiently specific to allow measuring the impact of particular commitments within each Action Group of the EIP on AHA. For this reason, we verified our initial choice of indicators and considered the selection of additional, Action Group specific indicators, through a subsequent review of good practices across Action Groups A1, A3, and D4.

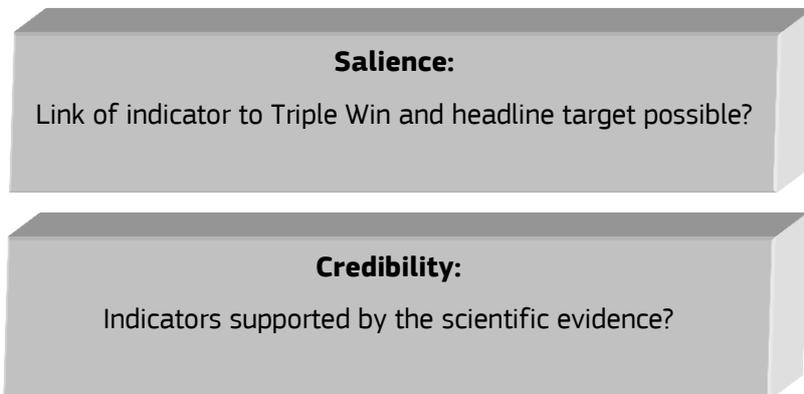
Secondly, with our proposed choice of outcome indicators, we aimed to reflect the idea of a multidimensional assessment within the EIP on AHA and the ability to map outcomes to EIP on AHA key objectives. Both concerns have been explicitly expressed in various key documents relating to this project. Precisely, the Strategic Implementation Plan of the EIP on AHA states that "*the monitoring framework could be based on a multi-dimensional approach, with various levels (from actions at micro level, through interface layers, to the headline target and strategic objectives at macro level) and with multiple indicators and targets/specific objectives*" and that "*a single-indicator approach based on measuring HLYs only appears to be inherently insufficient*". By following these key concerns, we aimed to address what Lethonen (2008) refers to as the *Saliency* of an indicator. According to Lethonen (2008), the saliency of an indicator refers to its ability to "*address the particular concerns of a user*". For the purpose of MAFEIP, this meant that 1) a single outcome indicator approach would not be sufficient and that 2) it should be possible to establish a quantitative link to the headline target and the Triple Win.

Finally, we tried to improve the *credibility* of our choice of outcome indicators by consulting the scientific literature. According to Lethonen (2008), the credibility of an indicator refers to its "*scientific and technical believability to a defined user*". We therefore complemented our dataset with the results from a systematic literature review with the aim of supporting, or refuting, the use of a particular indicator in the context of MAFEIP. A summary table of recommendations from the scientific literature with respect to the use of outcome indicators for monitoring the EIP on AHA is presented in Annex 4. In addition to that, we looked into the availability of international statistics relating to particular outcome indicators suggested in the framework displayed in Figure 1, including the indicators identified in the Theoretical document from 12 December 2012¹. However, this was rather to inform potential concerns regarding the ability to extrapolate information beyond the original context of the data.

Figure 2 provides a schematic representation of the three general selection criteria which we followed when choosing outcome indicators for the monitoring of the EIP on AHA.

Figure 2: General selection criteria for outcome indicators proposed for MAFEIP





Obviously, it is rather unlikely that an indicator would equally satisfy all of these conditions, and for each indicator, a different weighting of selection criteria may be indicated. This will be further specified, on an individual indicator basis, in the Results section below.

3. Results

In this section, we first present our results for potential indicators in the Quality of Life column, followed by potential indicators for assessing impact on the sustainability of health systems. We present the results from our joint analysis of survey data, information provided from a comprehensive review of Reference Sites' good practices, the outcome indicators used within Action Group B3, and the findings from systematically reviewing the scientific evidence with respect to outcome indicators suggested for the monitoring of the EIP on AHA. This analysis, which resulted in a short list of primary and secondary indicators which are all deemed commonly applicable across Action Groups, was complemented by a joint review of good practices submitted by Action Groups A1, A3 and D4, and also reconsidering B3 clustering data. This resulted in good support for the indicators initially chosen, and we identified a set of additional candidate indicators which are targeted to specific Action Groups. For potential outcome indicators, we present summary sheets containing the data gathered from different sources of evidence in Annex 1.

3.1 Quality of life column

With our proposed set of outcome indicators for the Quality of Life column, we tried to reflect the dual aim of the monitoring framework, which should "*enable the linking of the various actions to be undertaken under the Partnership with the overall objectives*" but also "*requires defining specific indicators per action*". We therefore developed a set of key (primary) indicators which ought to be general enough to be relevant across all Action Groups of the EIP on AHA, but also sufficiently specific and sensitive to capture the impact of particular commitments within each Action Group of the EIP on AHA. We further developed a set of secondary outcome indicators, which have emerged in one or several of the data sources reviewed. Secondary outcome indicators generally require a more elaborate modelling approach via primary indicators for linking outcomes to the EIP objectives and the headline target, and they could either be relevant for several Action Groups (common secondary indicators), or targeted at particular Action Groups (specific secondary indicators). For the purposes of analysis, it was necessary to combine all the information on outcome indicators gathered to date within the MAFEIP project, and also to add our own views on the potential to model a link between identified outcome indicators and the objectives of the EIP on AHA. However, we would like to highlight that this report does not aim to establish this link, the intention is rather to ensure that the indicators selected may enable such linkage. Further details on modelling quantitative links between outcome indicators on commitment level and the objectives of the EIP on AHA will be provided in deliverable D.3.1.

The following section (3.1.1) provides a general summary of our results for the Quality of Life column of the monitoring framework. This is followed by a more thorough discussion of primary outcome indicators for QoL (Section 3.1.2), secondary indicators that are commonly applicable between Action Groups (Section 3.1.3) and further candidates for secondary outcome indicators that are deemed Action Group specific (Section 3.1.4)

3.1.1 Summary of results

Our provisional proposal for outcome indicators in the Quality of Life column of the monitoring framework is summarised in Table 2. This proposal implies an a priori preference for primary outcome indicators for quantitatively modelling the EIP on AHA impact. If a commitment does not report data on primary indicators, common secondary indicators will be considered as an alternative. Only if neither primary nor common secondary indicators are reported would we consider the use of specific secondary indicators for quantitatively assessing the EIP on AHA impact on the Triple Win and the headline target. Further work will be required to assess the fitness of specific secondary indicators for this purpose, which will be reported in subsequent deliverables, particularly D.3.1.

Table 2: Provisional proposal for outcome indicators within the QoL column

| | Primary indicators | Secondary indicators |
|---|---------------------------|--|
| Common indicators | HrQoL Mortality | Risk Factors Physical Activity |
| Specific indicators* | n.a. | Adherence to treatment (A1) Frailty (A3) Cognitive decline (A3) Functional status (A3 / B3) Falls (A2 /C2 / to some extent A3) |
| * Some specific indicators may also apply - to a certain extent - to other Action Groups than those indicated here. However, our aim was to assign indicators to those Action Groups for which the highest number of additional commitments may be covered by the modelling proposed. | | |

Applying our selection criteria for outcome indicators to the data reviewed led to the selection of **primary outcome indicators** that are deemed general enough to be relevant across all Action Groups of the EIP on AHA, but also sufficiently specific and sensitive to capture the impact of particular interventions within each Action Group. One or both primary outcome indicators could be used depending on the needs and preferences of the different commitments and Action Groups:

- **Measures of health related quality of life (HrQoL)**, in particular instruments suited for constructing a single metric that combines the valuation of a certain health state with the time spent in this state, like the EQ-5D instrument, or instruments from the SF-family such as the SF-36 or the SF-6D.
- **Mortality rates**, stratified by major target diseases such as heart failure, stroke, COPD, dementia, falls, or suicide as applicable to each Action Group.

A set of **secondary outcome indicators**, which have emerged in one or several of the data sources reviewed, is also being proposed. Secondary outcome indicators generally require a more elaborate modelling approach via primary indicators for linking outcomes to the EIP objectives and the headline target, and they could either be relevant for several Action Groups (*common* secondary indicators), or targeted at particular Action Groups (*specific* secondary indicators). The most important common secondary indicators are:

- **Risk factors**
Risk factors include routine clinical measures such as blood pressure, cholesterol levels, blood glucose, body mass index. A change in risk factors due to interventions delivered within different commitments may result in a change in quality adjusted life expectancy. A quantitative link could be established, for instance, through the use of validated risk stratification tools such as the Framingham risk equation (D'Agostino et al., 2008) or the QRISK-tool (Hippisley-Cox J et al., 2007) for estimating cardiovascular disease risk.
- **Physical activity**
Physical Activity appears to be relevant across a large number of commitments and Action groups. In addition, some evidence could be found in the literature and studies exist that provide a link between changes in physical activity behaviour and respective changes in quality adjusted life expectancy using Decision Analytic Modelling (DAM). This link could be established, for instance, via the impact of a change of physical activity behaviour on risk factors. Hence, if a commitment collected data on both the change in physical activity and the resulting impact on risk factors, there would be an a priori preference for using the latter for modelling the commitments impact on QoL.

Next to those secondary indicators that are commonly supported by commitments across Action Groups, we identified a set of additional candidate indicators after the review of the good practices presented by each Action Group in their respective booklets. However, it needs to be highlighted that, for these indicators, the ability to establish a quantitative link to the EIP objectives and the

headline target is generally less clear, and additional work will be required to assess whether they may be suited for quantitatively modelling the EIP on AHA impact. In particular, deliverable D.2.4 will take into account evidence from a survey conducted across commitments to learn about the outcome indicators they use and for which data is more likely to become available, whilst the modelling concept for quantitatively linking outcomes to the Triple Win and the headline target will be discussed in much more detail in deliverable D.3.1. Hence, the indicators below constitute a short list of potential candidates whose ability to support the MAFEIP objectives will be checked through further research. The provisional list of specific secondary indicators consists of:

- **Adherence to treatment**

In accord with the main objective of Action Group A1, which is *'to improve the quality of life and health outcomes of older people living with chronic conditions, through a holistic approach, including enhanced self-care, personalized care, better adequacy of treatment, increased adherence to safe and effective care plans'*, we identified patient adherence as an additional indicator specific to Action Group A1. Health economic literature exists which could help conceptualizing a link between a change in adherence levels and its impact on EIP on AHA objectives.

- **Frailty, cognitive decline and functional status**

The main objective of Action Group A3 is *'prevention and early diagnosis of frailty and functional decline, both physical and cognitive, in older people'* and unsurprisingly we found strong support from good practices in A3 in favour of the above mentioned indicators, However, the extent to which frailty, cognitive decline and functional status are correlated, the existence of modelling studies that would inform a quantitative link to the headline target, and the consequent need to further refine our choice of indicators is currently unclear and needs to be assessed in more detail in future deliverables (D.2.4 and D.3.1).

- **Falls**

While falls related indicators were not found frequently in the Reference Sites and Action Group data reviewed, a number of scientific sources support using No. of falls, No. of fallers or rate of falls. In addition, though data was not available from respective good practices, we consider falls to be relevant for Action Groups A2 and C2, and found 4 commitments in Action Group A3 which reported collecting falls data. As for frailty, functional status and cognitive decline, more work will be required to assess the feasibility and usefulness of incorporating fall indicators into the quantitative monitoring framework.

3.1.2 Primary outcome indicators for QoL

For the Quality of life column, we propose to use two key (primary) outcome indicators for measuring the impact of the EIP on AHA across all Action Groups on the headline target (two additional healthy life years by 2020) and also with the purpose of linking outcomes to the Triple Win. The two primary outcome indicators proposed are:

- **Measures of health-related quality of life (HrQoL)**, in particular those instruments which are well suited for constructing a single metric that combines the valuation of a certain health state with the time spent in this state, e.g. the Health Utility Index (Horsman et al 2003), the SF-family of tools to measure health outcomes (e.g. SF-36, Ware et al, 2000; SF-12, Ware et al, 1996; SF-6D, Brazier et al ,2002)), the Nottingham Health profile (Hunt, 1981), the 15D-instrument (Sintonen, 2001), or the EQ-5D tool (Brooks et al, 2003). Respective instruments to consider within MAFEIP should be generic (i.e. applicable across major disease areas), relatively straightforward to use in various settings and across varying populations, scientifically well established, and geographically applicable to different national settings particularly within a European context (if a commitment is still hesitating about which health related QoL instrument to use, the EQ-5D instrument developed by the EuroQol Group (<http://www.euroqol.org/>) is, in our view, a tool which satisfies all the above mentioned criteria).

- **Mortality rates**, stratified by major target diseases tackled within different EIP on AHA Action Groups, such as heart failure, stroke, COPD, dementia, falls, or suicide. Through stratifying by major target diseases, we aim to increase the applicability of mortality rates as a measure of EIP on AHA outcome across different commitments and Action Groups. The combination of disease specific mortality rates with HrQoL in particular disease states, e.g. through the use of Decision Analytic Modelling (DAM) would enable to establish a link between disease specific mortality, health related quality of life, and the EIP on AHA key objectives.

As previously mentioned, we do not propose the simultaneous use of all outcome indicators across all commitments and Action Groups. For instance, if a particular commitment only reports impact on mortality but not on HrQoL and there is reason to believe that the HrQoL of individuals may also be affected, data could be obtained from alternative sources, such as very similar commitments that reported the required information, or the scientific literature which may provide evaluations of similar healthcare interventions where HrQoL was also measured. This allows highest flexibility of our approach even if the availability of data may be limited within MAFEIP.

3.1.2.1 Legitimacy of primary outcome indicators for QoL

Considering the results from the 2012 survey, the Reference Sites review and the B3 clustering exercise, measures of *health related quality of life belong to those that received the strongest support*, consequently scoring highest in terms of legitimacy; i.e. the question of whether indicators are based upon input from, and relate to, activities within the EIP on AHA. In addition, the review of Action Groups' good practices from A1, A3 and D4 and our reconsidering of the B3 clustering data provided further support for HrQoL. In Action Group A1, HrQoL measures were mentioned by 7 commitments, in Action Group A3 by 18 commitments, in Action Group B3 by 19 commitments and in Action Group D4 by 1 commitment respectively. This makes HrQoL the most frequently mentioned outcome indicator within each and across all Action Groups of the EIP on AHA and consequently, we regard 'HrQoL as generally applicable to various commitments across different Action Groups. However, what remains to be answered is the question of how to measure HrQoL, whereby different elicitation tools have been mentioned by different commitments. To which extend this will limit the applicability of HrQoL as a common indicator will be addressed further below and in much more detail in deliverables D.2.4 and D.3.1. .

Compared to HrQoL, the legitimacy of 'mortality data' stratified by major EIP on AHA target diseases was not quite as strong. However, the Reference Sites review and clustering data from Action Groups A3 and B3 provided good support in favour of this indicator. In addition, stratifying by target disease allows for wide applicability of mortality rates as an EIP on AHA outcome indicator across commitments and Action Groups.

3.1.2.2 Salience of primary outcome indicators for QoL

As mentioned before, we refer to the salience, or relevance, of a proposed outcome indicator as their '*ability to address the particular concerns of a user*' (Lethonen, 2008). For the purposes of MAFEIP, we define salience as the ability of proposed primary outcome indicators to capture impact in terms of the overall EIP on AHA objectives that is the headline target, the aspired gain of on average two additional healthy life years by 2020, and the Triple Win.

The multifaceted character of MAFEIP with hundreds of commitments across Europe (and sometimes beyond) which focus on diverse aspects of active and healthy ageing and which are organised in different Action Groups whose thematic focus vary considerably, inevitably calls for a multidimensional approach to the monitoring of EIP on AHA outcomes. Hence, on the level of individual commitments and Action Groups, MAFEIP should be designed to offer a battery of alternative outcome indicators to ensure widest applicability across the whole EIP on AHA. However, on the broadest level, potential impact of the EIP on AHA on the Triple Win and the headline target calls for a reduced set of "higher level indicators" (potentially one per column) to function as a "common currency" across individual indicators within each column. The reason for this is that we

need to aggregate impact somehow if the aim is to quantitatively assess the impact of EIP on AHA activities on the Triple Win and the headline target. As this impact is likely to be measured in different ways across commitments and Action groups, such a 'common currency' is needed within each column; though this does not preclude the possibility to complement the reporting of EIP on AHA impact using alternative indicators.

Hence, in order to assess the salience of proposed primary outcome indicators, we ought to address two key issues:

1. What could serve as a "common currency" within each column in order to allow aggregating the impact of the EIP on AHA across commitments and Action Groups.
2. How to link from outcome indicators to this "common currency"

Only if we can address both issues within each MAFEIP column (as each of these contributes towards one or more aspects of the Triple Win) we would be able to assess the overall impact of the EIP on AHA.

The key problem within the quality of life column is that outcome indicators relate to very different aspects of health, with some being measured in physical units (such as blood pressure or cholesterol levels) and others which may rather reflect the perceived health status of an individual. The key challenge is therefore to identify a single metric which 1) best captures changes in any of the proposed outcome indicators for QoL and 2) allows aggregating the impact across individual commitments and also mapping to the high level objective (+2HLY) and the Triple Win.

Amongst a number of potentially suitable indicators, "Healthy Life Years" (HLY) and "Quality Adjusted Life Years" (QALYs), have been considered for the purposes of MAFEIP to combine information on life expectancy with health status. The HLY indicator is computed by combining mortality statistics with information on self-perceived disability (EUROSTAT, 2013), which allows calculating healthy life expectancy at birth, at age 50 and at age 65 separately for men and women. To collect this data, respondents to the survey on EU-statistics on Income and Living Conditions (EU-SILC) are being asked whether, for at least the past six month, they have been limited in usual activities because of a health problem. Three answers are possible: severely limited, limited, but not severely and not limited at all.

QALYs are defined on a scale with interval properties (Williams, 1987, Weinstein et al., 2009) with 1 representing one year which has been spent without any limitations in health and zero representing death. Spending one year in a status which is not regarded as full health would be assigned a value between zero and one respectively. Further, interval properties mean that, if an intervention increases QALYs from 0.2 to 0.4, this should be just as "valuable" as an intervention that leads to a QALY gain from 0.8 to 1. QALYs capture the idea that any improvement of a patient's health is worthwhile, even if it is at either end of the scale, and this property simplifies aggregation of impact across various commitments tremendously, as it allows to add QALY gains across individuals, commitments, and Action Groups.

Obviously the most direct link between the impact achieved within commitments and the headline target could be established if commitments collected information to construct HLY for measuring their interventions impact. This information (i.e. the age-specific prevalence of the three above mentioned health states) could then be combined with the total person years lived at a particular age within the relevant target population. However, there are three issues with this approach: first, based on the review of 2012 survey results, the Reference Sites review, and the clustering data from Action Groups A1, A3, B3 and D4, it is unlikely that such information would be readily available on a commitment level, so that it makes no sense to include HLYs as a potential outcome indicator for the purposes of MAFEIP. Secondly, HLY may be less sensitive than QALYs to capture health changes. Thirdly, the scientific literature does not provide much support to model a quantitative link between outcome indicators on a commitment level and HLY, so that such an endeavour would rest on a considerable amount of exploratory work (if feasible at all).

As an alternative, we therefore propose to extrapolate from outcome indicators in the QoL block of the monitoring framework to QALYs, and add gains in quality adjusted life expectancy across interventions and commitments targeted at different populations. This, in turn, would allow estimating the total QALYs gained from all commitments under assessment, and ultimately to extrapolate this result to an EU-28 level. There are a number of advantages with this approach: First, QALYs combine, just like HLYs, information on length of life with information on perceived health status. However, unlike HLY, QALYs are defined on an interval scale, allowing to aggregate health impact across a wide range of commitments. As a consequence, QALYs are also much more sensitive to health changes than HLY. A large number of commitments reported to use elicitation tools that have been purposely developed for constructing QALYs. Finally, there is a vast body of scientific literature to conceptualise quantitative models between outcome indicators on commitment level and QALYs. This does not mean, however, that we disregard the fact that the headline target of the EIP on AHA is expressed in terms of HLYs. Rather, we consider the use of QALYs as an intermediate indicator between outcome indicators and the headline target, which is essentially in line with the strategic implementation plan of the EIP on AHA. However, we highlight that the feasibility of developing a quantitative link between QALYs as an intermediate indicator and HLY as the headline target would have to be explored further.

This leaves us with the second question to assess the salience of proposed primary outcome indicators, namely *'how to link towards the common currency expressed in QALYs'*. It is, in fact, the answer to this question which leads us to distinguishing between *'primary'* and *'secondary'* outcome indicators. The definition of QALYs as the *"value-weighted time—life-years weighted by their quality—accumulated over the relevant time horizon"* (Weinstein et al 2009) clearly shows the connection between QALYs and the two primary outcome indicators proposed for the QoL column, namely HrQoL and mortality. Hence, information on HrQoL, for instance elicited through the EQ-5D instrument (whose specific advantages for the purposes of MAFEIP will be discussed below), and length of life, as expressed through disease specific mortality rates, could be used to estimate the QALY change from interventions delivered within various EIP on AHA commitments. This allows establishing a direct quantitative link between both primary outcome indicators and the common currency expressed in terms of QALYs. For all other (secondary) indicators discussed in this document, we would have to link towards either HrQoL or mortality (or both) first, before we could estimate the respective impact on QALYs. The existence of economic evaluation studies that provide quantitative models to establish such linkage determines the fitness of such indicators for the purposes of MAFEIP, which will also be discussed in much more detail in deliverable D.3.1. For the final link between QALYs and the headline target expressed in HLY, more exploratory work will be required.

3.1.2.3 Credibility of primary outcome indicators for QoL

As explained in section 2.2 above, we define credibility of MAFEIP outcome indicators as their *'scientific and technical believability to a defined user'*. The primary source to inform a decision on the credibility of proposed outcome indicators is a scientific literature review which we undertook to identify through systematic searches scientific sources providing evidence on specific interventions relevant to the domains of each of the six Action Groups of the EIP on AHA. Although not exhaustive, this scientific literature review has been useful in confirming the credibility of the selected indicators. In this section, we will first discuss the credibility of the proposed primary outcome indicator HrQoL, followed by the mortality indicator.

Health-related Quality of life (HrQoL)

Looking at the area of falls prevention in particular (Action Group A2), we found some studies that attempt to link fall prevention interventions with quality of life outcomes and clinical outcomes. The main measures of quality of life found to be used include: a) members of the "SF-family" developed by RAND Corporation (e.g. SF-36, SF-12, Ware et al 2000; Ware et al 1996); b) the EuroQol EQ-5D instrument (Brooks et al 2003), c) QUALEFFO (Tosteson and Hammond 2002); and d) WHOQOL –

BREF (Skevington et al, 2004). The following examples illustrate the type of research outcomes found on fall prevention interventions:

- Positive effect on QoL in fall prevention interventions among the aged found only in few studies (meta review of RCT, Vaapio et al 2008).
- Only one trial including QoL as a measured outcome with a positive impact of the intervention (Conroy et al, 2011).

In addition, 15 systematic reviews out of the 139 sources screened on functional decline and frailty (Action Group A3) summarise findings from hundreds of studies. The complexity of frailty does not allow us to find unequivocal and convergent evidence although this does not mean that there is no evidence at all on outcomes. In spite of the lack of consensus on how to measure frailty and the wide range of possible areas of interventions (Nutrition; Physical activity; Mobility; Strength; Energy; Cognition; Mood and Social relation / social support, memory training), we could identify evidence relating to Quality of Life or health status (e.g. multi-morbidity) as shown in the examples below:

- Prevalence of multi-morbidity in older persons ranges from 55 to 98% (Marengoni et al, 2011).
- Association of multi-morbidity with disability or functional performances; and increasing number of diseases consistently associated with increasing odds or risk for disability as shown in two longitudinal studies (Bayliss et al, 2004; Marengoni et al, 2008) and three cross-sectional studies (Hudon et al, 2008; Kadam et al, 2007; Loza et al, 2009).
- No association between multi-morbidity and physical functioning (Hudon et al., 2008)
- Having 4+ chronic diseases associated with 4-year decline in the physical component summary score SF-36 (Bayliss et al., 2004).
- Compared to having one disease, having 2–3, 4–5, or 6+ diseases associated with poorer physical function measured with the SF-12 (Kadam et al., 2007).
- Increasing number of chronic conditions increased the risk of 3-year functional decline (Marengoni et al., 2009).
- Multi-morbidity associated with impaired functioning (Loza et al., 2009)

Our focus for B3 has been on the ICT component of integrated care emphasising the impact of this type of interventions on the elderly population, especially on remote monitoring. The majority of published studies reveal a positive impact of specific health information technology components on chronic illness care, for example:

- Predominantly positive results with better results for “behavioural” endpoints, e.g. adherence to medication or diet, and self-efficacy compared to results for medical outcomes (e.g. blood pressure, or mortality) and quality of life found in a systematic review about telemedicine and telecare (68 studies included, van den Berg et al, 2012).
- Positive results on Quality of life and mortality identified in a literature review on the value of telemedicine in the management of five common chronic diseases (asthma, COPD, diabetes, heart failure, hypertension). (Review of 141 RCT with 148 telemedicine interventions, Wootton, 2012)
- Integrated and coordinated care is beneficial for the population of frail elderly people (review of RCTs on integrated and coordinated interventions targeting frail elderly people living in the community, Eklund et al., 2009).

However, some sources highlight the weakness of the evidence in this field:

- Large gap between the postulated and empirically demonstrated benefits of eHealth technologies, because: (1) Available quantitative research is limited and has been done by a small number of institutions; (2) systems are heterogeneous and sometimes incompletely described; and (3) available financial and contextual data is limited. (Black et al., 2011; Chaudhry et al., 2006)

- Further challenges identified by a systematic review on methodologies to assess telemedicine (Ekeland et al, 2012), for instance:
 - Larger and more rigorously designed controlled studies to assess the impacts of telemedicine;
 - Standardization of populations, and/or interventions and outcome measures to reduce heterogeneity and facilitate meta-analysis;
 - Combining quantitative and qualitative research methods; applying different naturalistic approaches including methodologies addressing mutual adaptations of services and users; politically driven action research and formative research.
- A systematic review of the quality, validity and generalizability of economic evaluation in telemedicine showed that the majority of the economic evaluations reviewed were not in accordance with standard evaluation techniques (Bergmo, 2009)
- Telemedicine provided significantly better outcomes than the control condition in only half of 12 systematic reviews.

Although the evidence is not conclusive, integrated care and remote monitoring will facilitate access of care to patients as well as patient empowerment (autonomy and self-care) with an impact on quality of life.

In the area of Action Group C2, the evidence on outcomes from independent living solutions is currently limited as illustrated below:

- Most measurement activities and trials are focused on testing the reliability and validity of the measures produced by home based or wearable systems of monitoring through sensors (Kang et al, 2010).
- The main focus is still on the technological components and on the data processing algorithms; detecting errors in Activity of Daily Living (ADL) is important to accurately monitor functional performance, to intervene if the error creates a hazardous situation and to provide activity reminders. (Cook et al, 2009)
- Weaknesses identified both for home based and for wearable based solutions include lack of monitoring outside of the home environment, limited access to biomechanical parameters, the need for user control, constant wearing of mobile sensors or privacy concerns. (Hein et al 2010; Scanaill et al 2006)

Nevertheless, in terms of Quality of life, it is worth noting that:

- The evaluation of initiatives like the Scottish Telecare Programme found that people feel more independent, safer and feel their relatives worry less for them thanks to telecare (Bealea et al, 2010).
- Research done with Finnish population data found that people are happier at home than in institutions (Böckerman et al, 2011)

As mentioned before, the systematic literature review identified a number of elicitation tools for health related quality of life, such as SF-family" developed by RAND Corporation (e.g. SF-36, SF-12, Ware et al 2000; Ware et al 1996); b) the EuroQol EQ-5D instrument (Brooks et al 2003), c) QUALEFFO (Tosteson and Hammond 2002); and d) WHOQOL – BREF (Skevington et al, 2004). Additional tools exist, such as the health Utility Index (Horsman et al, 2003), the Nottingham Health Profile (Hunt et al , 1981), or the 15D-instrument (Sintonen, 2001). In general, instruments to consider within MAFEIP should be generic (i.e. applicable across major disease areas and thereby broadly deployable within different EIP on AHA Action Groups), relatively straightforward to use in various settings (to allow easy and efficient data-collection) and across varying populations (for instance through the existence of validated translations into different languages), scientifically well established, and geographically applicable to different national settings particularly within a European context (through the existence of country-specific value sets). If commitments are willing to measure HrQoL, the EQ-5D tool might be recommended. The EQ-5D is a standardised

instrument, applicable to a wide range of disease areas, which provides validated value sets for most European countries (Brooks et al 2003). It comprises 5 dimensions of health (mobility; self care; usual activities; pain / discomfort and anxiety / depression) and each dimension consists of three levels (no problems, some problems or severe problems). In addition, a five-level version of the EQ-5D has been recently developed (Herdman et al., 2011). Particular advantages of the EQ-5D are:

- its generic character, allowing to assess the health related quality of life of patients with varying diseases (as characteristic for the EIP on AHA),
- that it has been translated into and validated for many different languages and that value sets exist for most European countries (making it appealing for the purposes of MAFEIP),
- that it allows aggregating health status information in a single index, enabling calculation of Quality Adjusted Life Years (QALYs), and
- that it is relatively easy to use for professionals and easier to understand for respondents compared to other instruments such as the Health Utility index (Horsman et al, 2003).

In addition, the EuroQol group is well established since 1987 and comprises a vast network of international experts, giving the instrument strong scientific credibility. Another advantage is that, when comparing the initial MAFEIP framework to the EQ-5D dimensions, some overlap exists to indicators initially proposed for the Quality of life building block, e.g. related to functional decline, stress / anxiety, or mobility and self-care. As a result, we see very good applicability of the EQ-5D instrument for the purposes of MAFEIP. However, having said this, it is also important to emphasize that there may be other tools potentially applicable for measuring impact on health related quality of life across EIP on AHA interventions. In particular, the SF-family of instruments developed by RAND, which has also been mentioned above, provides a set of generic tools for assessing patients' health related quality of life.

It should be noted that the 2012 survey results and the analysis of data provided by good practices showed that commitments may consider different generic and / or disease specific elicitation tools for HrQoL. Whilst there is an increasing body of literature addressing potential mapping algorithms between such instruments, more exploratory work will be required to assess to which extent this may be feasible within MAFEIP given the limited data availability, and how the use of different HrQoL instruments may impact on the variability in results between respective commitments. Whilst deliverable D.2.4 will provide much more detailed information on the actual instruments in use through a survey that is currently conducted across Action Groups (thereby providing a clearer picture on the actual relevance of the issue), D.3.1 will address in more detail the issues involved with the usage of different elicitation tools for HrQoL, and the potential to map between them,

Mortality stratified by disease areas

There is evidence of the impact of interventions on mortality rates in most of the areas covered by the EIP on AHA.

In the field of adherence to medical treatment (Action Group A1), for example:

- Non-adherence to statins in the year after hospitalization for myocardial infarction associated with a 12% to 25% increased risk of mortality (Ho et al, 2009).
- For chronic coronary artery disease non-adherence to cardio-protective medications (blockers, statins, and/or angiotensin-converting enzyme inhibitors) is associated with a 10% to 40% relative increase in risk of cardiovascular hospitalizations and with a 50% to 80% relative increase in risk of mortality (Ho et al, 2009).

- Another study demonstrated that patients discontinuing clopidogrel² within 1 month after hospital discharge for acute myocardial infarction were significantly more likely to have an adverse outcome, including re-hospitalization and mortality, in the subsequent 11 months.

There is also evidence in the literature on the linkage between fall incidents of older people and mortality due to falls (Action Group A2). The authors of a meta review of RCTs in this field identify mortality as one of the main outcome measures against which fall prevention interventions should be assessed (Vaapio et al, 2008).

- Fall-related fractures among the elderly represent an important public health problem. Severe fractures have been related to increased risk of death (Coutinho et al. 2012).
- Ground-level falls in elderly patients represent a high risk for injury and concurrent comorbidities and mortality. (Spaniolas et al. 2010).
- Compared with children, elderly persons who fall are 10 times more likely to be hospitalized and eight times more likely to die as the result of a fall (Fuller 2000).

Furthermore, we found some impact on mortality in the area of frailty (Action Group A3):

- Losses in one or more domains of human functioning (physical, psychological, and social) increase the risk of adverse health outcomes, dependency, institutionalization and mortality (Gobbens et al, 2010, 2010a).
- Higher VES-13 scores³ have been shown to prospectively predict death and functional decline of elder adults over 1 year period of follow-up. (Min et al, 2009).
- Total-cause mortality 2.8 times higher, respiratory disease mortality 4.1 times higher and senility mortality 5.7 times higher in dependent subjects than in independent group (study of whether 12-year disease-specific mortality may be associated with ADL dependency in an 80-year-old population, Takata et al. (2013).

As to integrated care (Action Group B3) and independent living (Action Group C2), the following evidence also supports the credibility of mortality indicators:

- Positive results on Quality of life and mortality identified in the earlier mentioned literature review on the value of telemedicine in the management of five common chronic diseases (asthma, COPD, diabetes, heart failure, hypertension). (Review of 141 RCT with 148 telemedicine interventions, Wootton, 2012).
- Two RCTs on remote monitoring for heart failure show significant impact on mortality (Abraham et al., 2011; Antonicelli et al, 2010; Antonicelli et al., 2008).
- Other RCTs in this field conclude that there is no significant difference in mortality between control and intervention groups (e.g. Giordano et al. 2009, Koehler et al. 2011, Mortara et al. 2009).
- Early illness recognition and treatment is key to improving health status with more rapid recovery after an acute illness or exacerbation of a chronic illness, and preventing morbidity and mortality in older adults (Boockvar & Lachs, 2003; Ridley, 2005; Stuck et al. 2002).

Generally integrated care and remote monitoring will facilitate access of care to patients as well as patient empowerment (autonomy and self-care) which has an impact on mortality amongst others.

3.1.3 Common secondary outcome indicators for QoL

Besides the selection of primary indicators, which fulfilled the three criteria of legitimacy, salience and credibility, we propose to include in the EIP on AHA monitoring framework a set of secondary

² This is an oral, thienopyridine class antiplatelet agent used to inhibit blood clots in coronary artery disease, peripheral vascular disease, and cerebrovascular disease.

³ Vulnerable Elders-13 Survey

indicators which have emerged in one or several of the data sources reviewed although they may not fulfil the three selection criteria to the same degree as primary outcome indicators suggested above. Secondary outcome indicators generally require a more elaborate modelling approach via primary indicators for linking outcomes to the EIP objectives and the headline target, and they could either be relevant for several Action Groups (*common* secondary indicators), or targeted at particular Action Groups (*specific* secondary indicators, discussed in section 3.1.4 below). The most important **common secondary indicators** are risk factors and physical activity:

Risk factors

Risk factors include routine clinical measures such as blood pressure, cholesterol levels, blood glucose or body mass index. Risk factors are reliable measures which are easy to collect and record, and generally applicable within a wide range of commitments across various Action Groups. This has been confirmed both through analysis of the data provided by the 2012 survey, the Reference Sites review and the B3 clustering exercise, and the subsequent analysis of good practices from Action Groups A1, A3, B3 and D4. Risk factors were mentioned 31 times in the August 2012 survey, and they were explicitly mentioned by 4 commitments in Action Group A1, 6 commitments in Action Group A3, 12 commitments in Action Group B3, and once in Action Group D4 respectively. This makes risk factors - together with HrQoL - the most frequently mentioned indicators within and across all Action Groups for which data was available. As a consequence, we regard the legitimacy of risk factors for the purposes of MAFEIP as very high.

In addition, risk factors received strong backing from the scientific literature, so that they also scored high in terms of credibility. The following risk factors are supported particularly well by the literature reviewed and therefore fulfil our credibility criterion:

- Blood pressure;
- Cholesterol levels;
- Glucose levels;
- BMI.

Especially in the area of prescription and adherence to medical plans which pertains to Action Group A1, we found significant evidence on clinical outcomes albeit more widespread for Cardiovascular Diseases (CVD) than for diabetes II and other diseases. The following examples illustrate the type of associations between adherence and clinical outcomes reported in the scientific literature for Cardiovascular Diseases (CVD):

- High adherence to anti-hypertensive medications associated with blood pressure control (Schneider et al 2008).
- High adherence to statin medications associated with reduction in LDL cholesterol (Schneider et al 2008).
- Better adherence to a drug for hypertension in a RCT associated with lower diastolic blood pressure (Schneider et al 2008).
- Adherence to anti-hypertensive prescription on blood pressure (Turner et al 2009) associated with lower systolic blood pressure than for non-adherent patients (cross-sectional multi-clinic cohort study).

On the other hand, a systematic review of 10 RCT's reporting evidence on the adherence and clinical outcomes of interventions about self-administered medication use found that, whereas 6 of 10 trials reported higher adherence, this was associated with clinically significant improvement in only 1 study (Zedler et al 2011). If we look at adherence to treatment in particular to daily physical activity, there are links with the body mass index and mortality risk for COPD and dementia.

Finally, considering the salience of risk factors, i.e. their ability to be quantitatively linked to the EIP's objectives and the headline target, we found that a change in risk factors due to interventions delivered within different commitments may result in a change in quality adjusted life expectancy. A

quantitative link to the primary outcome indicators HrQoL and mortality could hence be established, for instance, through the use of validated risk stratification tools such as the Framingham risk equation (D'Agostino et al., 2008) or the QRISK-tool (Hippisley-Cox J et al., 2007) for estimating cardiovascular disease risk. This would allow estimating a change in the likelihood of experiencing an adverse health event as a result of a change in risk factors and this, in turn, would allow estimating the remaining quality adjusted life expectancy in this state (modelling issues will be further specified in deliverable D.3.1). For these reasons, we have identified risk factors as appropriate candidates for common secondary outcome indicators for the purposes of MAFEIP.

Physical activity

Physical activity is an indicator which may be relevant across a number of Action Groups. It has been mentioned twice in Action Group A1, 14 times in Action Group A3, twice in Action group B3, and twice in Action Group D4. In addition, it also received some support from the literature reviewed, as shown in the examples below (relating to Action Groups A2 and A3 respectively). When considering issues of salience (i.e. the potential to link the indicator to the Triple Win and headline target), we found studies within the domain of economic evaluation in health that developed decision analytic models where this link has been established via the impact of a physical activity change on risk factors. We therefore regard physical activity changes as an indicator secondary to risk factors. Some findings of the systematic review are:

- Strongest evidence on benefits for interventions that incorporate gait and balance and muscle strengthening components, as they seem to reduce rates of falling along with risk of falls (McKay & Anderson (2010).
- Physical exercise reduces falls by 17% (Review of 44 trials involving 9,603 participants Sherrington et al. (2008).
- Physical exercise reduces falls and increases social participation (Fairhall et al, 2011).
- Reduction in falls (e.g. multiple-component group exercise significantly reduced rate of falls (RaR 0.71, 95% CI 0.63 to 0.82; 16 trials; 3622 participants) and risk of falling (RR 0.85, 95% CI 0.76 to 0.96; 22 trials; 5333 participants) (Meta-review, Gillespie et al 2012).
- Participation in self-selected exercise activities independently associated with delaying the onset and the progression of frailty (Peterson et al., 2009).
- Death rates for men and women aged over 75 who exercised were similar to their peers aged 65 to 75 who did not exercise (Hubbard et al, 2009).
- Early interventions are considered essential to improve physical functions or even to reverse frailty (Faber et al , 2006).
- Relatively long-lasting and high-intensive multicomponent exercise programs have a positive effect on ADL and IADL disability for community-living moderate physically frail older persons (Daniels et al , 2008).
- Many age-associated changes in cardiovascular function result from physical inactivity (Heckman & McKelvie, 2008; Yazdanyar & Newman, 2009).
- Physical frailty indicators can predict ADL disability in community-dwelling elderly people (systematic review, Vermeulen et al, 2011).
- Firm evidence for training effects on physical fitness, functional performance, activity of daily living performance, and quality-of-life in the case of institutionalized Older Persons (Weening-Dijksterhuis et al, 2011).

Independent of the systematic review for which we summarized our results above, we also undertook a brief, non-systematic review of the relevant economic evaluation literature, and identified three papers presenting decision analytic models which could potentially be adapted to link a change in physical activity behaviour to changes in Quality Adjusted Life Years. In 2006, NICE assessed the cost-effectiveness of physical activity interventions. Within this study, decision analytic modelling (DAM) was used to model the impact of a change in physical activity on the

onset of coronary heart disease (CHD), stroke, type 2 diabetes and colon cancer, and the quality adjusted life expectancy from the onset of these conditions was estimated (NICE, 2006). Subsequently, Anokye et al (2011) adapted this model for the same purposes and populated it with data from systematically reviewing the related literature and results from their own analysis of data from the health survey for England (Craig and Mindell 2008). Finally, a third model has been recently developed for NICE (Anokye et al., 2013), which is not a static decision tree model as the two previously mentioned ones, but rather a health state transition model based on a Markov process. It addresses a major limitation of the other models, namely the assumption that a change in physical activity behaviour would generally last long enough to achieve health benefits (i.e. that each person who changes physical activity becomes "fully engaged" and therefore reduces his/her likelihood of developing a disease).

3.1.4 Additional Action Group specific indicator-candidates for QoL

Following the review of clustering data for Action Groups A1, A3 and D4, which confirmed our initial selection of primary and secondary outcome indicators, we were able to define a set of additional candidates for Action Group specific outcome indicators.

It should be noted that this additional list of candidates is predominantly based on a review of Action Groups' good practices, thereby only informing the legitimacy criterion for each Action Group for which data was available. Whilst considerations on modelling issues have motivated our decision to exclude some potential candidates, the ability to establish a quantitative link to the EIP objectives and the headline target for the indicators identified below is generally unclear, and additional work will be required to assess whether they are actually suited for quantitatively modelling the EIP on AHA impact. In particular, deliverable D.2.4 will take into account evidence from a survey conducted across commitments to learn about the outcome indicators they use and for which data is more likely to become available, whilst the modelling concept for quantitatively linking outcomes to the Triple Win and the headline target will be discussed in much more detail in deliverable D.3.1. Hence, the indicators below constitute a short list of additional candidates whose ability to support the MAFEIP objectives will be checked through further research. The provisional list of **specific secondary indicators** consists of:

- **Adherence to treatment**

In accord with the main objective of Action group A1, which is *'to improve the quality of life and health outcomes of older people living with chronic conditions, through a holistic approach, including enhanced self-care, personalized care, better adequacy of treatment, increased adherence to safe and effective care plans'*, we identified patient adherence as an additional indicator specific to Action Group A1. Health economic literature exists which could help conceptualizing a link between a change in adherence levels and its impact on EIP on AHA objectives.

- **Frailty, cognitive decline and functional status**

The main objective of Action Group A3 is *'prevention and early diagnosis of frailty and functional decline, both physical and cognitive, in older people'* and unsurprisingly we found strong support from good practices in A3 in favour of the above mentioned indicators, However, the extent to which frailty, cognitive decline and functional status are correlated, the existence of modelling studies and value sets for disease states that would inform a quantitative link to the headline target, and the consequent need to further refine our choice of indicators is currently unclear and needs to be assessed in more detail in future deliverables (D.2.4 and D.3.1).

- **Falls**

While falls related indicators were not found frequently in the Reference Sites and Action Group data reviewed, a number of scientific sources support using No. of falls, No. of fallers or rate of falls. In addition, though data was not available from respective good practices, we consider falls to be relevant for Action Groups A2 and C2, and found 4 commitments in

Action Group A3 which reported collecting falls data. As for frailty, functional status and cognitive decline, more work will be required to assess the feasibility and usefulness of incorporating fall indicators into the quantitative monitoring framework.

The remainder of this section will discuss, per Action group, the reasons for including or excluding additional indicator candidates for the purposes of MAFEIP.

Action Group A1:

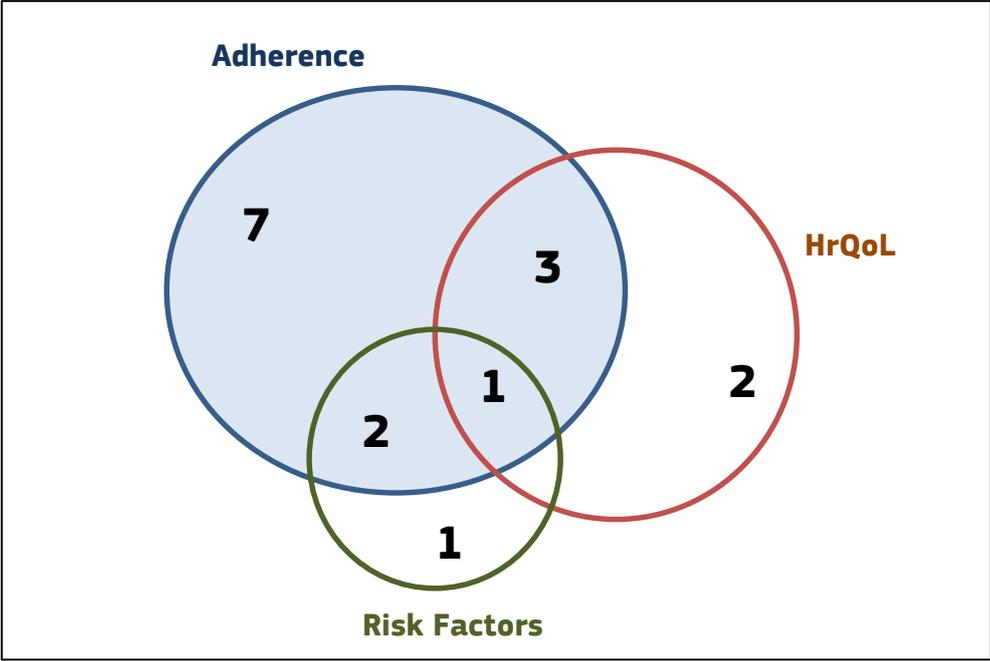
Screening commitments in Action Group A1 for the most relevant indicators resulted in strong support for our primary and common secondary indicators. Four additional indicators emerged as relevant for the QoL column: adherence (mentioned by 13 commitments); adverse drug effects (5 commitments); appropriateness of prescription (4 commitments) and health status (3 commitments).

We regard health status, adverse drug effects and appropriateness of prescription as inadequate for our purposes from a modelling perspective as they may be defined as "umbrella concepts" rather than unique indicators with well-defined health states, each consisting of a battery of potential outcome indicators. For instance, due to the way the initial monitoring framework has been designed, both "immunologic and virologic outcome" as well as "self-perceived health status" would fall under the category "health status". Likewise, adverse drug effects may range from 'nausea' or 'headache' to 'death', so that it may not be possible to quantify respective changes in quality adjusted life expectancy due to a change in adverse effects without knowing much more about the nature of the adverse events avoided. This might hold even more for the appropriateness of prescription, as this indicator does not just deal with the question of whether a particular substance and the respective daily doses prescribed are indicated for a particular patient, but also whether these substances or interactions of different substances may lead to adverse health effects for individuals. Both the data availability within MAFEIP and the resulting time required for conceptualising, implementing and populating quantitative models make neither the inclusion of 'health status', nor that of 'adverse drug effects' or 'appropriateness of prescription' appear feasible.

The remaining indicator with the strongest support from commitments in Action Group A1 was adherence, which makes it a potential candidate indicator for Action Group A1. We therefore considered two further aspects: first, what would be the 'incremental gain' from including patient adherence as an additional outcome indicator for the purposes of MAFEIP. In other words, from the 13 respective commitments, how many do not report information on primary and common secondary indicators already included in our proposal. Secondly, though this will be discussed much more thoroughly in deliverable D.3.1, we briefly checked whether there may be strong reasons against the inclusion of patient adherence as an additional candidate indicator from a modelling perspective.

As for the first question, consider the Venn diagram displayed in Figure 3. From 13 commitments reporting adherence rates, there are six which also report the use of HrQoL measures or risk-factors, or both. Hence, given our a priori preference for primary and common secondary indicators, for the respective commitments, there would be no need to consider additional data on adherence if HrQoL and changes in risk factors are provided. Our current proposal of primary and common secondary outcome indicators therefore has the potential to cover almost 50% of commitments reporting adherence levels. If we can reasonably argue that the impact of commitments modelled through HrQoL and / or risk factors could also be generalised to similar commitments within the same cluster for which there is no data on primary outcome indicators available, we could even make inferences about the potential impact of the latter group of commitments on the health objective of the EIP on AHA. Based on these results, one could consider dropping adherence rates from the list of potential outcome indicators for the purposes of the linkage to the Triple Win and the 2HLYs.

Figure 3 - Venn-Diagram of Adherence, HrQoL and Risk Factors suggested as outcome indicators based on commitments in Action Group A1



However, even though primary and common secondary outcome indicators would cover almost 50% of those commitments that report on adherence, we may still consider adherence as an additional indicator candidate for Action Group A1, provided that there are no strong reasons against its inclusion from a modelling point of view. From a health economic perspective, non-adherence results in reduced clinical efficacy of healthcare interventions while maintaining their healthcare costs (e.g. Greving et al., 2011, Gandjour, 2013). This may result in lower health outcomes as could be expected under a full-adherence scenario and also a reduced potential to avoid future healthcare cost, but at the full cost of the intervention. Hence, adherence is relevant both for the QoL and the sustainability of health systems column, and our aim would be to define a model that can be applied simultaneously in both columns. There may be models available to incorporate adherence-levels into MAFEIP (e.g. Gandjour 2013). For instance, assuming a linear relationship between patient adherence and treatment effectiveness, the effect of adherence could be modelled if we knew the interventions effectiveness given full adherence (e.g. from the scientific literature), as well as the baseline adherence and changes in adherence levels as reported by the respective commitments. This would then allow extrapolating changes in patient adherence to changes in quality adjusted life expectancy, provided that the scientific literature provides estimates on how interventions impact on HrQoL and mortality under a full-adherence scenario.

Action Group A3:

As with Action Group A1, there was good support for the primary and common secondary outcome indicators as previously chosen, i.e. HrQoL was reported by 18 commitments, physical activity by 14, Mortality by 8 and risk factors by 6 commitments. In addition to that, there were a number of indicators which seemed to be particularly relevant for Action Group A3. Above all was cognitive Functioning, which was mentioned by 17 commitments, followed by nutrition (12), mental health (11), frailty (10), functional decline (8), health status (7) and social participation (7).

As discussed within the context of Action Group A1, we decided to drop 'health status' from further consideration because of its wide definition, which makes it inappropriate for quantifying health impact within our proposal. Further, we have decided to drop social participation from the list of

potential indicators as, in 4 out of 7 commitments that reported the use of this indicator, HrQoL was also considered hence capturing the impact of these commitments on the QoL column already. This limits considerably the additional benefit from investing analytic resources into the development of quantitative models for this indicator. In addition, as social participation is an outcome that goes beyond the health dimension, it would be hardly compatible with our approach that rests on extrapolating health impacts to quality adjusted life years.

As it was mentioned by 12 commitments in Action Group A3, we thoroughly considered the inclusion of nutrition as an additional indicator for the quantitative assessment within MAFEIP. However, for several reasons we came to the conclusion that nutrition requires further analysis before making a final decision as to whether include or exclude this indicator. First and foremost, 'nutrition' is very broadly defined and, just like health status or adverse drug effects, rather an umbrella concept than an outcome indicator suitable for quantitative assessment; i.e. providing clearly defined health states with published health state utilities which are necessary for the construction of QALYs. This is also confirmed by A3 data, as for instance 'vitamin D intake', 'olive oil consumption' or 'dehydration' were, besides malnutrition, also subsumed under that category. As to 'malnutrition', further analysis may be required to assess both the additional coverage reached by including this indicator and the analytic resources required to conceptualise quantitative models and to populate them with data. In terms of additional coverage the A3 data shows that out of the 12 commitments that reported nutrition five would not be covered by HrQoL, mortality or physical activity (Table 3). Furthermore, if we considered only one additional indicator for which there is heavy support within Action Group A3, namely cognitive functioning, only two commitments would remain for which there is no overlap with other indicators. Hence, the relevance of nutrition is rather weak. Nevertheless we suggest neither to include nutrition in the list of potential candidates nor to drop this group of indicators entirely for the time being, but rather to wait until survey data becomes available to assess whether a quantitative model would be indicated and feasible. This will be reported in deliverables D.2.4. and D.3.1.

Table 3: Overlap between Nutrition and other indicators for commitments in Action Group A3

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nutrition (reported by 12 commitments in A3) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Physical Activity | | 1 | 1 | | 1 | | | | | | | |
| HrQoL | | 1 | 1 | 1 | | 1 | | | | | | |
| Falls | | 1 | 1 | 1 | | 1 | | | | | | |
| Mortality | | | 1 | 1 | | | 1 | | | | | 1 |
| Functional decline (additional candidate indicator for A3) | 1 | 1 | 1 | | | | | | 1 | | 1 | |

Four potential candidates remain for Action Group A3, namely cognitive functioning (17), mental health (11), frailty (10) and functional decline (8). It is not surprising that these candidates received strong support from the cluster data as they best describe the overall aim of Action Group A3, which is the 'prevention and early diagnosis of frailty and functional decline, both physical and cognitive, in older people' (A3 Action Plan).

Whilst we regard 'mental health' as a category which is too broad to be considered as an outcome indicator for Action Group A3, we realised that in many cases, the good practices data further specified 'depression' as the main condition within the mental health category. Further, out of 11 good practices reporting mental health as a potential outcome indicator, 4 also mention using HrQoL. We suggest neither to include mental health in the list of potential candidates nor to drop this group of indicators entirely for the time being, but rather to wait until survey data becomes

available to assess which diseases are most commonly referred to under 'mental health', and whether a quantitative model would be indicated and feasible. The feasibility of such a model would depend on the existence of health state utilities for a defined set of health states associated with a particular mental disease, such as depression. This will be reported in deliverables D.2.4. and D.3.1.

For cognitive decline, functional decline and frailty we also found some overlap with the use of HrQoL measures: 5 out of 17 for cognitive decline, 4 out of 8 for functional decline and 5 out of 10 for frailty. Additional questions also remain with respect to cognitive decline, frailty and functional decline - both cognitive and physical: first, can we regard them as independent conditions or do they interact, strengthen or support each other. For instance, Robertson et al (2013) stated that *'a number of epidemiological studies have reported that frailty increases the risk of future cognitive decline and that cognitive impairment increases the risk of frailty suggesting that cognition and frailty interact within a cycle of decline associated with ageing'*. Likewise, Zahodne et al (2013) conclude that *'cognitive declines appear to precede and cause functional declines prior to and following dementia diagnosis. Standardized neuropsychological tests are valid predictors of later functional changes in both non-demented and demented older adults.'* Only if we can disentangle interrelationships between disease states will we be able to develop and populate meaningful quantitative models for the purposes of MAFEIP

Unfortunately, after briefly screening the related literature we have not yet found useful studies, which is why we cannot yet answer the question of whether the inclusion of one or more of the above indicators is feasible within the scope of MAFEIP. Hence, more desk research will be required to better understand these relationships, to identify the concept that best describes the respective health states, and to assess whether quantitative information would be available to populate a decision model. All of this, however, should be addressed in much more detail in subsequent deliverables. Deliverable D.2.4 will clarify the actual need for including one or more of these indicators based on survey results. If, for instance, HrQoL (e.g. through SF-36 or EQ-5D) was available for most of the respective commitments, there would be no need to consider alternative indicators given our a priori preference for primary and common secondary indicators. Of the 30 commitments within the current clustering exercise that mentioned at least one of the named indicators for Action Group A3, 10 did also report the use of HrQoL indicators. If a stronger overlap was confirmed within the survey, it may be adequate to drop the above mentioned indicators. If, however, the need for including frailty, cognitive and/or functional decline is confirmed by the survey, deliverable D.3.1 will then assess in much more detail the feasibility of conceptualising and populating respective decision models for the purposes of MAFEIP. For the time being, we therefore suggest keeping frailty, functional and cognitive decline as potential candidates, and to further assess their usefulness and the feasibility of modelling once more information becomes available.

Action Group D4:

When looking into the D4 clustering data, it gets instantly apparent that the interventions within this Action Group have a much broader scope in the sense that they concern various aspects of life, including, but not limited to, the health domain. Accordingly, we obtained the impression that the potential outcome indicators mentioned in this Action Group have a wider definition than those considered in other Action Groups. For instance, within the other Action Groups, we consider HrQoL elicited through tools such as the EQ-5D or SF-36 instrument. However, for D4, we felt that QoL is usually defined in a broader context, potentially including non-health outcomes of the respective interventions. This makes sense for Action Group D4 because of its respective mix of interventions, but causes problems in terms of quantitative modelling as it does not allow extrapolating QoL outcomes on commitment level to QALYs.

The indicators mentioned most frequently within the QoL column across commitments were social participation (6) and self-sufficiency / independence (4). Unfortunately, we do not see a good chance of incorporating these indicators into our modelling approach, as we cannot easily establish quantitative links towards HrQoL and / or mortality, especially if elicitation methods used are not

confined to health outcomes. This does not mean that we do not regard such indicators as important. Especially in the light of the fact that D4 commitments focus on a broader variety of interventions that affect both health and non-health outcomes of individuals, it may be necessary to look into alternative indicators for D4 commitments which are independent of our quantitative modelling proposal. However, in terms of our proposed modelling approach, we see little chance to incorporate this data.

There may still be, however, a few commitments within D4 that could be considered for the quantitative assessment of impact within the context of our proposal. Precisely, quality of life was mentioned a number of times, and though we often had the impression that this was not confined to the health domain, one commitment explicitly mentioned the use of EQ-5D, and for a further two commitments, the use of a similar elicitation tool appeared to be likely because of their stronger health focus compared to other D4 commitments. In addition, physical activity was mentioned twice in such a way that our modelling approach could apply, and risk factors were mentioned once.

In conclusion, Action Group D4 poses the biggest challenges in terms of impact assessment and we could not identify additional indicators for D4 that could increase the applicability of our modelling approach within the QoL column. Some commitments may be still includable based on the choice of our common indicators HrQoL, physical activity and risk factors.

3.2 "Sustainability of health systems" column

While having distinguished between primary and secondary outcome indicators within the Quality of Life building block, we propose collecting information on the change in quantities of health and care resources for assessing the EIP on AHA impact on the sustainability of health and care systems. As the resources mostly affected may differ substantially on an individual commitment level, we start off from the list of potential resource use indicators mentioned in the initial framework (Figure 1), but also argue that the inclusion of additional resource use items may be adequate on an individual commitment level to better reflect their idiosyncratic resource use profiles and to provide an unbiased view on their impact on the sustainability of health systems.

3.2.1 Primary outcome indicators for 'Sustainability of Health Systems'

3.2.1.1 Summary of results

A key concern for most countries across the European Union is an ever rising demand for health and care services, resulting in constantly increasing pressure on the sustainability of health and care systems. Therefore, one of the main objectives of the EIP on AHA is the sustainability of health and care systems. As a consequence, we ought to consider how interventions by the commitments of the EIP on AHA may impact on the sustainability of the health and care systems across the EU. This includes both the cost associated with implementing (and scaling up) the health and social care models proposed within different commitments and Action Groups, and the potential cost savings from the respective interventions. Standard economic evaluation literature states that a costing exercise generally consists of two core elements (e.g. Drummond et al, 2005, Fox-Rushby & Cairns, 2005), and this has implications for our proposed choice of outcome indicators for the sustainability column, namely:

- **The measurement of the quantities of resource use.** Obtaining information on the change in resource use due to interventions delivered within and across Action Groups constitutes the core objective of MAFEIP activities within the sustainability of health and care systems column. As mentioned before, this includes both, resources consumed to implement such activities, but also the resources saved from avoiding adverse health events in the future, increasing efficiency in health and care delivery, or shifting health and care towards less resource intensive modes of delivery. The key question is whether EIP on AHA activities may result in net resource savings, and thereby contribute towards the sustainability of healthcare systems. Starting off from the initial framework, resource use

data include: hospital (re-) admissions by diagnosis; emergency admissions; length of hospital stay (bed days); number of consultations to primary care; pharmaceutical consumption, etc. However, on an individual commitment level, the resources predominantly affected may differ substantially, and may fall into a wide range of different categories. Hence, in order to accommodate this diversity and also ensure a robust and unbiased evaluation of EIP on AHA impact on the sustainability of health systems, we encourage commitments to report data on all major resources affected (positively and negatively) by their respective interventions. In order to facilitate efficient reporting and to harmonise between individual commitments, however, we propose developing a standard reporting format within the sustainability column, which we have also specified further below.

- **The assignment of unit costs or prices:** unlike resource use data, for which the input from commitments and Action Groups is key to assess the EIP on AHA impact on the sustainability of health and care systems, unit cost of resources may be collected via accompanying desk research by IPTS or may be provided by EIP on AHA participants. National average values could be used to allow better scaling up of results at health and care system and EU level, ultimately enabling to quantify the impact of EIP on AHA activities on the sustainability of health and care systems.

3.2.1.2 Legitimacy of primary outcome indicators for Sustainability of Health Systems

According to the information obtained from the stakeholder survey, the Reference Site review and the clustering exercise of good practices in Action Groups A1, A3, B3 and D4, the most frequently mentioned outcome indicators for the sustainability of health systems are related to:

- **Health and care resource use**, e.g. no of visits to primary care; measures of hospital / emergency admission and length of stay; no of people living in institutions.
- **Health and care cost / expenditures** (resource use valued in monetary units) e.g. drug cost, administrative costs, etc.

From a legitimacy point of view, the above mentioned outcome indicators score well across all sources of data analysed, which has also been confirmed through the review of Action Groups' good practices. Healthcare cost related measures have been mentioned 8 times in Action Group A1, 5 times in Action Group A3, 9 times in Action Group B3, and 2 times in Action Group D4 respectively. Hospitalisation was reported by 7 good practices in A1, 11 good practices in Action Groups A3 and B3 respectively, and 2 good practices in Action Group D4. Primary care visits were mentioned by 4 Good practices in both Action Groups A1 and A3, and 5 good practices in Action Group B3 respectively. However, three remarks should be made with respect to these potential outcome indicators.

First, collecting information on healthcare cost / expenditure (i.e. resource use weighted by unit cost) may be problematic as it does not allow transferring information obtained from individual commitments to other health and care settings, or even extrapolating from a local to a health and care system level. The main reason is that relative prices may differ substantially between settings, so that an identical change in resource utilisation in two settings may translate into completely different impact on the respective health and care budgets. In addition, unit costs of resources are also likely to change over time within the same setting, which may impact on respective budgets even if utilisation remains constant. As the relating health economic evaluation literature therefore supports the view that resource utilization data may be more transferrable to other health and care settings than unit cost data (e.g. Sculpher et al., 2004; Drummond et al, 2005; Fox-Rushby & Cairns et al, 2005, amongst many others), we ought to make explicit both the 'quantities of resources' and the 'unit cost' of these resources in order to generalise beyond the boundaries of what is originally being observed within individual commitments.

Secondly, we argue that the common element between all the indicators mentioned above is their strong focus on a change in the resources used due to interventions of the commitments of the EIP on AHA. Although the above mentioned indicators cover a range of potential resource use items,

they do not provide a comprehensive list of resources that may be affected substantially across vastly different commitments and Action Groups. In order to develop a monitoring framework that is sufficiently sensitive to measure EIP on AHA impact on 'sustainability' across a wide range of commitments with varying resource use profiles, we deem it necessary to allow commitments reporting resource use data on those items which they regard as substantially affected by the intervention under consideration (which may or may not been mentioned in the initial Assessment Framework (Figure 1). The rationale for our approach is further specified below.

Finally, whilst both resource use and cost related indicators received very strong support from Action Groups good practices, it needs to be mentioned that patient satisfaction also received strong backing across all Action Groups under review. Precisely, patient satisfaction was mentioned 13 times in Action Group A1, 15 times in A3, 11 times in B3, and 10 times in Action Group D4 respectively. Despite its strong backing from Action Groups' good practices, however, there are issues regarding the potential to link patient satisfaction towards the sustainability objective of the EIP for AHA as measured through its impact on respective health and care expenditures. We will pick up on this matter within section 4 of this report (issues for discussion)

3.2.1.3 Salience of primary outcome indicators for Sustainability of Health Systems

As mentioned before, we define the salience of an indicator for the purposes of MAFEIP as its ability to enable a link to the Triple Win and the headline target. For the sustainability of health and care systems, the main purpose of MAFEIP is to quantify resource utilization from EIP on AHA activities and measure it against health and care systems' expenditures across EU member states. Even though this "budget impact" of EIP on AHA will be ultimately expressed in monetary terms, we do not consider direct measures of healthcare costs or expenditure as appropriate indicators for the data collection within MAFEIP as it would not be possible to transfer findings from an individual commitment level to other healthcare contexts, or even to generalise to entire health and care system impact. Hence, our proposal is to collect resource use data from commitments within EIP for AHA Action Groups. Though clustering data provided some indication on important resource use items, we believe that individual commitments should determine which resources are substantially affected by their respective interventions, and which of these resources may also result in a significant impact on the health and care expenditures. This means that not all above mentioned resource use items may be relevant for each commitment, but also that some commitments may report on resource use items that have neither been mentioned in the initial framework nor in the section above. In order to facilitate and harmonise data collection across individual commitments and Action Groups, we suggest using a standard reporting format for the purposes of MAFEIP (as summarised further below).

Besides collecting information on the resources affected (both positively and negatively as well as within and outside the health and care sectors) by EIP on AHA interventions, our proposal is to collect information on unit cost for resources via desk research to be carried out by IPTS (if not reported by commitments). This research should result in a comprehensive list of unit cost (national averages) for those resources which are likely to substantially impact on the sustainability of health and care systems within and across EU countries. Making explicit the difference between resource use and unit cost has the further advantage that sensitivity analyses could be carried out with respect to a change in either cost or quantities. Finally, Decision Analytic Modelling may be used to extrapolate, from the existing data, the impact which EIP on AHA activities may have on entire health and care systems, should they be rolled out nationally. This will ultimately allow quantifying the impact of the EIP on AHA on the sustainability of health and care systems.

As the currently available information may prevent us from providing a comprehensive list of resource use items on which data shall be collected within the EIP on AHA, we instead suggest a standard reporting format, which we hope will facilitate and harmonise data reporting across EIP on AHA commitments. The key issues to address are the following:

- **What should be the viewpoint of the analysis?** (healthcare perspective, societal perspective, provider perspective, etc.) The key question is who bears the costs of the resources consumed / saved as a result of the intervention. A strict healthcare perspective (i.e. not taking into account cost in related sectors such as the social care system) may be a too restrictive viewpoint for the purposes of MAFEIP. We therefore propose a "health and care" perspective that simultaneously looks into the impact of the EIP for AHA on both health and care systems. As the boundaries between health and care systems may also differ between different countries, choosing a perspective that considers both may improve the comparability of results between different geographic settings. For instance, whilst some care related services are commonly being delivered by community nurses in a UK setting (and therefore not considered from a pure healthcare perspective), the same services may fall within the healthcare system in other countries where community nurses don't exist. However, an even broader perspective may also be indicated for several reasons. For some commitments / Action Groups, cost may be more restricted to health and care systems as for others. Only considering health and care resources may therefore bias results towards / away from particular Action Groups if substantial investments / savings lie outside the health and care systems. This may be particularly the case for Action Group D4. Secondly, provided that the overall impact of EIP for AHA activities is positive, it needs to be considered whether this result comes at the cost of increased pressure on the budgets available in other sectors, which may ultimately require a societal perspective. Consequently, we propose reporting of any resources which are substantially affected (positively and negatively) by individual interventions delivered within the EIP on AHA, irrespective of whether they fall within or outside the health and care systems, or whether they are borne by individual patients.
- **Which resource use items are most relevant?** Unlike for Quality of Life, where we proposed the use of a number of key indicators and elicitation tools and aimed to demonstrate their applicability to various commitments across EIP on AHA Action Groups, we have already specified above that individual commitments should determine which resources are substantially affected by their respective interventions, and which of these resources may also result in a significant impact on health and care expenditures. This implies that not all above mentioned resource use items may be relevant for each commitment, but also that some commitments may report on resource use items that have not been mentioned in the initial framework. By proposing to collect resource use data across commitments, and allowing for flexibility regarding the resource use items to be reported by individual commitments, we aim to align the monitoring framework with the requirements of individual commitments. However, it is also important that reporting is done within a reasonable standard for individual commitments. As a general rule, it may not be worthwhile to invest huge efforts to collect resource use information whose impact on respective expenditures is relatively small. Hence, resources which are consumed in small quantities and are characterised by low unit cost may not necessarily be reported for the purposes of monitoring the impact of the EIP on AHA on the sustainability of health and care systems. Finally, resource use shall be reported only for those resources which are likely to differ in their consumption between standard care and the intervention delivered within the EIP on AHA. Whilst this helps to narrow down the list of relevant resource use data to be reported, it also requires both reporting of baseline data (referring to standard health and care services, i.e. without the EIP on AHA intervention) and the differential resource use relating to the delivery of the intervention under assessment. Reporting incremental differences alone (without providing a picture of the standard care without the innovative intervention) will not be sufficient to estimate the impact of EIP on AHA activities on the sustainability of health systems.

- **What is the appropriate reporting format?** This question attempts to ensure sufficient data quality to allow efficient monitoring of EIP on AHA activities, and also to align reporting across individual commitments and Action Groups. We see the need for:
 - o A clear and comprehensive description of each resource use item potentially affected by the intervention
 - o A clear description of the unit of measurement for each resource use item (for instance, GP consultation minutes per patient over a certain time period; Number of bed days per patient over a pre-specified period of time, for pharmaceuticals total daily doses per patient, etc.)
 - o An estimated resource use at baseline and / or within a control group receiving standard care (to estimate resource use without the intervention)
 - o An estimated resource use which is due to the intervention delivered within the EIP on AHA. Incremental changes can then be calculated by subtracting the resource use at baseline from the resource use which is due to the intervention. Providing incremental data alone (i.e. the "deltas") is not sufficient for the purposes of linking resource use information to the sustainability of health systems. In other words, a baseline (usually defined in terms of standard care) is always required.
 - o An indication of the sector in which the resource use item falls (i.e. health system, care system (e.g. social services, community care), the patient, third parties, etc.).

By focusing on resource use alone we think that reporting efforts can be kept within a reasonable limit on a commitment/Action Group level. However, by allowing flexibility across commitments with respect to the resources to be reported (depending on what is most substantially affected by their respective interventions) we seek to accommodate individual commitments' needs to ensure wide applicability of the monitoring framework. Finally, by defining reporting standards, our aim is to facilitate efficient monitoring and to harmonise reporting across commitments and Action Groups within the EIP on AHA.

3.2.1.4 Credibility of primary outcome indicators for Sustainability of Health Systems

The evidence found shows two main types of outcomes: some studies report cost savings between intervention group and control group, others report results in terms of resource utilisation.

In the area of prescription and adherence (Action Group A1), some studies report outcomes in terms of resource utilisation in the case of adverse events or adherence for instance:

- Between 20.000 and 10.000 extra patients hospitalisation when NSAID (analgesic treatment of acute or chronic conditions) used in combination with anti-diabetes drugs; between 30.000 and 10.000 extra patients hospitalisation when NSAID used in combination with renin-angiotensin + furosemide (retrospective cohort study, Pratt et al 2010)
- Drug related ADEs responsible for 19% of hospital admissions, of which 65% preventable with better prescribing and increased adherence (prospective observational study, Perez Menendez-Conde et al (2011),
- High level of medication adherence associated with lower disease-related medical costs for diabetes, hypertension, hypercholesterolemia, and congestive heart failure, and lower hospitalisation rates: a high level of medication adherence was associated with lower disease-related medical costs, since higher medication costs (prescription drugs costs) were more than offset by medical cost reductions, producing a net reduction in overall healthcare costs (retrospective cohort study, Sokol et al 2005)
- A study on adherence intervention and diabetes II with specific focus on hypoglycaemic events (Lee et al 2006) showed significant decreases in HA emergency department visits, whereas HA-related hospitalizations and outpatient visits remained similar after the intervention;

- an analysis (Roebuck et al 2009) of the impact of adherence on annual numbers of inpatient hospital days, emergency department visits, and outpatient physician visits for patients with CHF, hypertension, diabetes and dyslipidemia showed:
 - Adherent patients had fewer inpatient hospital days annually;
 - Average annual pharmacy spending of adherent patients was higher;
 - Annual medical spending was significantly lower for adherent patients.
 - Across the board, adherent patients spent significantly less than non-adherent patients.

A number of sources including the above also provide data on costs, although it should be kept in mind that some of these studies only look at the intervention itself and not at side effects e.g.:

- A 13% rate of inappropriate drug prescribing using the Beers List measure and a 10.4% using IPET measure resulted respectively into avoidable per patient monthly costs of, respectively, €824.88 and €381.28 (annual costs of 10,000 and 4,500). The cost calculation was obtained using the Net Ingredient Cost (NIC) per month of the inappropriate medicines. It is, therefore, a net direct drugs cost not including the indirect medical services costs for potential adverse events and related avoidable hospitalisation (Consecutive cohort study, Ryan et al 2009).
- In the US the cost of unused drug and wastage/destruction is US\$ 1 billion (systematic review, Doggrell 2010).
- Inappropriate prescribing of Proton Pump Inhibitor (PPIs) over a follow-up period of 1034 patient-years translates into US\$1.5 million for prescribed PPIs and US\$ 233,994 for inappropriate over-the-counter PPIs (retrospective analysis)
- The study on adherence and diabetes II with specific focus on hypoglycaemic events mentioned earlier (Lee et al 2006) showed:
 - Total mean all-cause annual treatment costs were reduced by \$1590 per patient (from \$16,359 to \$14,769; $P < 0.01$);
 - Annual HA costs were reduced by \$788 per patient (from \$1415 to \$627; $P < 0.01$), predominantly as a result of decreased hospitalization costs (from \$857 to \$288; $P < 0.01$);
 - Annual DA costs were reduced by \$600 per patient (from \$8827 to \$8227; $P < 0.01$).

In sum, adherence to treatment in general can prevent hospitalization and connected costs.

In contrast for fall prevention (Action Group A2), the evidence on resource utilisation and cost effectiveness is limited for Europe and comes overwhelmingly from the USA, Canada and Australia. We only found one study dealing with a European country (the UK). We can highlight the following:

- In the UK, nearly 650,000 people above the age of 60 years fall and require a visit to hospital every year and the annual cost approaches £1 billion (Scuffham et al 2003).
- Multidisciplinary falls-prevention programs in New South Wales (Australia) have been shown to be effective with benefit to cost ratio of 20.6:1 generating significant savings (Hanley et al 2010).
- The US Falls Rehabilitation Program (Rizzo et al 1998) estimated the following preventable costs: a) \$3353 per person for those aged 65 to 74 years; and b) \$4192 per person for those aged 75 years and older (Wu et al 2010).
- A review of five trials (n=2474) each reporting fall-related re-admission as an outcome does not bring supporting evidence (Conroy et al 2012): over the full follow-up period for each the five trials there was no significant difference in readmissions comparing control to intervention groups [risk ratio 0.95 (95% CI 0.83–1.08)].

- Some more positive evidence is reported in the meta-review by Church et al (2011) for both community and residential care interventions which identifies the most cost-effective fall prevention interventions. The author also indicates clearly the main outcome measures against which fall prevention interventions should be assessed: a) fall-related admission; b) fall-related readmission; c) mortality; d) return Emergency Department visits; e) cumulative number of falls.

In the area of frailty and functional decline (Action Group A3) evidence on resource utilisation and cost is scarce. Nevertheless, the following sources are worth noting:

- The systematic review carried out by Wang et al. (2013) shows that frailty was associated with a higher risk of hospitalization or nursing home admission across the different definitions of frailty. For old adults, frailty, disabilities, and multiple morbidities appear to be strongly associated with hospitalization.
- Ellis et al. (2011) evaluate the effectiveness of comprehensive geriatric assessment (CGA) in hospital for older adults admitted as an emergency. A clear and significant improvement in the odds of a patient being alive and in their own home if they receive coordinated specialist services rather than conventional care in a hospital setting was found. However, there was no significant difference between the groups for the outcome of readmission to hospital and the analysis of length of stay was not performed due to the significant heterogeneity of the trials identified). Beyond hospital activity, Ellis et al. (2011) also reported the cost comprehensive geriatric assessment. The authors stated that most of the differences in cost are attributed to differences in length of stay or differences in the type and number of investigations requested between the groups.

As to integrated care (Action Group B3) and independent living (Action Group C2), evidence is scarcer. Nevertheless the earlier mentioned review by Wootton (2012) on the value of telemedicine in the management of five common chronic diseases (asthma, COPD, diabetes, heart failure, hypertension) identified hospitalisation as one of the four main quantitative outcomes to be measured.

- Eklund and Wilhelmson. (2009) have reviewed randomised controlled trials on integrated and coordinated interventions targeting frail elderly people living in the community, their outcome measurements and their effects on the client, the caregiver and healthcare utilisation. The results provide some evidence that integrated and coordinated care is beneficial for the population of frail elderly people and reduces health and care utilisation.
- Finally, Klersy et al. (2011) have assessed the cost-effectiveness and the cost utility of remote patient monitoring when compared with the usual care approach based upon differences in the number of hospitalizations, estimated from a meta-analysis of randomized clinical trials. The meta-analysis of 21 heart failure (HF) RCTs (5715) concluded that remote patient monitoring was associated with a significantly lower number of hospitalizations for HF [incidence rate ratio (IRR): 0.77, 95% CI 0.65–0.91, P, 0.001] and for any cause (IRR: 0.87, 95% CI: 0.79–0.96, P 1/4 0.003), while Length of Stay (LOS) was not different. The difference in costs between remote patient monitoring and usual care ranged from 300€ to 1000€, favouring remote patient monitoring.

4. Issues for discussion

4.1 Innovation and growth column

In the above section we have presented a proposal consisting of a set of primary and secondary indicators for the two columns Quality of Life and Sustainability of Health Systems for the purpose of monitoring the EIP on AHA outcomes. However the initial EIP on AHA monitoring framework contains a third column dealing with Innovation and Growth which we have not included here.

First of all, we would like to consider the indicators mentioned under the pillar 'Innovation'. Some of them are more macro-indicators, some are more process indicators like number of SME's involved, sectors involved, the number of users of a developed/implemented device. Others contain more specific information about the tool of intervention, like implemented technologies and devices. Therefore, we would like to suggest that some of this information will be part of the process analysis, which is addressed separately in the Report on "Outcome indicators review" annexed to MAFEIP deliverable D1.1 "Inception Report".

The following are innovation **process** indicators at the level of the Action Groups (though in some cases rather generic):

Innovation - SMEs/ Sectors involved

This dimension is already measured in the process questionnaire, see deliverable D2.1 which contains much more detailed information on this topic.

Innovation – Implemented technology and devices

There are a lot of indicators dealing with implemented technology and devices like:

- Internet: "Number of visits to website", "Number of users using website for appointment"
- "Number of subscribers to sms warnings" and "No. of users using apps"
- Number of users assisted by telehealth/telecare/telemedicine
- Number of users receiving care remotely

Employment rate, creation of jobs and **poverty and exclusion** under the Growth category are macro indicators.

In addition to the above, it should be noted that one important aspect to be measured within innovation is the added value of the EIP on AHA. While this is being addressed in the process indicators part of MAFEIP through answers from commitments to free text questions on this topic, some further reflection may be needed on how to best capture the network effect of the EIP on AHA. This may include additional field work, for instance, in the form of semi-structured interviews with EIP on AHA stakeholders. We are currently in the process of considering alternative modelling approaches for the innovation and growth column of the monitoring framework. More details on this issue, however, may only become available in deliverables D.2.4 and D.3.1.

4.2 Action Group D4 on innovation for age-friendly buildings, cities and environments

The analysis of Action Group D4 is the most challenging. Firstly, this area is very broad with somewhat unclear boundaries and definitions which made it difficult to identify relevant scientific literature to back potential indicators. Secondly, this Action Group is horizontal. For example interventions under this group could influence positively the physical environment to avoid falls (Action Group A2) and increasing social support and participation by the elderly. This also applies to Action Groups C2 and A3. To put it differently, Action Group D4 may comprise more community or city wide infrastructural interventions, whereas Action Groups C2, A2 and A3 relate to the provision

of specific services more tailored at the level of individual users / patients. Therefore, the analysis of the other Action Groups and indicators selected for those may also apply to the interventions of Action Group D4, though there may be additional indicators to consider to fully reflect the multidimensional impact of activities delivered within Action Group D4.

Analyzing good practices in D4 confirmed that the broader aim and the diversity of interventions delivered within this Action Group somewhat limits the applicability of our proposal. Indeed taking the Quality of Life column as an example, our proposal focusses inherently on health related quality of life while quality of life in D4 seems to have a broader meaning. We therefore feel that D4 may require an alternative approach. In this context we have recently been made aware of an initiative within Action Group D4 that looks into measures of QoL which go well beyond the health dimension (personal communication with an expert from TNO, Netherlands). However, this should be regarded as explorative work that may well have the potential to capture broader QoL outcomes for D4, but may not be compatible with our framework as both QALYs and HLY are measures which are strictly confined to health.

4.3 Excluded indicators and indicators which may require further discussion

The proposal we have made followed the logic of legitimacy, salience and credibility as explained earlier. This has led to the exclusion of some indicators from the initial framework which may be perceived as problematic. The main reasons for exclusion are summarised below.

- **Healthy life years**

Based on considerations of legitimacy, the use of 'healthy life years' was not sufficiently supported by the reviewed evidence. Initially, we have considered the inclusion of HLY as a potential outcome indicator for its ability to link directly to the headline target of the EIP on AHA, which has also been defined in terms of HLY. However, as data shows, it may be unlikely that commitments measure impact directly in terms of HLYs, or collect the required information on self-perceived disability in the form provided by the European health Module (part of EU-SILC) to construct HLYs for the respective target population. We therefore decided to drop HLYs from the list of potential outcome indicators for a quantitative assessment of the EIP on AHA.

- **Participation in society**

Participation in society is likely to be related to QoL outcomes. However, given the scarce data from the Reference Sites and the good practices across all Action Groups as well as the difficulties with establishing a quantitative link between "participation in society" and HrQoL and / or mortality, which would be required to extrapolate changes in participation in society to changes in QALYs, we suggest not to consider this indicator further for the purposes of MAFEIP.

- **Management of health services**

The issue of cost / **expenditures** has been addressed in section 3.2. This section gives strong reasons why it is advisable to collect resource use data rather than cost/ expenditure at an Action Group or commitment level, as the latter is regarded more context specific and therefore less transferrable to other settings or suitable for extrapolation from a local to a national level.

Organisation of care is an important issue especially with regard to Action Groups B3 on integrated care and C2 on independent living but also to some extent in other Action Groups. Elements of organisation of care that are related to resource use are covered by the proposed primary indicator for the sustainability column, however other elements such as guidelines and training programmes, scored low on legitimacy in the Reference Sites review and the clustering exercise while they scored high only in the 2012 survey that led to the definition of the initial framework. Furthermore in terms of salience, these indicators

seem hardly capable of enabling the link to the EIP on AHA headline targets. As neither the clustering data from Action Groups A1, A2, A3 and D4 nor the scientific literature review supported these items, ultimately they were excluded from our proposal.

- **Living in institutions**

This topic is covered by looking at the respective resources affected by the individual commitments (see reference to Health and care resource use at the start of section 3.2.1.2).

- **Old-age social spending**

This indicator also failed to pass our selection criteria for its lack of legitimacy. While it may be important for the EIP on AHA targets it did not appear more than a couple of times across all sources taken together so that we decided to exclude it from further consideration.

- **Access of care**

Access of care scored high in the initial framework data (August 2012), medium in the Reference Sites review and low in the Action Groups' clustering. Whilst our scientific literature review did not support the use of access of care as much as it did support other proposed indicators (such as HrQoL, mortality or risk factors), we do acknowledge that studies exist which directly link delayed or restricted access of care to health outcomes (and also healthcare resource use for that matter). This indicator was excluded from our proposal as we believe that other indicators may allow efficient monitoring of impact within respective Action Groups. In other words, the consequences of delayed or restricted access of care may be covered by indicators such as HrQoL and mortality for the QoL column, or resource use for the sustainability of health and care systems.

While we excluded the above from our current proposal of outcome indicators for the EIP on AHA monitoring framework, we identified through the August 2012 input of the Action Groups, the Reference Sites review, the Action Groups' good practices data and the literature review three items that need consideration as they came out frequently in both data sets, which gives them strong legitimacy:

- **Patient / User satisfaction**

For the sustainability column, patient / user satisfaction was the most recurrent indicator within D4, and it has also been mentioned very frequently in other Action Groups. We do not think that a link between patient / user satisfaction and the sustainability of health systems (in terms of EIP on AHA impact on available healthcare resources) can be established easily within the scope of this exercise. Nevertheless, the strong support in favour of the inclusion of patient / user satisfaction from both Reference Sites and Action Groups' data, could serve as a basis for including it as an additional outcome indicator for the sustainability of healthcare systems column, in particular as patient/user satisfaction may be regarded as an important criterion for successful implementation of technological and social innovation. Hence, further discussions may be needed to decide upon the inclusion / exclusion of this potential indicator for the purposes of MAFEIP, bearing in mind the analytic resources available for carrying out this work.

- **Mental health – in particular depression**

Whilst we regard 'mental health' as a category which is too broad to be considered as an outcome indicator for Action Group A3, we realised that in many cases, the good practices data further specified 'depression' as the main condition within the mental health category. We therefore suggest neither to include mental health in the list of potential candidates nor to drop this group of indicators entirely for the time being, but rather to wait until survey data becomes available to assess which diseases are most commonly referred to under 'mental health', and whether a quantitative model would be indicated and feasible. The feasibility of such a model would depend on the existence of health state utilities for a

defined set of health states associated with a particular mental disease, such as depression. This will be reported in deliverables D.2.4 and D.3.1.

- **Nutrition**

As it was mentioned by 12 commitments in Action Group A3, we thoroughly considered the inclusion of nutrition as an additional indicator for the quantitative assessment within MAFEIP. However, for several reasons we came to the conclusion that nutrition requires further analysis before making a final decision as to whether include or exclude this indicator. First and foremost, 'nutrition' is very broadly defined and, just like health status or adverse drug effects, rather an umbrella concept than an outcome indicator suitable for quantitative assessment; i.e. providing clearly defined health states with published health state utilities which are necessary for the construction of QALYs. This is also confirmed by A3 data, as for instance 'vitamin D intake', 'olive oil consumption' or 'dehydration' were, besides malnutrition, also subsumed under that category. As to 'malnutrition', further analysis may be required to assess both the additional coverage reached by including this indicator and the analytic resources required to conceptualise quantitative models and to populate them with data. In terms of additional coverage the A3 data shows that out of the 12 commitments that reported nutrition five would not be covered by HrQoL, mortality or physical activity (Table 3). Furthermore, if we considered only one additional indicator for which there is heavy support within Action Group A3, namely cognitive functioning, only two commitments would remain for which there is no overlap with other indicators. Hence, the relevance of nutrition is rather weak. Nevertheless we suggest neither to include nutrition in the list of potential candidates nor to drop this group of indicators entirely for the time being, but rather to wait until survey data becomes available to assess whether a quantitative model would be indicated and feasible. This will be reported in deliverables D.2.4 and D.3.1.

The legitimacy of the above indicators may be confirmed once the data from the survey currently carried out across commitments becomes available. Their credibility and salience would also require further checking, and this may be reported in deliverable D.3.1.

4.4 Data availability

The proper monitoring of the EIP on AHA over the period 2012-2020 is a mid to long term project which requires the definition of a baseline and the regular recording of changes so as to draw conclusions on the impact of the EIP on AHA on the headline targets in 2020. Since activities in most commitments have only just started, outcomes may not be expected immediately. In addition, the definition of the baseline data is a crucial aspect for successful monitoring. While it cannot be expected that a perfect set of standardized data is achieved, we should aim for data that is sufficiently robust to enable the linking to the 2HLYs and the Triple Win. This is why it is important that commitments provide information regarding at least one outcome indicator per column (if relevant), and it also let us to define a reporting format for the purposes of MAFEIP.

5. Conclusions

The EIP on AHA monitoring framework initially developed in 2012 by the EC in close cooperation with the EIP on AHA Action Groups and experts needed to be operationalized. In an ideal monitoring situation, standardized data would be collected from the activities to be monitored on a set of common indicators. However because of the early stages of the EIP on AHA and the diversity of commitments within each Action Group such data is not yet and (may never be fully) available.

In the absence of reference data, it was decided to jointly review three sources of data which provided information on outcome indicators and which were either directly or closely related to the activities undertaken by the EIP on AHA commitments, namely:

- The 2012 data that shaped the initial monitoring framework.
- The data from 71 good practices submitted by EIP on AHA Reference Sites.
- And the data from the good practices of EIP on AHA Action Groups A1, A3, B3 and D4.

This joint analysis sought to identify most frequently mentioned outcome indicators. Following the compilation of results from these sources, the outcome indicators found across the data sets were checked for their legitimacy, salience and credibility. The latter was done by using the results of a systematic scientific literature review which helped checking the validity and reliability of each identified indicator for the purposes of MAFEIP as a whole, but also on an individual commitment level, thus contributing to a greater robustness of the framework when it comes to linking EIP on AHA outcomes with the headline target of 2HLYs and the Triple Win.

As a result of the above process, we propose to retain for the purpose of a quantitative assessment within MAFEIP a set of primary outcome indicators for the EIP on AHA monitoring framework column on Quality of Life, which fulfilled our three selection criteria (legitimacy, salience and credibility), namely:

- Health-related Quality of life (HrQoL).
- Mortality.

We also propose a set of common secondary indicators for Quality of Life based on their strong legitimacy but lower degree of salience.

- Risk factors
- Physical activity

Finally, through the review of Action Groups good practices data, we identified a set of additional candidate indicators that are specifically related to particular Action Groups, but for which we would require more work to assess their potential to be quantitatively linked to the health objective of the EIP for AHA. These additional candidates are:

- Adherence to treatment (A1)
- Frailty (A3)
- Cognitive decline (A3)
- Functional status (A3 / B3)
- Falls (A2 / C2 / to some extent A3)

For the sustainability of health systems, we propose to assess the impact of the EIP for AHA in terms of changes in the use of healthcare resources valued in monetary units. Consequently, we propose to collect data on:

- Measures of resource use, for instance:
 - Hospital / emergency admission and length of stay

- Number of visits to primary care; number of outpatient visits; number of referrals to external providers; number of home visits; etc.
- Living in institutions, for instance: long term care admissions; number of patients institutionalized; number of elderly receiving care at home after hospitalization etc.

In addition, we propose that commitments shall report relevant resource use data for all items of resource use which they regard as substantially affected by their particular interventions, not just those items listed above which have been previously mentioned in the initial framework. In order to foster efficient reporting of resource use data across commitments and Action Groups, we propose some reporting format for the purposes of MAFEIP.

While we are confident in the soundness of our proposal with regard to the data reviewed, we would like to underline that some open issues need to be addressed such as indicators for Innovation and Growth and for Action Group D4. It is also important to stress that primary data from commitments' activities was not available at the time of writing. Therefore, the selection of indicators we propose has been based on a proxy for data availability, by using as a starting point the frequency of occurrence of outcome indicators in the data sources reviewed. Nevertheless, to monitor the EIP on AHA activities, all commitments should ideally provide information on at least one outcome indicator per column.

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7. Annexes

Annex 1 - Overview of indicators

Table 4: Overview of indicators on Quality of Life - Health Status

| | | Health Status | | | | | | | | | | | | |
|---|--|---|------------------------------------|-----------------------------|--------------------------------------|---|--------------------------|-----------------------|-------------------------|--------------------------------------|-------------------------------|---|-----------------|-------------------------|
| | | Health status | | | | QoL | | Other Health status | | | | | | |
| | | HLY | Perceived health status of elderly | Self-reported health of 50+ | Identified condition (e.g. dementia) | Quality of Life | Life satisfaction of 50+ | Well-being | Functional consequences | Self-sufficiency/staying independent | | Mental well-being | Security/safety | Stress/anxiety |
| | | | | | | | | Health and well being | | Autonomy | Early care of persons at risk | | | Reduced fear of falling |
| August 2012 Framework (survey outcomes) | | 35 | | | | | | | | | | | | |
| Reference sites review | | 6 | | | | 18 | | 5 | 7 | 4 | 2 | 4 | 2 | |
| Macro indicators (D.1.1 inception report annex 1) | | 48 | | | | | | | | | | | | |
| | | 2 | | | 1 | | 3 | 2 | 2 | | 1 | | | |
| | | 11 | | | | | | | | | | | | |
| B3 clustering | Integrated care | 1 | | | 2 | 7 | 2 | 3 | 2 | | 1 | | 1 | |
| | Screening and prevention | | | | 1 | 1 | 1 | | 2 | | | | | |
| | Sharing health information | | | | | 5 | 3 | 2 | | | | | | |
| | Telehealth, telecare and remote monitoring | | 1 | | | 6 | | | 1 | | | | | |
| | all clusters | 1 | 1 | 0 | 3 | 19 | 0 | 6 | 5 | 5 | 0 | 1 | 0 | 1 |
| | total | 41 | | | | | | | | | | | | |
| Scientific literature (D.1.1) | A1 | | | | | | | | | | | | | |
| | A2 | retain Health Status | | | | There are studies that attempt to link fall prevention interventions with quality of life outcomes and in particular with 'feeling safe' or 'fear for falling'. Measurement of quality of life through e.g.: SF-36; EQ5-D, etc. Recommendation to use QALYs gained. | | | | | | There are studies that attempt to link fall prevention interventions with quality of life outcomes and in particular with 'feeling safe' or 'fear for falling'. | | |
| | A3 | Nutrition, Daily physical activities and Health status determine and influence the level of frailty | | | | | | | | | | | | |
| | B3 | Health status | | | | Positive impacts of the use of ICT on QoL indicators | | | | Active ageing index | | | | |
| | C2 | | | | | Recommendation to use QALY. The various supporting instruments that can be used include: SF-36 ; RAND-36 ; QUALEFFO ; Euroqol 5-D ; WHOQOL – BREF. | | | | | | | | |
| | D4 | | | | | | | | | | | | | |

Table 5: Overview of indicators on Quality of Life - Mortality and Injuries

| | | Mortality and injuries | | | | | | | | |
|--|---|---|---------------------|-----------------|----------|---------------|------|----------|---|-------------|
| | | Mortality and injuries | | | | | | | Rate of Falls | |
| | | Life expectancy | Main cause of death | Chronic disease | Diabetes | Heart Failure | COPD | Dementia | Suicide | No of falls |
| August 2012 Framework (survey outcomes) | | 1 | | | | | | | | |
| Reference sites review | | 7 | | | | | | | 5 | |
| Macro indicators (D.1.1 inception report annex 1) | | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | |
| | | 12 | | | | | | | | |
| B3 clustering | Integrated care | | | | | 1 | | | | |
| | Screening and prevention | | | | | | | | | |
| | Sharing health information | | | | | | | | | |
| | Telehealth, telecare and remote monitoring | | 3 | | | | | | | |
| | all clusters | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | |
| Scientific literature (D.1.1) | A1 | retain "causes of death", reformulate as mortality rates by disease to be measured among the target population addressed (e.g. mortality rates among diabetes II patients, COPD patients, etc.) | | | | | | | | |
| | A2 | retain causes of death | | | | | | | Measure of fall reduction: - numbers of falls and - rate of falls - number of fallers. - falls avoided Mortality rates among elderly treated for fall prevention | |
| | A3 | The complexity of frailty does not allow us to find unequivocal and convergent causal coefficients on "outcome" indicators proposed in the framework for this Action Group. | | | | | | | | |
| | B3 | | | | | | | | | |
| | C2 | | | | | | | | | |
| | D4 | | | | | | | | | |

Table 6: Overview of indicators on Quality of Life - Risk Factors

| | | Risk factors | | | |
|---|--|---|-------------|---------|-----|
| | | Blood pressure | Cholesterol | Glucose | BMI |
| August 2012 Framework (survey outcomes) | | 31 | | | |
| Reference sites review | | 2 | | | |
| Macro indicators (D.1.1 inception report annex 1) | | 2 | 2 | 2 | 3 |
| | | 9 | | | |
| B3 clustering | Integrated care | 2 | | 1 | 1 |
| | Screening and prevention | 1 | 1 | 1 | 1 |
| | Sharing health information | 2 | 1 | 2 | 1 |
| | Telehealth, telecare and remote monitoring | 7 | 3 | 4 | 5 |
| | all clusters | 12 | 5 | 8 | 8 |
| total | | 33 | | | |
| Scientific literature (D.1.1) | A1 | Retain "risk factors", Evidence of reduction of risk factors and of mortality risks or rates (by diseases). Ample general evidence (though not reviewed here) showing that reducing risk factors reduce the disease progression and prevalence. | | | |
| | A2 | | | | |
| | A3 | | | | |
| | B3 | retain risk factors | | | |
| | C2 | | | | |
| | D4 | | | | |

Table 7: Overview of indicators on Sustainability of Health Systems - Hospitalisation

| | | # Hospitalisations | | | | |
|---|--|---|-------------------------|--|---------------------------------|---------------------|
| | | No. of hospitalisation (or reduction of) (or entry/discharge) | No of rehospitalisation | Direct hospitalisation rate (no emergency visit) | No of avoidable hospitalisation | Time to readmission |
| August 2012 Framework (survey outcomes) | | 19 | | | | |
| Reference sites review | | 10 | | | | |
| Macro indicators (D.1.1 inception report annex 1) | | 6 | 1 | 0 | 0 | 0 |
| | | 7 | | | | |
| B3 clustering | Integrated care | 5 | 2 | 0 | 2 | 1 |
| | Screening and prevention | 0 | 0 | 0 | 0 | 0 |
| | Sharing health information | 0 | 0 | 0 | 0 | 0 |
| | Telehealth, telecare and remote monitoring | 6 | 3 | 0 | 0 | 0 |
| | all clusters | 11 | 5 | 0 | 2 | 1 |
| Scientific literature (D.1.1) | A1 | Retain: "hospital re-admission" • Total number of hospital re-admissions for the sample of patients included in the monitored intervention and/or hospital re-admission rate (number of re-admissions divided by the total number of patients); • Hospitalisation rate (hospitalized patients / total number of patients); • Hospitalisation risk (probability of 1 or more hospitalizations during a given time period, expressed as a percentage); Retain: "Hospital bed days" • Total number of hospital bed days for the sample of patients included in the monitored intervention | | | | |
| | A2 | Retain hospital re-admission, Hospital admissions Some authors indicate clearly the main outcome measures against which fall prevention interventions should be assessed: a) fall-related admission; b) fall-related readmission; c) mortality; d) return Emergency Department visits; e) cumulative number of falls. Total number of fall-related hospital re-admissions for the sample of patients included in the monitored intervention and/or hospital re-admission rate (number of re-admissions divided by the total number of patients); | | | | |
| | A3 | Retain: "hospital re-admission" and "hospital bed days" | | | | |
| | B3 | Hospital (re)admissions and hospital bed days (length of stay) For sustainability of health systems, we suggest to include the following indicators: - Hospital admission - Hospital readmission - Length of stay - Emergency admissions | | | | |
| | C2 | Hospitalisation and Institutionalisation costs (savings). Per user institutionalisation costs / cost saved for users maintained at home in the local areas of the monitored intervention; | | | | |
| | D4 | | | | | |

Table 8: Overview of indicators on QoL – A1 Clustering

| Framework | Main categories D.1.1 | Detailed categories (D.1.1 - annex) | August 2012 Framework (survey outcomes) | A1 clustering | | | | | | | |
|---|-----------------------------|--|---|-------------------------------|---|--------------------------------|--------------------------|-------|-----------------|---|---|
| Categories | Categories | Indicators | No. | Adherence | Polypharmacy & appropriate prescription | User empowerment / information | Research and methodology | Other | all A1 clusters | total Nr of commitments using indicator | |
| Nutrition | | Typology of food supplements | 6 | | 1 | 1 | | | 2 | 2 | |
| Physical activity | | Activity levels | 5 | 1 | | 1 | | | 2 | 2 | |
| | | Self-reported activity 50+ | | | | | | | | | |
| Risk factors | | Blood pressure | 31 | 2 | 1 | 1 | | | 4 | 4 | |
| | | Cholesterol | | 1 | | | | | 1 | | |
| | | Glucose | | 1 | 1 | 1 | | | 3 | | |
| | | BMI | | | | | | | | | |
| Health Status | Health status | HLI | 35 | | | | | | | 3 | |
| | | Perceived health status of elderly | | 2 | | | | | 2 | | |
| | | Self-reported health of 50+ | | | | | | | | | |
| | | Identified condition (e.g. dementia) | | 1 | | | | | 1 | | |
| | QoL | Quality of Life | | 3 | 2 | 1 | 0 | 1 | 7 | 7 | |
| | | Life satisfaction of 50+ | | | | | | | | | |
| | | Health and well being | | | | | | | | | |
| | Well-being | Functional consequences | | | 1 | | | | | 1 | 1 |
| | | Self-sufficiency/staying | | Autonomy | | | | | | | |
| | | Mental well-being | | Early care of persons at risk | | | | | | | |
| Security/safety | | | | | | | | | | | |
| Stress/anxiety | Reduced fear of falling | | | | | | | | | | |
| Access of Care | Waiting lists/waiting time | Waiting list/ time | 21 | | | | | | | | |
| | | Availability of services in foreign languages | | | | | | | | | |
| | | Inhabitants per GP / per nurse | | | | | | | | | |
| Participation in Society | Social Participation | Social participation | 14 | | | | | | | | |
| | | Amount of time dedicated to volunteering | | | | | | | | | |
| | | Volunteering activity 50+ (%) | | | | | | | | | |
| | | Percentage of formal vs. informal volunteering | | | | | | | | | |
| | | Percentage of 50+ voting | | | | | | | | | |
| | Social isolation/loneliness | | | | | | | | | | |
| Voluntary work | | | | | | | | | | | |
| Mortality and injuries | Mortality and injuries | Life expectancy | 1 | | | | | | | | |
| | | Main cause of death | | | | | | | | | |
| | | Chronic disease | | | | | | | | | |
| | | Diabetes | | | | | | | | | |
| | | Heart Failure | | | | | | | | | |
| | | COPD | | | | | | | | | |
| | | Dementia | | | | | | | | | |
| | Suicide | | | | | | | | | | |
| Rate of Falls | No of falls | | | | | | | | | | |
| Additional categories suggested (in review, clustering, or by project team members) | | Adherence (A1) | n.a. | 10 | 3 | | | | 13 | 13 | |
| | | Appropriateness of prescription | | 1 | 3 | | | | 4 | 4 | |
| | | Adverse effects (A1) | | | 5 | | | | 5 | 5 | |
| | | cognitive function (A3) | n.a. | | | | | | | | |
| | | Frailty (A3) | n.a. | | | | | | | | |

Table 9: Overview of indicators on QoL – A3 Clustering

| Framework | Main categories D.1.1 | Detailed categories (D.1.1 - annex) | A3 clustering | | | | | | | | |
|---|----------------------------|--|-------------------|--------------------|-------------------|-----------|-------------------------|-------------------|-----------------|---|--|
| Categories | Categories | Indicators | Frailty (general) | Functional decline | Cognitive decline | Nutrition | Dependancy & Caregivers | Physical exercise | all A3 clusters | total Nr of commitments using indicator | |
| Nutrition | | Typology of food supplements | 5 | 2 | | 5 | | | 12 | 12 | |
| Physical activity | | Activity levels | 5 | | 2 | | | 7 | 14 | 14 | |
| | | Self-reported activity 50+ | | | | | | | | | |
| Risk factors | | Blood pressure | 2 | | | | | 4 | 6 | 6 | |
| | | Cholesterol | | | | | | 1 | | | |
| | | Glucose | | | | | | 1 | | | |
| | | BMI | 1 | | | | | 1 | | | |
| Health Status | Health status | HLY | | | | | | | | 7 | |
| | | Perceived health status of elderly | | | | | | | | | |
| | | Self-reported health of 50+ | | | | | | | | | |
| | | Identified condition (e.g. dementia) | 2 | 1 | 1 | 1 | 1 | 1 | 7 | | |
| | QoL | Quality of Life | 7 | 3 | 2 | 0 | 2 | 4 | 18 | 18 | |
| | | Life satisfaction of 50+ | | | | | | | | | |
| | Well-being | Health and well being | | | | | | | | | |
| | Functional consequences | | 4 | 1 | | 1 | | 2 | 8 | 8 | |
| | Self-sufficiency/staying | Autonomy | | | | | | | | | |
| | | Early care of persons at risk | | | | | | | | | |
| Mental well-being | | 3 | 1 | 4 | 2 | 1 | | 11 | 11 | | |
| Security/safety | | | | | | | | | | | |
| Stress/anxiety | Reduced fear of falling | | | | | | | | | | |
| Access of Care | Waiting lists/waiting time | Waiting list/ time | | | | | | | | | |
| | | Availability of services in foreign languages | | | | | | | | | |
| | | Inhabitants per GP / per nurse | | | | | | | | | |
| Participation in Society | Social Participation | Social participation | 2 | 1 | 4 | | | | 7 | 7 | |
| | | Amount of time dedicated to volunteering | | | | | | | | | |
| | | Volunteering activity 50+ (%) | | | | | | | | | |
| | | Percentage of formal vs. informal volunteering | | | | | | | | | |
| | Percentage of 50+ voting | | | | | | | | | | |
| Social isolation/loneliness | | | | | | | | | | | |
| Voluntary work | | | | | | | | | | | |
| Mortality and injuries | Mortality and injuries | Life expectancy | | | | | | | | | |
| | | Main cause of death | 5 | 1 | | 1 | 1 | | 8 | 8 | |
| | | Chronic disease | | | | | | | | | |
| | | Diabetes | | | | | | | | | |
| | | Heart Failure | | | | | | | | | |
| | | COPD | | | | | | | | | |
| | Dementia | | | | | | | | | | |
| Suicide | | | | | | | | | | | |
| Rate of Falls | No of falls | 3 | 1 | | | | | 4 | 4 | | |
| Additional categories suggested (in review, clustering, or by project team members) | | Adherence (A1) | | | | | | | | | |
| | | Adverse effects (A1) | | | | | | | | | |
| | | cognitive function (A3) | 6 | | 6 | 4 | | 1 | 17 | 17 | |
| | | Frailty (A3) | 8 | 1 | | | 1 | | 10 | 10 | |

Table 10: Overview of indicators on QoL – D4 Clustering

| Framework | Main categories D.1.1 | Detailed categories (D.1.1 - annex) | D4 clustering | | | | | | | | | | | |
|---|-----------------------------|--|-------------------------------|---------|-------------------|-------------------------------------|---------------------|----------------|-------------------|---------|----------|--------------|---|---|
| Categories | Categories | Indicators | AAAL | Housing | Urban Environment | Age friendly: business and services | Age friendly: voice | Transportation | Physical Activity | Tourism | Dementia | all clusters | total Nr of commitments using indicator in D4 | |
| Nutrition | | Typology of food supplements | | | | | | | | | | | | |
| Physical activity | | Activity levels | | | | | | | 2 | | | | 2 | |
| | | Self-reported activity 50+ | | | | | | | | | | | | |
| Risk factors | | Blood pressure | 1 | | | | | | | | | | 1 | |
| | | Cholesterol | | | | | | | | | | | | |
| | | Glucose | | | | | | | | | | | | |
| | | BMI | | | | | | | | | | | | |
| Health Status | Health status | HLY | | | | | | | | | | | | |
| | | Perceived health status of elderly | | | | | | | | | | | | |
| | | Self-reported health of 50+ | | | | | | | | | | | | |
| | | Identified condition (e.g. dementia) | | | | | | | | | | | | |
| | QoL | Quality of Life | Quality of Life | 1 | | | | | | | | | | 1 |
| | | | Life satisfaction of 50+ | | | | | | | | | | | |
| | | Well-being | Health and well being | | | | | | | | | | | |
| | | Functional consequences | | | | | | | | | | | | |
| | | Self-sufficiency/staying | Autonomy | 3 | | | | | 1 | | 1 | | | 5 |
| | | Mental well-being | Early care of persons at risk | | | | | | | | | | | |
| Security/safety | | | | | | | | | | | | | | |
| Stress/anxiety | Reduced fear of falling | | | | | | | | | | | | | |
| Access of Care | Waiting lists/waiting time | Waiting list/ time | | | | | | | | | | | | |
| | | Availability of services in foreign languages | | | | | | | | | | | | |
| | | Inhabitants per GP / per nurse | | | | | | | | | | | | |
| Participation in Society | Social Participation | Social participation | 4 | | 1 | 1 | | | | | 1 | | 7 | |
| | | Amount of time dedicated to volunteering | | | | | | | | | | | | |
| | | Volunteering activity 50+ (%) | | | | | | | | | | | | |
| | | Percentage of formal vs. informal volunteering | | | | | | | | | | | | |
| | | Percentage of 50+ voting | | | | | | | | | | | | |
| | Social isolation/loneliness | | | | | | | | | | | | | |
| Voluntary work | | | | | | | | | | | | | | |
| Mortality and injuries | Mortality and injuries | Life expectancy | | | | | | | | | | | | |
| | | Main cause of death | | | | | | | | | | | | |
| | | Chronic disease | | | | | | | | | | | | |
| | | Diabetes | | | | | | | | | | | | |
| | | Heart Failure | | | | | | | | | | | | |
| | | COPD | | | | | | | | | | | | |
| | | Dementia | | | | | | | | | | | | |
| | Suicide | | | | | | | | | | | | | |
| Rate of Falls | No of falls | | | | | | | | | 1 | | 1 | | |
| Additional categories suggested (in review, clustering, or by project team members) | | Adherence (A1) | | | | | | | | | | | | |
| | | Adverse effects (A1) | | | | | | | | | | | | |
| | | cognitive function (A3) | | | | | | | | | | | | |
| | | Frailty (A3) | | | | | | | | | | | | |

Table 11: Overview of indicators on Sustainability of Health Systems – A1 Clustering

| Framework | Main categories D.1.1 | Detailed categories (D.1.1 - annex) | A1 clustering | | | | | | |
|-----------------------------------|-----------------------------------|---|--------------------|---|--------------------------------|--------------------------|-------|-----------------|---|
| Categories | Categories | Indicators | Adherence | Polypharmacy & appropriate prescription | User empowerment / information | Research and methodology | Other | all A1 clusters | total Nr of commitments using indicator in A1 |
| Hospitalisation | Emergency admissions / visits | No of emergency visits | 2 | 2 | | | | | 4 |
| | | Rate of readmission to emergency | | | | | | | |
| | Hospital (re-) admission | No. of hospitalisation (or reduction of) (or entry/discharge) | 2 | 4 | | | 1 | | 7 |
| | | No of rehospitalisation | | | | | | | |
| | | Direct hospitalisation rate (no emergency visit) | | | | | | | |
| No of avoidable hospitalisation | | | | | | | | | |
| | | Time to readmission | | | | | | | |
| Hospital bed days | average length of stay | Average Length Of Stay (ALOS) | | | | | | | |
| | | ALOS readmission | | | | | | | |
| management of health services | Healthcare costs / expenditures | Healthcare costs | 2 | 4 | | 2 | | | 8 |
| | | Operating cost of clinical services | | | | | | | |
| | | Administrative costs | | | | | | | |
| | | Hospitalisation costs | | | | | | | |
| | | Costs of hospital diagnosis services | | | | | | | |
| | | Hip fracture costs | | | | | | | |
| | resource use | No of repeated visits to hospital | | | | | | | |
| | | No. of visits to primary care | 3 | | 1 | | | | 4 |
| | | No of consultations | | | | | | | |
| | | No of outpatient visits | | | | | | | |
| | | No of referral to external providers | | | | | | | |
| | | No of home visits | | | | | | | |
| | | Night care | | | | | | | |
| | | Care consumption | | | | | | | |
| | | No. of cancelled prescriptions | | | | | | | |
| | | Percentage of decrease in medication | | | | | | | |
| | | No of early diagnosis | | | | | | | |
| | | No of early detections | | | | | | | |
| | | Cost-benefit | | | | | | | |
| | | Performance | Cost effectiveness | 1 | | 1 | 1 | | |
| | | Efficiency | | | | | | | |
| | Organisation of care | Enabling new models of care | | | | | | | |
| | | Service coordination | | | | | | | |
| | | Reduced workload for Healthcare professionals | | | | | | | |
| | | Time savings for care professionals | | | | | | | |
| | | Length of discharge process | | | | | | | |
| | | Waiting time to social services delivery | | | | | | | |
| | Number of implemented guidelines | Implemented/ improved guidelines | | | 1 | 1 | | | 2 |
| | | No. of geriatric assessments | | | | | | | |
| | Education, training workforce | Number of registrations to courses | | | | | | | |
| | | Number of professionals trained | | | | | | | |
| | | Number of professionals aware | | | | | | | |
| | | Health education programmes | | | | | | | |
| | Integrated care models | | | | | | | | |
| | implemented self care models | | | | | | | | |
| | business models | | | | | | | | |
| | e-prescription | | | | | | | | |
| | Quality of care | Error reduction | | | | | 1 | | 1 |
| | User empowerment | User empowerment | | | 1 | 1 | | | 2 |
| | Patient satisfaction | User satisfaction | | | | | | | |
| Quality of care | | | | | | | | | |
| Patient satisfaction | | 4 | 2 | 3 | 1 | 3 | | 13 | |
| Institutionalisation | avoided long term care admissions | Long Term Care (LTC) admissions | | | | | | | |
| | | Time to LTC for dementia | | | | | | | |
| | | No. of elderly receiving care at home after hospitalisation | | | | | | | |
| | living in institutions | No. of independent elderly | | | | | | | |
| Risk of entry into nursing home | | | | | | | | | |
| No. of patients institutionalised | | | | | | | | | |
| Old age social spending | | Percentage of population in inadequate housing | | | | | | | |

Table 12: Overview of indicators on Sustainability of Health Systems – A3 Clustering

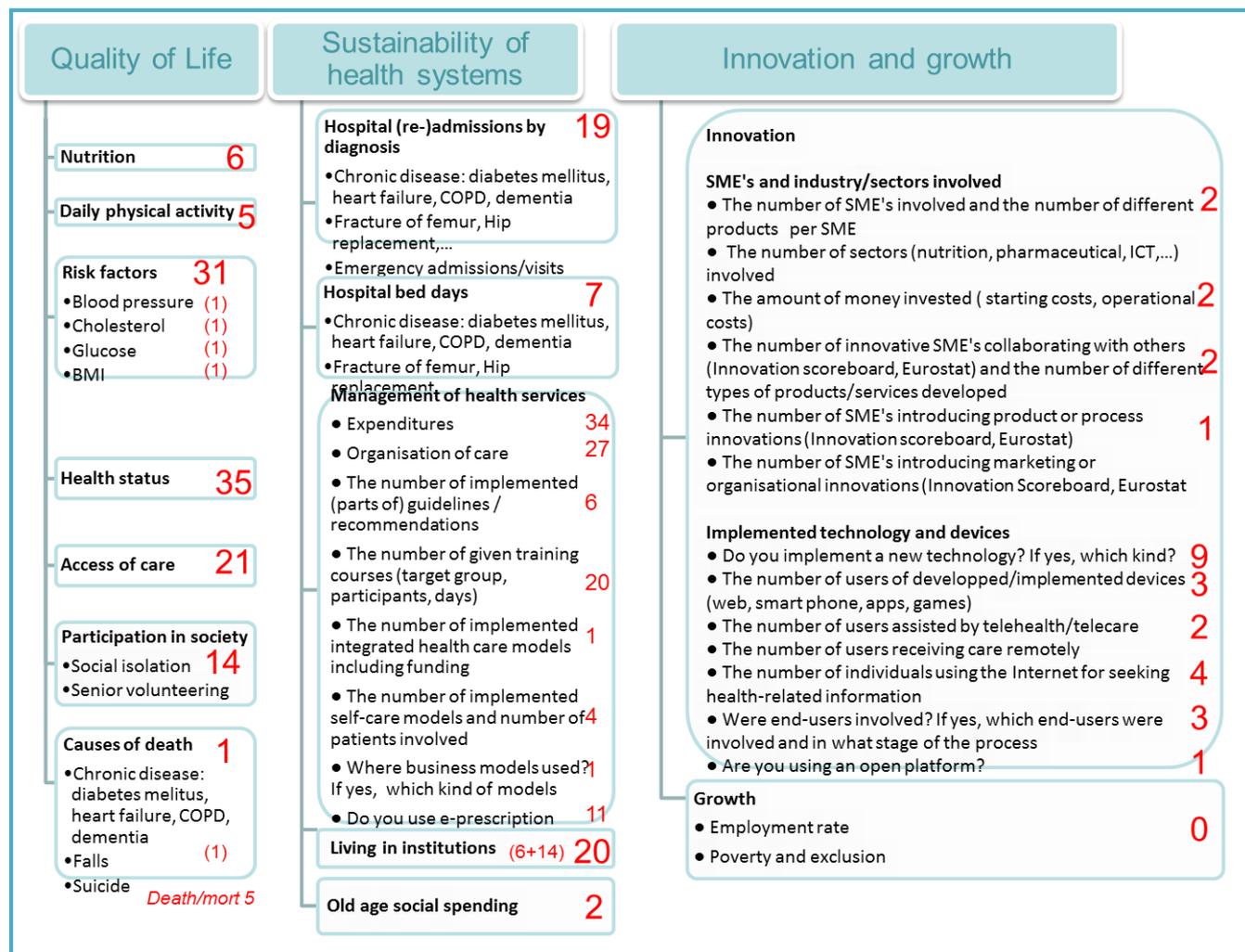
| Framework | Main categories D.1.1 | Detailed categories (D.1.1 - annex) | A3 clustering | | | | | | | | |
|-------------------------------|---------------------------------|---|---|--------------------|-------------------|-----------|-------------------------|-------------------|-----------------|---|----|
| Categories | Categories | Indicators | Frailty (general) | Functional decline | Cognitive decline | Nutrition | Dependancy & Caregivers | Physical exercise | all A3 clusters | total Nr of commitments using indicator in A3 | |
| Hospitalisation | Emergency admissions / visits | No of emergency visits | | | | | | | | | |
| | | Rate of readmission to emergency | | | | | | | | | |
| | Hospital (re-) admission | No. of hospitalisation (or reduction of) (or entry/discharge) | 5 | | 2 | 1 | 2 | 1 | | 11 | |
| | | No of rehospitalisation | 5 | 1 | | | 2 | | | 8 | |
| | | Direct hospitalisation rate (no emergency visit) | | | | | | | | | |
| | | No of avoidable hospitalisation | | 1 | | | | | | | |
| | Time to readmission | | | | | | | | | | |
| Hospital bed days | average length of stay | Average Length Of Stay (ALOS) | 2 | 1 | | 1 | | | | 4 | |
| | | ALOS readmission | | | | | | | | | |
| management of health services | Healthcare costs / expenditures | Healthcare costs | 1 | 3 | 0 | | 1 | | | 5 | |
| | | Operating cost of clinical services | | | | | | | | | |
| | | Administrative costs | | | | | | | | | |
| | | Hospitalisation costs | | | | | | | | | |
| | | Costs of hospital diagnosis services | | | | | | | | | |
| | resource use | | Hip fracture costs | | | | | | | | |
| | | | No of repeated visits to hospital | | | | | | | | |
| | | | No. of visits to primary care | 2 | | | | 1 | 1 | | 4 |
| | | | No of consultations | | | | | | | | |
| | | | No of outpatient visits | | | | | | | | |
| | | | No of referral to external providers | | | | | | | | |
| | | | No of home visits | | | | | | | | |
| | | | Night care | | | | | | | | |
| | | | Care consumption | | | | | | | | |
| | | | No. of cancelled prescriptions | | | | | | | | |
| | | | Percentage of decrease in medication | | | | | | | | |
| | | | No of early diagnosis | | | | | | | | |
| | Performance | | No of early detections | | | | | | | | |
| | | | Cost-benefit | 1 | | | | | | | 1 |
| | | | Cost effectiveness | 2 | | 1 | | | | | 3 |
| | Organisation of care | | Efficiency | | | | | | | | |
| | | | Enabling new models of care | | | | | | | | |
| | | | Service coordination | | | | | | | | |
| | | | Reduced workload for Healthcare professionals | | | | | | | | |
| | | | Time savings for care professionals | | | | | | | | |
| | | | Length of discharge process | | | | | | | | |
| | | | Waiting time to social services delivery | | | | | | | | |
| | | | Implemented/ improved guidelines | | | | | | | | |
| | | | No. of geriatric assessments | | | | | | | | |
| | | | | | | | | | | | |
| | Education, training workforce | | Number of registrations to courses | | | | | | | | |
| | | | Number of professionals trained | | | | | | | | |
| | | | Number of professionals aware | | | | | | | | |
| | Integrated care models | | Health education programmes | | | | | | | | |
| | | | | | | | | | | | |
| | implemented self care models | | | | | | | | | | |
| | | | | | | | | | | | |
| | Quality of care | | busines models | | | | | | | | |
| | | | e-prescription | | | | | | | | |
| | User empowerment | | Error reduction | | | | | | | | |
| | | | User empowerment | | | | | | | | |
| | Patient satisfaction | | User satisfaction | | | | | | | | |
| | | | Quality of care | | | | | | | | |
| | | | Patient satisfaction | 5 | | 4 | 1 | 3 | 2 | | 15 |
| | Institutionalisation | avoided long term care admissions | Long Term Care (LTC) admissions | 2 | | | | | | | 2 |
| | | | Time to LTC for dementia | | | | | | | | |
| | | living in institutions | No. of elderly receiving care at home after hospitalisation | | | | | | | | |
| No. of independent elderly | | | | | | | | | | | |
| Old age social spending | | Risk of entry into nursing home | | | | | | | | | |
| | | No. of patients institutionalised | 4 | | | | 2 | | | 6 | |
| | | Percentage of population in inadequate housing | | | | | | | | | |

Table 13: Overview of indicators on Sustainability of Health Systems – D4 Clustering

| Framework | Main categories D.1.1 | Detailed categories (D.1.1 - annex) | D4 clustering | | | | | | | | | | | | | |
|-------------------------------|--|---|---|---------------------------------|--------------------|-------------------------------------|---------------------|----------------|-------------------|---------|----------|--------------|---|----|--|--|
| Categories | Categories | Indicators | AAL | Housing | Urban Environment | Age friendly: business and services | Age friendly: voice | Transportation | Physical Activity | Tourism | Dementia | all clusters | total Nr of commitments using indicator in D4 | | | |
| Hospitalisation | Emergency admissions / visits | No of emergency visits | | | | | | | | | | | | | | |
| | | Rate of readmission to emergency | | | | | | | | | | | | | | |
| | Hospital (re-) admission | No. of hospitalisation (or reduction of) (or entry/discharge) | 1 | | | | | | | | 1 | | 2 | | | |
| | | No of rehospitalisation | | | | | | | | | | | | | | |
| | | Direct hospitalisation rate (no emergency visit) | | | | | | | | | | | | | | |
| | | No of avoidable hospitalisation | | | | | | | | | | | | | | |
| Hospital bed days | average length of stay | Time to readmission | | | | | | | | | | | | | | |
| | | Average Length Of Stay (ALOS) | | | | | | | | | | | | | | |
| management of health services | Healthcare costs / expenditures | ALOS readmission | | | | | | | | | | | | | | |
| | | Healthcare costs | | | | 1 | | | | | 1 | | 2 | | | |
| | | Operating cost of clinical services | | | | | | | | | | | | | | |
| | | Administrative costs | | | | | | | | | | | | | | |
| | | Hospitalisation costs | | | | | | | | | | | | | | |
| | | Costs of hospital diagnosis services | | | | | | | | | | | | | | |
| | resource use | Hip fracture costs | No of repeated visits to hospital | | | | | | | | | | | | | |
| | | | No. of visits to primary care | | | | | | | | | | | | | |
| | | | No of consultations | | | | | | | | | | | | | |
| | | | No of outpatient visits | | | | | | | | | | | | | |
| | | | No of referral to external providers | | | | | | | | | | | | | |
| | | | No of home visits | | | | | | | | | | | | | |
| | | | Night care | | | | | | | | | | | | | |
| | | | Care consumption | | | | | | | | | | | | | |
| | | | No. of cancelled prescriptions | | | | | | | | | | | | | |
| | | | Percentage of decrease in medication | | | | | | | | | | | | | |
| | | | No of early diagnosis | | | | | | | | | | | | | |
| | | | No of early detections | | | | | | | | | | | | | |
| | | | Performance | Cost-benefit | Cost effectiveness | | | | | | | | | | | |
| | | | | | Efficiency | | | | | | | | | | | |
| | Organisation of care | Enabling new models of care | Service coordination | | | | | | | | | | | | | |
| | | | Reduced workload for Healthcare professionals | | | | | | | | | | | | | |
| | | | Time savings for care professionals | | | | | | | | | | | | | |
| | | | Length of discharge process | | | | | | | | | | | | | |
| | | | Waiting time to social services delivery | | | | | | | | | | | | | |
| | | | Implemented/ improved guidelines | | | | | | | | | | | | | |
| | Education, training workforce | Number of implemented guidelines | No. of geriatric assessments | | | | | | | | | | | | | |
| | | | Number of registrations to courses | Number of professionals trained | | | | | | | | 1 | | 1 | | |
| | | | | Number of professionals aware | | | | | | | | | | | | |
| | Health education programmes | | | | | | | | | | | | | | | |
| | Integrated care models | Number of implemented guidelines | Number of registrations to courses | | | | | | | | | | | | | |
| | | | Number of professionals trained | | | | | | | | | | | | | |
| | implemented self care models | Number of implemented guidelines | Number of professionals aware | | | | | | | | | | | | | |
| | | | Health education programmes | | | | | | | | | | | | | |
| | Quality of care | Error reduction | Health education programmes | | | | | | | | | | | | | |
| | | | Health education programmes | | | | | | | | | | | | | |
| | User empowerment | User empowerment | Health education programmes | | | | | | | | | | | | | |
| | | | Health education programmes | | | | | | | | | | | | | |
| | Patient satisfaction | User satisfaction | Quality of care | | | | | | | | | | | | | |
| | | | Patient satisfaction | 2 | 1 | 1 | 4 | | 1 | | 1 | | | 10 | | |
| Patient satisfaction | | | | | | | | | | | | | | | | |
| Institutionalisation | avoided long term care admissions | Long Term Care (LTC) admissions | | | | | | | | | | | | | | |
| | | Time to LTC for dementia | | | | | | | | | | | | | | |
| | living in institutions | No. of elderly receiving care at home after hospitalisation | | | | | | | | | | | | | | |
| | | No. of independent elderly | | | | | | | | | | | | | | |
| Old age social spending | Percentage of population in inadequate housing | Risk of entry into nursing home | | | | | | | | | | | | | | |
| | | No. of patients institutionalised | | | | | | | | | | | | | | |

Annex 2: August 2012 Action Group survey

Figure 4: Overview of indicators included in the EIP on AHA framework



The above figure is based on the initial information collected from Action Groups in August 2012. The data collected was used to define the Framework. However it should be noted that the Framework was further refined during the period July to November 2012 and therefore the figures are not the only basis for including an indicator, the input from the experts and the Action Group members have also influenced the shaping of the Framework.

Annex 3: April 2013 reference site review of good practices

Table 14: Categories of impact measured for Quality of Life

| Categories | No. |
|--------------------------------------|-----|
| Nutrition | 2 |
| Physical activity | 4 |
| Risk factors | 2 |
| Health Status | |
| Health status | 6 |
| QoL | 18 |
| Well-being | 5 |
| Functional consequences | 7 |
| Self-sufficiency/staying independent | 4 |
| Mental well-being | 2 |
| Security/safety | 4 |
| Stress/anxiety | 2 |
| Access of Care | |
| Waiting lists/waiting time | 8 |
| Participation in Society | |
| Social Participation | 2 |
| Social isolation/loneliness | 2 |
| Voluntary work | 2 |
| Mortality and injuries | |
| Mortality and injuries | 7 |
| Rate of Falls | 5 |

Table 15: Categories of impact measured for Sustainability of Health Systems

| Categories | No. |
|-------------------------------------|------------|
| Hospital (re-)admission | |
| - Emergency admissions/visits | 8 |
| - Hospital admissions | 10 |
| Hospital bed days | |
| - (Average) Length of stay | 12 |
| Management of HS | |
| - Health care costs/ expenditures | 20 |
| - Quality of care | 7 |
| - Education/training workforce | 5 |
| - No. of implemented guidelines | 3 |
| - User Empowerment | 5 |
| - Patient satisfaction | 9 |
| Institutionalisation | |
| - Avoided Long Term Care admissions | 7 |
| - Living in institutions | 3 |
| Old age social spending | |
| -Old age spending | 1 |

Annex 4: Overview of results from a scientific literature review on outcome indicators to be used within MAFEIP

| | Gap analysis & evidence | No evidence | Indicators suggested for selection | Additional evidence/references SANCO |
|---------------------------------------|---|---|--|---|
| A1: prescription and adherence | <p>QoL: Retain "risk factors", "causes of death", "daily physical activity" Include "quality of care" and "adherence level" Evidence of reduction of risk factors and of mortality risks or rates (by diseases). Ample general evidence (though not reviewed here) showing that reducing risk factors reduce the disease progression and prevalence.</p> | <p>No link between "prescription and adherence" and: - daily physical activity - BMI - mortality risk for COPD and dementia</p> | <p>QoL - add indicator on appropriate prescribing - add indicator on adherence level Risk factors - better called vital parameters or even better clinical outcomes: - Blood pressure; - Cholesterol levels; - Glucose levels Causes of death: - Reformulate as mortality rates by disease to be measured among the target population addressed (e.g. mortality rates among diabetes II patients, COPD patients, etc.)</p> | <p>Link between "adherence to treatment" and: - daily physical activity - BMI - mortality risk for COPD and dementia</p> |
| | <p>SHS Retain: "hospital re-admission" and "hospital bed days"</p> | <p>Organisation of care: No link found</p> | <p>•Total number of hospital re-admissions for the sample of patients included in the monitored intervention and/or hospital re-admission rate (number of re-admissions divided by the total number of patients); •Total number of hospital bed days for the sample of patients included in the monitored intervention; •Hospitalisation rate (hospitalized patients / total number of patients); •Hospitalisation risk (probability of 1 or more hospitalizations during a given time period, expressed as a percentage); •Costs in general or more specific, like per patient drug costs; per patient hospitalisation costs; or per patient total costs (drug costs</p> | <p>- Organisation of care (e.g. involvement of pharmacist and polypharmacy, adverse effect) and adherence <i>NO evidence provided but SANCO mentioned:</i> - No of implemented guidelines is one way to organize care by involving pharmacists - No of training course: guidelines implementation often accompanied by training - No of implemented integrated healthcare models incl. funding (same as above) - The number of implemented self-care models and number of patients involved: User empowerment is one of the main interventions which make people become</p> |

| | Gap analysis & evidence | No evidence | Indicators suggested for selection | Additional evidence/references SANCO |
|--|---|---|--|---|
| | | | plus hospitalisation costs). | more adherent. (one article shown) |
| A2: Personalised health management – Falls prevention | <p>QoL</p> <p>Retain 'Physical Activity', 'Health Status' and 'causes of death</p> <p>Link between personalized health management and nutrition not checked.</p> | <p>Non conclusive evidence on link between falls prevention intervention and quality of life outcomes</p> | <p>Measure of fall reduction (under mortality and injuries):</p> <ul style="list-style-type: none"> - numbers of falls and - rate of falls - number of fallers. <p>Measure of quality of life through e.g.: a) SF-36; b) RAND-36; c) QUALEFFO; d) Euroqol 5-D; e) WHOQOL - BREF.</p> <p>Measure of physical activity change:</p> <ul style="list-style-type: none"> - Physical Activity Scale in the Elderly (PASE) ; - Gait Abnormality Rating Scale (GARS) - Frenchay Activities Index (FAI) ; - Late Life Function and Disability Instrument (LLFDI) <p>Finally one can measure:</p> <ul style="list-style-type: none"> - Mortality rates among elderly treated for fall prevention | <p>Information on the importance of nutrition in falls prevention e.g. "as frailty results from a loss of muscle mass and strength, neuromuscular impairment, immobilisation and malnutrition.</p> <p>There are studies that attempt to link fall prevention interventions with quality of life outcomes and in particular with 'feeling safe' or 'fear for falling'.</p> |
| | <p>SHS</p> <p>Retain hospital re-admission' and 'hospital bed days'.</p> <p>Hospital admissions</p> <p>Some authors indicate clearly the main outcome measures against which fall prevention interventions should be assessed: a) fall-related admission; b) fall-related readmission; c) mortality; d) return</p> | <p>Cost reduction and cost-effectiveness outcomes</p> <p>No data from Europe. Data from US etc, with limited use for EU extrapolation purposes. Recommendation to measure:</p> <ul style="list-style-type: none"> - Fall Avoided - Hospitalisation avoided - QALY gained. | <ul style="list-style-type: none"> • Total number of fall-related hospital re-admissions for the sample of patients included in the monitored intervention and/or hospital re-admission rate (number of re-admissions divided by the total number of patients); • Total number of fall-related hospital bed days for the sample of patients included in the monitored intervention; • Costs reduction, among others: per patients drug costs, per patient assistive devices costs and per patient care givers costs. | |

| | Gap analysis & evidence | No evidence | Indicators suggested for selection | Additional evidence/references SANCO |
|---|--|--|---|---|
| | Emergency Department visits; e) cumulative number of falls. | | | |
| A3: Functional decline and frailty | <p>QoL</p> <p>Nutrition, Daily physical activities and Health status determine and influence the level of frailty.</p> <p>Independent association between Activities of Daily Living (ADL), dependency and mortality due to all causes, respiratory disease or senility, but no association with mortality due to cardiovascular disease</p> <p>Nutrition:</p> <p>association between frailty syndrome and nutritional status</p> <p>Daily physical activity</p> <p>Independent association between activity and delaying /slowing down frailty</p> <p>Evidence in institutionalised elderly of training effect on fitness,physical performance, ADL and QoL.</p> | <p>No association between ADL and mortality due to cardiovascular disease</p> <p>The complexity of frailty does not allow us to find unequivocal and convergent causal coefficients on “outcome” indicators proposed in the framework for this Action Group.</p> | <p>A frailty index should be added to the framework as direct outcomes (Most of the frailty instruments reported in the literature include indicators related with physical dimension, psychological dimension and social dimension which are captured in a frailty index)</p> | |
| | SHS Retain: "hospital re-admission" and "hospital | Avoidable hospitalization | hospital readmission hospital bed days iatrogenic events | |

| | Gap analysis & evidence | No evidence | Indicators suggested for selection | Additional evidence/references SANCO |
|---|--|--------------------|--|--|
| | <p>bed days"</p> <p>Apart from the obvious primary adverse outcome of reduced function, there is also an association with an extended length of hospital stay, increased rates of nursing home admission, social isolation and reduced quality of life</p> | | | |
| B3: integrated care for chronic diseases | <p>QoL</p> <p>All items can be retained, No conclusive evidence but sufficient trials</p> <p>Positive impacts of the use of ICT on QoL indicators</p> | | <p>QoL</p> <p>Risk factors (cause of death)</p> <ul style="list-style-type: none"> - Quality of Life - Health status - Active ageing index | sources on the importance of e.g. care reorganization |
| | <p>SHS</p> <p>hospital (re)admissions and hospital bed days (length of stay)</p> | | <p>For sustainability of health systems, we suggest to include the following indicators:</p> <ul style="list-style-type: none"> - Hospital admission - Hospital readmission - Length of stay - Emergency admissions | |
| C2 independent living solutions | <p>More or less coherent body of literature addressing independent living solutions, most analyses are either prospective, qualitative (based on case studies and focus groups), or when quantitative they mainly concerns attitudes of potential users. This means that the actual deployment</p> | | <p>Quality of life</p> <p>Primary Process indicators):</p> <ul style="list-style-type: none"> • Satisfactory alarm/ false alarm/alert ratios. This can be calculated both for early warning and monitoring systems taking the metrics automatically produced by the technological systems and dividing them by the transcript of the triggered interventions enacted by caregivers / health professional; • Rate of positive response to behavioural messages. This concern the persuasive | <p>evaluation of initiatives like the Scottish Telecare Programme found that people feel more independent, safer and feel their relatives worry less for them thanks to telecare. This is also highlighted in a research report from the European Network of Economic Policy Research Institutes which found based on Finnish population data that people are happier at home than in institutions</p> |

| | Gap analysis & evidence | No evidence | Indicators suggested for selection | Additional evidence/references SANCO |
|--|--|--------------------|--|---|
| | <p>of such solutions is too limited to generate scientifically sound data on quality of life, clinical, and sustainability outcomes.</p> | | <p>technology component (if present) and can be calculated dividing the number of registered and correct actions performed by users in response to technology delivered behavioural nudges divided by the total number of nudged delivered;</p> <ul style="list-style-type: none"> • Take up of social media communication functionalities. This could be measured with standard indicators of usage such as the one applied for Internet and/or social media (simple indicators of take up, indicators of intensity of use, etc.) <p>Secondary Process indicators:</p> <ul style="list-style-type: none"> • Prevention / early diagnosis and intervention. These indicators are a bit more challenging to envisage ex ante without having a clear picture of the organisational and institutional settings where a concrete intervention takes place. They would be closely related to the first indicator of primary outcomes (the ratios between satisfactory and false alarm/alert ratios). In simple terms it should measure the number of care giving and/or of healthcare interventions triggered by the independent living systems; <p>Outcome indicators</p> <ul style="list-style-type: none"> • QALY. As mentioned earlier, QALY are measured using one of the various health related quality of life instruments and assigning to the indicator in volume, thus obtaining a monetary value. The various supporting instruments that can be used include: <ul style="list-style-type: none"> - SF-36 ; | |

| | Gap analysis & evidence | No evidence | Indicators suggested for selection | Additional evidence/references SANCO |
|--|-------------------------|-------------|--|--------------------------------------|
| | | | <ul style="list-style-type: none"> - QUALEFFO ; - Euroqol 5-D ; - WHOQOL – BREF. <p>In addition, Scores on the ILTQoL scale may be used. This will be a composite measure of quality of life impact as perceived by the users (or in the case of dementia patients by their relative and friends). Details on how to construct this scale can be extracted from the relevant source (Agree et al 2011)</p> <ul style="list-style-type: none"> • Fall reduction. As mentioned in an earlier section, the basic indicators are: <ul style="list-style-type: none"> - numbers of falls and - rate of falls. • A combination of "Daily physical activity" and "participation in society" as component of a measurement scale as defined by Agree et al which can be linked to the Active Ageing Index. • Living in institutions | |
| | SHS | | <p>Institutionalisation rate. Institutionalised elderly/ total number of elderly in the local area of the monitored intervention;</p> <p>Bed day in institutions. Total number of nursing home bed days in the local area of the monitored intervention</p> <p>Emergency hospital admissions. Total number of hospital emergency admissions for the sample of elderly included in the monitored intervention and/or hospital emergency re-admission rate (number of re-admissions divided by the total number of elderly);</p> | |

| | Gap analysis & evidence | No evidence | Indicators suggested for selection | Additional evidence/references SANCO |
|-------------------------------|---|-------------|--|--------------------------------------|
| | | | <p>Institutionalisation costs (savings). Per user institutionalisation costs / cost saved for users maintained at home in the local areas of the monitored intervention;</p> <p>Hospitalisation costs (savings). Per users hospitalisation costs / costs saved for users not re-hospitalised among those included in the monitored intervention</p> | |
| D4 Age-friendly cities | <p>Daily physical activity and participation in society are indicators that make sense in this domain,</p> <p>Age-friendly buildings, cities & environments” is not addressed as a separate and self-standing research topic.</p> | | <p>From CC Scientific literature review, related to WHO Healthy cities. Examples of indicators:</p> <p>A clean, safe, high-quality physical environment (including housing quality)</p> <p>An ecosystem which is stable now and sustainable in the long-term</p> <p>A strong, mutually supportive and non-exploitive community</p> <p>A high degree of public participation in and control over the decisions affecting one’s life, health, and well-being</p> <p>The meeting of basic needs (food, water, shelter, income, safety, and work) for all the city’s people</p> <p>Access to a wide variety of experiences and resources with the possibility of multiple contacts, interaction, and communication</p> <p>A diverse, vital, and innovative city economy</p> <p>Encouragement of connectedness with the past, with the cultural and biological heritage, and with other groups and individuals</p> <p>A city form that is compatible with and enhances the above parameters and behaviours</p> <p>An optimum level of appropriate public-health and sick-care services accessible to all</p> <p>High health status (both high positive health status and low disease status)</p> <p>Centralization of resources and populations in a specific place</p> <p>Verticality of construction arrangements (be they for housing or other functional purposes)</p> <p>Related to the first two characteristics, concentration of resources (man-made, natural, and human) and waste products requires the effective urban management by authorities of flows of these within the city perimeter and between the urban and regional environment.</p> <p>These characteristics in turn lead to a greater diversity, both in natural (eco-systemic) and in cultural terms, which potentially makes for greater opportunities for ecological, economic,</p> | |

| | Gap analysis & evidence | No evidence | Indicators suggested for selection | Additional evidence/references SANCO |
|--|------------------------------------|--------------------|--|---|
| | | | <p>and social well-being</p> <p>Information and communication are pivotal in the development and exchange of knowledge and innovation</p> <p>From their earliest stages, cities have relied on mechanization and technology for their smooth operation</p> <p>Political authority and governance systems must be in place for cities to sustain themselves</p> | |

Annex 5: Outcome indicators used within Action Group B3

- This document is based on the information from the booklet of good practices developed by B3 Action Groups members in March-August 2013 (version 08/10/2013).
- There are 87 good practices described in the mentioned document. After reviewing them, we decided to discard eight of them deemed not to be fitting with the final aim of the clustering which was to inform the selection of outcomes indicators for the monitoring of EIP-AHA activities for each Action group. These good practices discarded are shown in **Table 20** with a brief explanation of the reasons for not including them in the clustering exercise.
- The remaining 79 good practices were then clustered in four groups according to their activities, objectives and targets. A description of these four clusters is presented below, together with an exploratory analysis of the commonalities among the good practices within each cluster in relation to indicators.

Cluster 1: Integrated care and care Pathways

Criteria: The practices grouped in this cluster have the objective of improving directly the care received by patients through a better organisation of resources. This re-organization can happen between healthcare levels (i.e. primary care and specialist care) and/or between health and social care or even community services. Practices that tackle better ways of providing care within a service were also included in this group.

There are **28 good practices** (Table 16) included in this group that cover a wide range of interventions (personalized health care, implementation of evidence based medicine, case management, etc) and conditions and patients (Fragile and with special needs elders, COPD patients, diabetes, cardiovascular diseases, etc).

Indicators: 75% of the good practices report that they use or have obtained indicators. Although these are quite specific to each intervention, they can be classified into 4 groups:

- Activity: e.g. No of electronic messages between hospitals and municipalities, No of screened and vaccinated patients, no of diabetic patients followed , frequency of use of social and health care resources, Number of patients identified as complex chronic patients (CCP), Patients with plan activated / active programs
- Individual health/quality of life: e.g. morbidity rates, blood pressure, weight, Heart Failure incidence rate Relative risk reduction of conditions.
- Quality of services: e.g. No of avoidable hospitalisations, Participants return on average 72 days earlier to their workplace, satisfaction with care, satisfaction with their working environment, urgent hospital admissions which did not need significant intervention, Adherence to medication plan.
- Cost: e.g. Pharmacy costs, savings per family and intervention, health care costs

Table 16: Clustering B3 best practices – Cluster 1: Integrated care and care pathways

| Initiative name | Organisation Name | Country | Indicators |
|---|---|-------------|---|
| Epital, Core establishment | Municipality of Lyngby-Taarbaek | Denmark | none |
| SAM:BO Cooperation on care pathways in the Region of Southern Denmark | Southern Denmark Health Innovation | Denmark | No of electronic messages between hospitals and municipalities |
| The Bridge to better Health | Region Zealand | Denmark | morbidity rates, quality and effectiveness of health services |
| MACVIA-LR | MACVIA-LR: Combattre les Maladies Chroniques pour un Vieillissement Actif en Languedoc Roussillon | France | - No of avoidable hospitalisations for chronic diseases |
| Multimorbid clinic for chronic diseases (MACVIA-LR) | MACVIA-LR: Combattre les Maladies Chroniques pour un Vieillissement Actif en Languedoc Roussillon | France | - no of hospitalisations /- HLY /- QoL - number of patients included in primary care |
| Second Opinion for Back Pain | Techniker Krankenkasse and the German Pain Association DGS | Germany | - working disability/ - sick leave days / - Quality of Life |
| TK Integrated Care Contract for Back Pain | Techniker Krankenkasse | Germany | - Patient conditions (e.g. pain intensity, pain disability, and fear for work and for physical activity) - Participants return on average 72 days earlier to their workplace. - Savings in sick pay, hospital stays and drugs |
| Maccabi Healthcare Services | Maccabi Healthcare Services | Israel | - No of screened patients /- No of vaccinated patients - no of diabetic patients followed /- No of diabetic patients with stable outcomes |
| BUONGIORNO CReG | Telbios SpA | Italy | - No of patients enrolled |
| BuongiornoCReG and Viva paziente esperto | Telbios SpA | Italy | - vital signs like blood pressure, weight, pulse oximeter, and blood sugar values |
| Complications Prevention in Diabetes | AUSL Ferrara _ ASSRRERIT | Italy | - care consumption |
| Eubiosia Project | ANT Foundation | Italy | none |
| ParkinsonNET | ParkinsonNet, Radboud University Nijmegen Medical Centre | Netherlands | none |
| The Walcheren Integrated Care Model | evaluation: Institute of Health Policy and Management (Erasmus University Rotterdam) /implementation: Stichting Ketenzorg Midden en Noord Zeeland | Netherlands | - job satisfaction /- health care use/ objective burden change - elderly: quality of life, satisfaction with care - caregivers: quality of life, satisfaction with care |

| Initiative name | Organisation Name | Country | Indicators |
|---|---|---------|--|
| | ParkinsonNet, Radboud University Nijmegen Medical Centre | | - professionals: satisfaction with their working environment |
| Integrated Healthcare Information System for End-to-End Standardized | Polibienestar Research Institute – University of Valencia | Spain | - frequency of use of social and health care resources - number of patients visiting a doctor or social worker in the primary care centre - no of visits that these professionals receive/ - number of drugs consumed - urgent hospital admissions which did not need significant intervention, and- patients’ and caregivers’ satisfaction regarding the social and health care resources received. |
| CHRONIC CARE PROGRAMME IN CATALONIA | Department of Health | Spain | - Health outcomes - No of avoidable emergency admissions and 30-day readmissions |
| Hospital Clinic Integrated Care Nexes Project | Hospital Clinic, Barcelona | Spain | none |
| Collaborative model between health and social care. MECASS | Catalan Health Institute | Spain | - Patient satisfaction index /- Patient quality of life index - Avoidable admittance rate /- Adherence to medication plan - Number of patients identified as complex chronic patients (CCP) - Patients with plan activated / active programs - Readmission rate of CCP managed < 30 days for patients CCP admitted/ - Stay rate accumulated CCP case management - Number of visits (No patient contacts): Primary and Emergency - Adherence to the overall care plan/ - Pharmacy costs - avoidable admissions /- reducing initial admissions and readmissions |
| PITES: Innovation platform in new telemedicine and e-health services for chronic and dependent patients | Bio-Med Aragon | Spain | - User satisfaction with the service provided - Transfer from emergency rooms visits to scheduled GP visits- Transfer from specialized healthcare to primary healthcare attention - Economical savings under ideal circumstances (no co-morbidity and all the attendance handled by the Contact Centre). |
| PROMIC - Congestive heart failure | Department of Health of the Basque Country | Spain | - Heart Failure incidence rate and hospitalization rate ratio - Time to event (Kaplan-Meier and log Rank test) - Program associated risk of the event: Hazard ratio HR (Cox regression) - Relative risk reduction (RRR)/- Number needed to treat (NNT) |
| SAIATU | Department of Health of the Basque Country | Spain | - 150 families served /- no of hospitalisation in last months of life - savings per family and intervention /- No of people who started |

| Initiative name | Organisation Name | Country | Indicators |
|--|---|---------|--|
| | | | working in this field |
| Strategies to tackle the challenge of Chronicity | Department of Health of the Basque Country | Spain | - no of hospital admissions /- care costs |
| Coproduction and Community Capacity Building | Community Capacity Building, Coproduction, Asset Based Approach | UK | - direct saving to other health and care systems /- reduced admission to A&E |
| Integrated Services for Chronic Pain Patients | NHS Lanarkshire | UK | - patient experience /- measures on quality of life - mood /- self efficacy. |
| Integration of health and social care in Scotland | Scottish Government – Health and Social Care Directorates | UK | none |
| Intermediate Care Improvement Community | Joint Improvement Team, Scottish Government | UK | -Rate of emergency bed days for over 75s - Delays to discharge and the rate of bed days lost due to delays - Rate of attendance at A&E /- Compliance with the 4 hour access standard - Proportion of last 6 months of life spent at home or in the community - Balance of care /- Patient and carer experience and personal outcomes |
| Reshaping Care for Older People : A Programme for Change | Joint Improvement Team, Scottish Government | UK | none |
| Integrated Resource Framework for Health and Social Care in Scotland | Scottish government | UK | none |

Cluster 2: Screening and Prevention

Criteria: The practices grouped in this cluster have the objective of providing information and/or tools that allow health care professionals and even citizens to classify individuals according to their disease risks. The final aim of these interventions is to offer preventive measures and/or treat conditions in their earlier stages with the associated health benefits.

There are **10 good practices (Table 17)** included in this group that cover a wide range of approaches and tools (biomarkers, epidemiological studies, disease-specific scales, etc.) and conditions and patients (diabetes, cancer, dementia, cardiovascular and other chronic conditions, etc.).

Indicators: just 40% of the good practices report that they use or have obtained indicators. Combined with the low number of practices in this cluster, this means that there is little information on indicators. Nevertheless, those identified can be classified into 3 groups:

- Activity: No of patients in case/disease management , No of new diabetic patients
- Individual health/quality of life: health outcomes and patient satisfaction and improvement of quality of life among patients.
- Cost: treatment and care costs

Table 17: Clustering B3 best practices – Cluster 2: Screening and prevention

| Initiative name | Organisation Name | Country | Indicators |
|---|---|----------|---|
| Automated Prospective Model of Health Care in Ophthalmology | AIBILI – Association for Innovation and Biomedical Research on Light and Image Ageing@Coimbra - European Reference Site for Active and Healthy Ageing | Portugal | - absenteeism /- loss of employment - treatment and care costs |
| GMP Production of Radiopharmaceuticals for Oncology and Neurodegenerative diseases | ICNAS-Produção, Unipessoal, Lda | Portugal | none |
| PREVADIAB 2 – Prevalence Study Follow-up | National Diabetes Observatorium | Portugal | - Biometrical and personal and family history data - Findrisk questionnaire /- No of new diabetic patients |
| Retmarker as a Biomarker of Diabetic Retinopathy progression | AIBILI – Association for Innovation and Biomedical Research on Light and Image Ageing@Coimbra - European Reference Site for Active and Healthy Ageing | Portugal | none |
| Standardization and Harmonization of Biomarkers for Neurodegenerative diseases | CNC/CHUC Ageing@Coimbra, Consortium | Portugal | none |
| Personalised guidance service for patient empowerment – CHRONICempower | Biomedical Research Institute INCLIVA | Spain | - health outcomes and patient satisfaction - Improvement of quality of life among the chronically ill - Improvement and support caregiver’s decision-making - Patients more active in managing their health - Reduction on use of resources and costs |
| Population stratification | Department of Health of the Basque Country | Spain | - No of patients in Case management /- No patients Disease management - No of patients Self-Management |
| Gard | Chronic Respiratory Disease (Asthma And Copd) Prevention And Control Program And National Action Plan | Turkey | none |
| Achieving benefits for patients by leveraging the use of risk prediction to support anticipatory care planning at scale through the General Practice (GMS) contract in Scotland | NHS Scotland | UK | none |
| SPARRA Risk Prediction Tool | Information Services Division Scotland | UK | none |

Cluster 3: Sharing Health information

Criteria: The practices grouped in this cluster have the objective of improving health and social care and the related processes through the sharing of health information between stakeholders. This sharing can be between health professionals, between health professionals and citizens and between health authorities, professionals and citizens. There are also examples of collaboration between companies that share information.

There are **23 good practices (Table 18)** included in this group that cover a wide range of activities , such as bringing specialists from Hospitals to the street to promote health styles, allowing individuals to access online health records, creating registries to inform professionals as well as examples of patient-healthcare professional collaboration.

Indicators: less than 50% of the good practices report that they use or have obtained indicators. In spite of the relative low amount of information, the indicators found can be classified into 3 groups:

- Activity: No of referrals, registered users, no of training participants, no of primary care nurses and GP visits ,No of practices , resources, experts and n0 of patients intervened.
- Individual health/quality of life: blood pressure and blood glucose, quality of life and quality outcomes.
- Specific activities indicators: patient satisfaction, awareness and knowledge

Table 18: Clustering B3 best practices – Cluster 3: Sharing Health information

| Initiative name | Organisation Name | Country | Indicators |
|--|---|----------|--|
| The Health Village | Campus Salute Onlus | Italy | - number of referrals to the ambulatories - statistic of the diffusion of chronic disease among the population - awareness of the health status among citizens |
| Citizen's Online Health Account | Region Zealand | Denmark | Blood pressure, blood glucose, INR-value, physical performance |
| Dossier Pharmaceutique® applied to elderly patients | MACVIA-LR: Combattre les Maladies Chroniques pour un Vieillissement Actif en Languedoc Roussillon | France | none |
| Improvement in postoperative PAIN OUTcome (QUIPS internationally) | University Hospital Jena | Germany | - outcome quality parameters (pain intensity, functional impairments, side effects, etc.) - selected clinical-demographic data |
| QUIPS – Quality improvement in postoperative pain treatment | University Hospital Jena | Germany | - pain treatment quality outcomes /- length of stay /- patient satisfaction - several outcome quality parameters (pain intensity, functional impairments, side effects) |
| Networking actions in Mirandola Biomedical District | Fondazione Democenter-Sipe - ASSRRERIT | Italy | none |
| Personal Health Record system and patient/citizens empowerment – TreC – Cartella Clinica del Cittadino | Fondazione Bruno Kessler, Azienda Provinciale Servizi Sanitari, Provincia Autonoma di Trento | Italy | - registered users |
| Positive Technological Innovation as a Driver of People Health Engagement (PHE – Project) | UNIVERSITA' CATTOLICA DEL SACRO CUORE | Italy | none |
| Regional Diabetics Register - Piedmont | CSI Piemonte | Italy | none |
| The Abilities Passport and Network of Forensic Medicine - PABI | CSI Piemonte | Italy | none |
| School of Diabetes – Courses for Health Professionals | APDP – Diabetes Portugal | Portugal | - No of training participants |
| Expert Patient Programme of Catalonia | Ministry of Health of Catalonia | Spain | - QoL /- degree of patient satisfaction - perceived quality of life /- no of Primary care nurses and GP visits |

| Initiative name | Organisation Name | Country | Indicators |
|---|--|----------------|---|
| FOCUSS | Bio-Med Aragon | Spain | - Knowledge / skills withholding - Professional Competence improvement |
| Exchange and Homogeneous Management of Digital ECG Formats | Bio-Med Aragón | Spain | none |
| MICROHEALTH HEMOPHILIA | MicroHealth | Spain & USA | - therapeutic outcomes |
| OPIMEC – Observatory of Innovative Practices for Complex Chronic Disease Management | Andalusian School of Public Health | Spain | - No of practices, resources, experts |
| PALANTE – Patient leading and managing their healthcare through EHealth | Regional Minister of Health and Social Welfare (Andalusian Health Service) | Spain | none |
| Population Intervention Plans PIP's | Department of Health of the Basque Country | Spain | - No of patients intervened - Patient satisfaction |
| Building Capacity and Competency for Staff Using Telehealthcare Education and Training Strategy | Scottish Centre for Telehealth and Telecare, NHS 24 | UK | none |
| Everyone Matters: 2020 Workforce Vision for healthcare in Scotland | Scottish Government – Health and Social Care Directorates | UK | none |
| Integrated Care Pathways for Mental Health | Healthcare Improvement Scotland | UK | none |
| Key Information Summary - Sharing Patient Information | NHS National Services Scotland | UK | none |
| Supporting an Integrated Telehealth and Telecare Learning Network | NHS 24, Scottish Centre for Telehealth and Telecare | UK | none |

Cluster 4: Telehealth, telecare and remote monitoring.

Criteria: The practices grouped in this cluster have as common objective the remote delivery of health and care services to patients in their homes or at distance through remote devices. The type of technologies vary from very simple alarm systems, to telehealth service allowing the remote monitoring of vital signs, to telemedicine applications such as telediabetology for instance.

There are **18 good practices (Table 19)** in this group that cover a wide range of activities from teleservices for chronic patients (i.e. diabetic and cardiology), remote monitoring of patients, to designing telecare services and benchmarking them.

Indicators: two thirds of the good practices grouped in this cluster report that they use or have obtained indicators. The latter can be classified into 3 groups:

- Individual health/quality of life: examples are the recording of glucose values, electrocardiogram data, pulse frequency and quality of life data.
- Quality /efficiency of services: e.g. number of rehospitalizations/ readmissions , visits to health care professionals
- Costs: health and care costs, including pharmaceuticals.

Table 19: Clustering B3 best practices – Cluster 4: Telehealth, telecare and remote monitoring

| Initiative name | Organisation Name | Country | Indicators |
|--|---|---------|---|
| Personalised Guidance Service for Teleservices: Chronic care management for diabetes patients | Tele-diabetological Competence Centre in Saxony | Germany | - glucose value /- injection insulin units - daily physical activity /- improved individual self-management |
| A telemedicine-based approach to sustain the Healthcare System: lessons from the Lombardy Region | Fondazione Salvatore Maugeri/ Cefriel/Politecnico Milano (CEFRIEL) Department of Management, Economics and Industrial Engineering, Center of Excellence for Research, Innovation, Education and Industrial Labs Partnership Milan, Italy. | Italy | none |
| eCare Network in Bologna | ASSRRERIT – CUP2000 | Italy | |
| Nouva Reti Sanitare Home-based Telesurveillance program (HBTelep) in patients with chronic heart failure | Salvatore Maugeri Foundation | Italy | - clinical parameters (BP and body weight measurements) - electrocardiogram data /- No of hospital readmissions - death/ - cause of hospitalization - Life Quality Questionnaire |
| Nouva Reti Sanitare Home-based Telesurveillance program (HBTeleP) in patients with COPD | Salvatore Maugeri Foundation | Italy | - No of hospital readmissions /- death - cause of re-hospitalization /- clinical parameters - Life Quality Questionnaire |
| SISSI – Social and health information system | AUSL Cesena & Cup2000_ASSRRERIT | Italy | none |
| Support patients through e-service solutions | AUSL Ferrara_ASSRRERIT | Italy | - Effectiveness of tele-medicine - Patients' monitoring data |
| Telecardiology for public health care of cardiovascular disease (Telecardionline) | Regional Healthcare Agency of Puglia | Italy | - No of ECG reported |
| Telemedicine for Management People with Chronic Diseases | CSI Piemonte | Italy | - threshold values for every physiological parameter (blood pressure, heart rate, weight, oxygen saturation in the blood, respiratory rate, single-lead ECG, capillary blood glucose) - Transport /- care costs /- No of avoided hospitalisation - No of patients treated /- No of emergency visits |
| The ARIA Project | Arcispedale S.Maria Nuova plus Reggio Emilia Local Health Authority | Italy | - oxyhemoglobin level /- pulse frequency - annual hospitalization days |

| Initiative name | Organisation Name | Country | Indicators |
|---|--|---------|--|
| Aprop Telemedicine Platform | Mútua Terrassa | Spain | <ul style="list-style-type: none"> - clinical parameters /- quality of life - satisfaction and use of the health care system /- no of hospital admissions - visits made to primary health care /- glycosylated haemoglobine - arterial pressure /- quality of life - pharmaceutical costs |
| Basic Care Unit and Home (BaCUaH) | GRUPO AURA ANDALUCÍA | Spain | <ul style="list-style-type: none"> - patient condition /- QoL - healthcare costs /- mediation use |
| Design of an ontology-based telemonitoring system to support personalized supervision for chronic patient at home | Bio-Med Aragón | Spain | none |
| End-to-end telemonitoring solution working with European standards: | Bio-Med Aragón | Spain | none |
| Evaluation and alignment of telemedicine systems in the HealthCare domain: Tele dermatology experience in Aragón | Bio-Med Aragón | Spain | none |
| TELBIL | Department of Health of the Basque Country | Spain | <ul style="list-style-type: none"> - daily patient self-measurements of respiratory-rate, heart rate, blood pressure, oxygen saturation, weight, body temperature - completion of a health status questionnaire /- emergency department attendances - home visits by primary care professionals /- appointments at the health center or with specialists/ - telephone calls - mortality /- association between hospitalizations and alerts generated by the telemonitoring system in last 5 days - no of hospitalisations /- care costs |
| Valcronic programme | Polibienestar Research Institute – University of Valencia, Valencian Ministry of Health, and Telefónica. | Spain | <ul style="list-style-type: none"> - HrQoL (EQ-5D questionnaire) - no of visit to hospitals /- no of hospitalisations |
| TeleSCoPE – European Code of Practice for Telehealth Services | Health Design & Technology Institute, Coventry University | UK | none |

Table 20: Clustering B3 best practices – Good practices discarded

| Initiative name | Organisation Name | Country | Indicators |
|---|---|---------|--|
| Integrated falls prevention and management and fracture prevention pathway for older people | Scottish government | UK | - No of partnerships reporting programme in place |
| Personalised Guidance Service for ICT , Project “Alter leben” | Saxon Housing Cooperatives | Germany | none |
| DREAMING | Bio-Med Aragón | Spain | - vital signs /- clinical, economic and quality of life indicators/ - emergency visits - SF-36 questionnaire - HADS questionnaire |
| Home Care | ADIPER SERVICIOS SOCIOSANITARIOS | Spain | - satisfaction questionnaires |
| Promoting Autonomy | ADIPER SERVICIOS SOCIOSANITARIOS | Spain | - patient satisfaction |
| Change Fund | Joint Improvement Team, Scottish Government | UK | - No of falls |
| TAGS project - Textiles for Ageing Society | Fondazione Democenter-Sipe | Italy | none |
| Falls prevention initiative (MACVIA LR) | MACVIA-LR: Combattre les Maladies Chroniques pour un Vieillissement Actif en Languedoc Roussillon (Fighting chronic diseases for active and healthy ageing) | France | - Reduce the incidence of falls - avoidable hospitalisations / - HLY - number of patients included in the falls prevention (process) - assessment of psychotropic drugs and their relation to falls |

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