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Strategic Intelligence Monitor on Personal Health Systems,

Phase 2

# Evidence Consolidation:

# Report on Best Practices and Key Drivers of Success

Author: Maria Lluch

Editors: Fabienne Abadie, Maria Lluch, Francisco Lupiañez, Ioannis Maghiros, Elena Villalba, Bernada Zamora

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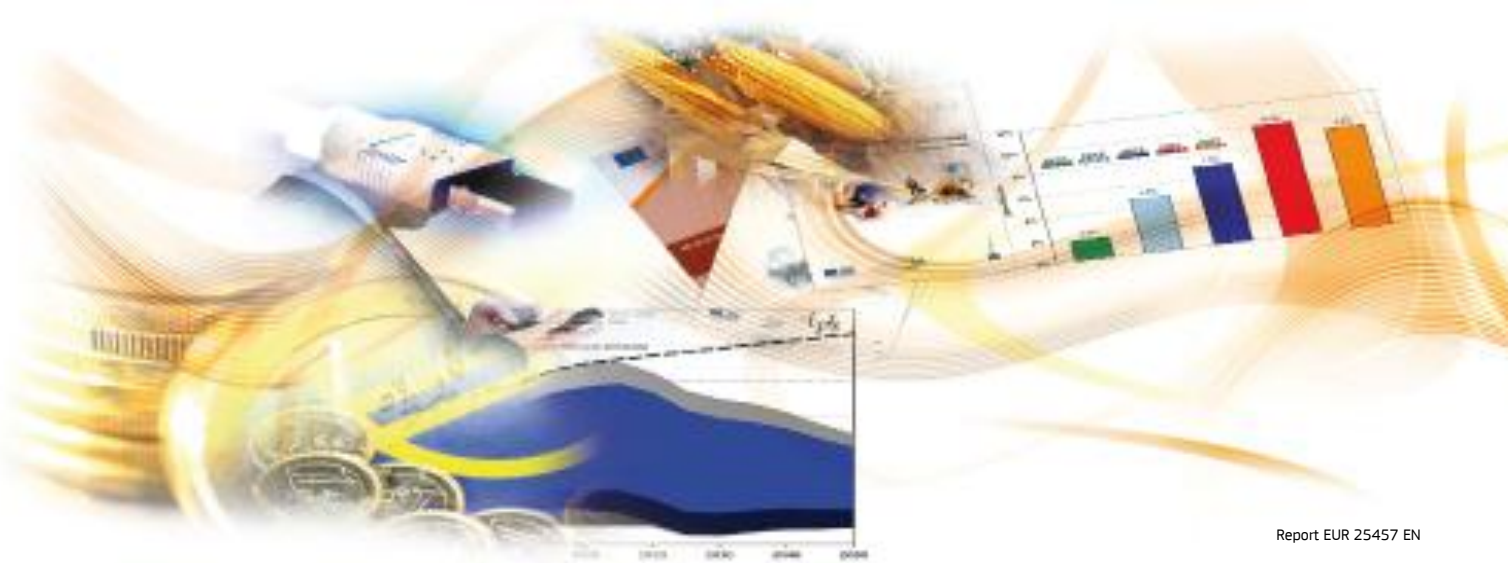

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Institute for Prospective Technological Studies

Contact information
Address:Edificio Expo. C/ Inca Garcilaso, 3. E-41092 Seville (Spain)
E-mail: jrc-ipts-secretariat@ec.europa.eu
Tel.: +34 954488318
Fax: +34 954488300

http://ipts.jrc.ec.europa.eu/
http://www.jrc.ec.europa.eu/

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# TABLE OF CONTENTS

## List of Figures



## List of Tables

## List of Boxes

# Executive summary – evidence consolidation

## Integrated care deployment leads to faster mainstreaming of Personal Health and Social Care services"

The goal of European Health and Social Care (HealthCare) systems is to improve citizens' health status (in terms of length and quality of life) whilst decreasing (or containing) health care expenditure. There are a number of challenges to achieving this. For instance, on the demand side, demographic changes due to ageing and lifestyle-related factors are resulting in an increase in chronic diseases. In addition, rising personal incomes are contributing to growing expectations of better quality and access to HealthCare. On the supply side, HealthCare systems are under pressure due to limited budgets and a growing shortage of trained professionals in view of the increase in demand. IT solutions could help significantly in addressing the challenges HealthCare systems are faced with. There are, however, significant organisational, legislative and political issues that must be dealt with first.

The eHealth team at JRC/IPTS has undertaken research in this area, in the framework of the project Strategic Intelligence Monitoring in Personal Health Systems (SIMPHS), in collaboration with DG INFSO/H1 (ICT for Health Unit). This report is the main deliverable of the project. It is based on an analysis of developments in integrated care in thirty-one care schemes across eight different Member States: Denmark, the UK, Spain, Italy, Estonia, the Netherlands, Germany and France. The following paragraphs summarise the main outcomes of the research, suggest areas where policy input is needed and propose the development of a monitoring framework to enable decision makers assess the state of maturity of the deployment efforts in a mainstreaming process.

The overall findings of the SIMPHS research show that:

1. There is evidently an ongoing transformation of the provision of Health care and cure services in Europe, defined as Integrated Care. This empowers patients and provides them with the same level of medical services as traditional care, with the added benefit of keeping ageing patients with chronic diseases out of hospital, containing costs as well as addressing the complexity of care organisation and enabling a better coordination of multi-disciplinary care efforts.
    a. There is overwhelming evidence that the quality level in healthcare provision in this new paradigm is not inferior to traditional health care, even if not all patients may benefit from integrated care systems because of the specificities of their condition.
    b. Evidence on impacts is positive as the new paradigm results in fewer emergency admissions, less hospitalisation and fewer bed days per intervention. Mortality has also proven to be reduced, in some cases dramatically and beyond expectations.
2. Patients, once exposed to the new service, are largely in favour. They are willing to become more empowered (taking more responsibility for self-management) to deal with their own health care as this promises to enhance their independence, their mobility and their quality of life.
3. Even though there is not always conclusive evidence that this transformation is cost-effective, some countries and regions have already decided to proceed with mainstreaming the new services (e.g. the NHS in the UK, Scotland, Denmark, some regions in Italy and Spain, etc…). As regards costs, there is tangible evidence of savings in the long-run, mostly brought about by the re-organisation and integration which the transformation imposes on the portfolio of care services involved – this is, however, not always conclusive.

In essence, all the evidence collected from our in-depth cases studies, which are analysed in this report, indicates that it is not a question of whether this transformation will be implemented, but rather when. In addition, the conditions under which changes will take place will be affected by the complexity of the field, the multiplicity of the stakeholders involved and also the cultural/organizational differences across European Member States. Our research suggests that the

challenges identified, if addressed and managed properly, can be turned into drivers; which in turn provide hope that the reorientation that our care services require to meet the challenges of our ageing societies is feasible.

The research presented in the body of this report identifies the following key challenges that need be addressed for successful deployment of integrated and personalised care services such as telehealth:

(a) The re-organisation of the existing health and social care services ensuring the coordination of all core services along the continuum of care for the population served.

(b) A sound, committed and integrated governance structure is needed, which will engage stakeholders in the transformation process – some of whom may feel threatened by it. Such strong and continuous political commitment and involvement requires that: (i) the awareness of decision-makers of the challenges at hand must improve; (ii) strategies for dissemination and communication must proliferate; (iii) legal frameworks that address liability issues must be developed and enforced; and (iv) patients must be better integrated in decision-making processes.

(c) Funding is needed to address up-front costs for infrastructure development, interoperability requirements, testing and certification procedures and a more in-depth use (sophisticated functionality) of electronic and personal health records. Equally important is the sustainable financing for these services in the long run, and which requires dedicated funding mechanisms.

(d) Incentives, probably in the form of financing, are also needed across tiers of care; it is important that these are aligned to ensure the equal motivation of key stakeholders.

(e) Interoperability of technical systems is crucial for achieving integration of services, as are semantic interoperability across tiers of care provision and service innovation. Moreover, existing proprietary technical systems must be integrated into emerging care pathways. All of this requires a centralised effort.

(f) A strong focus on patients (patient centricity) is needed to ensure they (and their informal carers) are sufficiently empowered. Emphasis should be placed on doctor-patient communication which is in essence being re-shaped by the transformation of care.

(g) Champions among professionals, especially nursing staff and mainly at hospital level should be identified and rewarded. Innovative working methods and flexible administration by an enlightened hierarchy are called for.

To sum up, this analysis concludes that momentum in Europe for Integrated and Personal Health and Care Services provision is growing rapidly. While the evidence is not always fully conclusive (e.g. cost efficiency), the decision to mainstream is ultimately still a value judgement. For those engaged in facilitating this transformation, the above mentioned key areas represent the main challenges to be addressed. If these issues are tackled they will become facilitators of change which is why policy options need be developed to support this process. Of all the above, the re-organisation of the existing services is not only the most challenging and the most promising, but also the most decisive. Europe benefits from relatively widely implemented electronic health records systems which will support the need for greater coordination through more efficient information management arising from multi-disciplinary service provision. Electronic health records will also offer more efficient access to critical information and thus better control in complex situations. Moreover, once the re-organisation efforts start bearing fruit, it is expected that a technological and service innovation wave, at present only just starting, will further push the transformation process to completion.

Last but not least, we propose the development of a framework to assess the preparedness of HealthCare systems and support the decision-making process. This framework could combine assessment of tangible (cost) and intangible (care) factors which would enable decision makers to

judge how mature their integrated care services are, and how ready they are to be scaled up. It would also represent a knowledge and evidence base which would enable better international comparisons of performance. The development of such a framework should be seen as an evolving process involving different levels of decision-making and stakeholders in a continuous learning and prioritisation process.

# 1. Introduction

## 1.1 Background and rationale for this report

SIMPHS 2, the Strategic Intelligence Mapping on Personal Health Systems Phase 2 (SIMPHS2), is a fourteen-month project carried out by the IPTS in cooperation with DG INFSO/ H1. It uses an approach focusing on the healthcare supply (providers and professionals) and demand (users) sides. The SIMPHS2 approach, compared to the SIMPHS 1 emphasis on the ICT manufacturer and industry side, aims to further expand and integrate the findings from SIMPHS 1.

In particular, SIMPHS2 has enlarged the scope of SIMPHS1 from Personal Health Systems (PHS) to IPHS (Integrated Personal Health/Care Services, see definition in Box 1, as a result of emerging convergence trends between health and social care related to ICT enabled services.

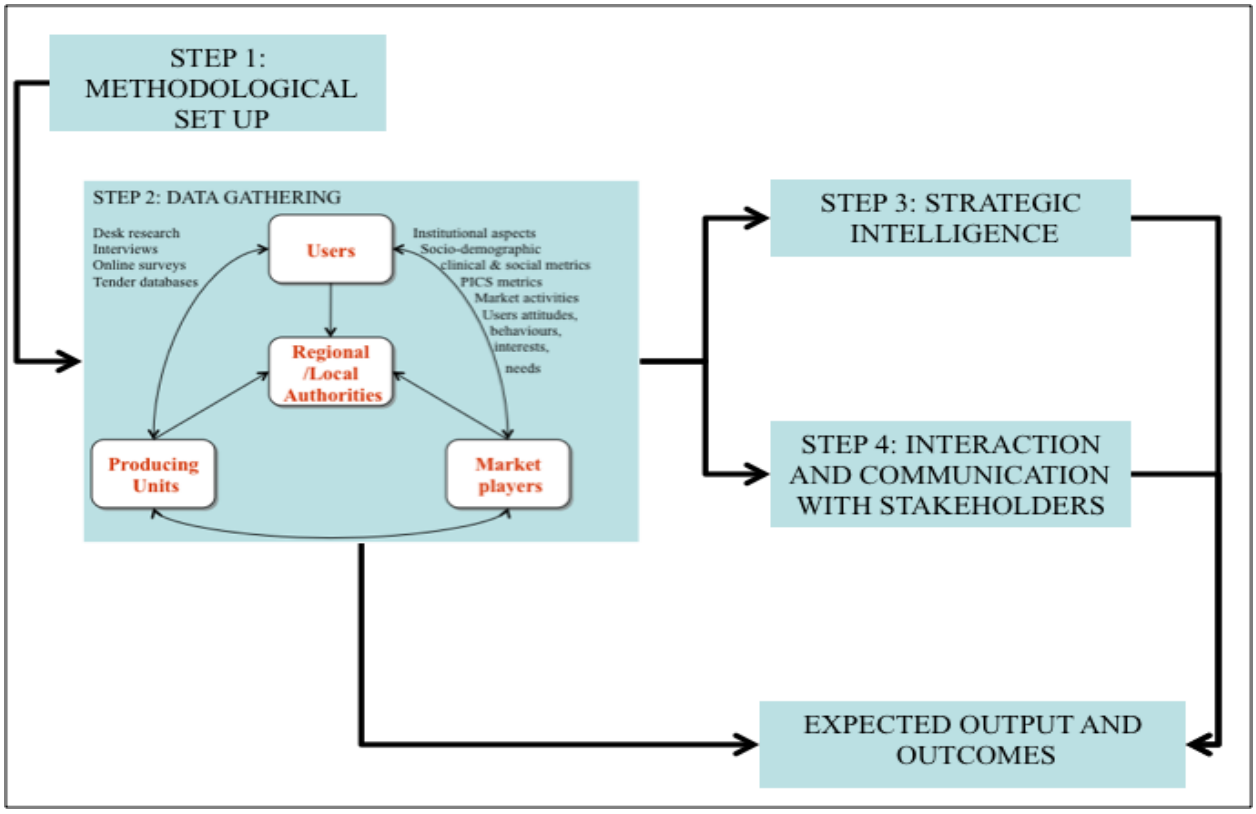
**Box 1 – Definition of Integrated Personal Health/Care Services (IPHS)**
Integrated Personal Health/Care Services or simply IPHS address the health and/or social care needs of individuals outside of care institutions and support the work of care providers in an integrated fashion: 1) they can integrate social assistance, remote monitoring of chronic diseases, prevention, wellness and fitness; 2) they are produced as a result of integration of different institutional and information systems. They are p[1]ersonal and possibly personalised in the way they gather, process and communicate data (for feed-back/action). They are supported by the following technological layers: a) ambient and/or body (wearable, portable or implantable) sensor devices, which acquire, monitor, and communicate physiological parameters and other health and social relevant context of an individual (e.g., vital body signs, biochemical markers, activity, emotional and social state, environment); b) intelligent processing of the acquired information to derive insights about individual's health and social status and support/trigger the activity of professionals; c) active feedback to the users, either from professionals or directly from the devices (i.e. through mobile health applications, possibly in the form of persuasive technologies and serious gaming)
Source: WP1- Methodological Set up Report. Forthcoming [1]

The emphasis on the healthcare supply side (providers and professionals) adopted by SIMPHS2 has driven the research to study the integration between disease management and RMT as well as health and social care in order to extract strategic intelligence and quantitative evidence to support the policy process.

The full illustration of SIMPHS 2 research design and its articulation in activities and deliverables is provided in the Technical Annex. Below a very synthetic summary of this design is provided in order to contextualise the specific objectives of this deliverable. SIMPHS 2 comprises the four steps and six work packages reported below and depicted in Figure 1)

- Step 1/WP 1: Methodological set up
    - WP1a: Conceptual framework
    - WP1b: Scope Definition
- Step 2: Data gathering
    - WP2: Scope and Fact finding
    - WP3: Integrated Disease Management
- Step 3: Strategic intelligence
    - WP4 Evidence Consolidation
    - WP5 Support to Impact Assessment
- Step 4/ WP6: Interaction and communication with stakeholders

**Figure 1 – SIMPHS2 Research design**



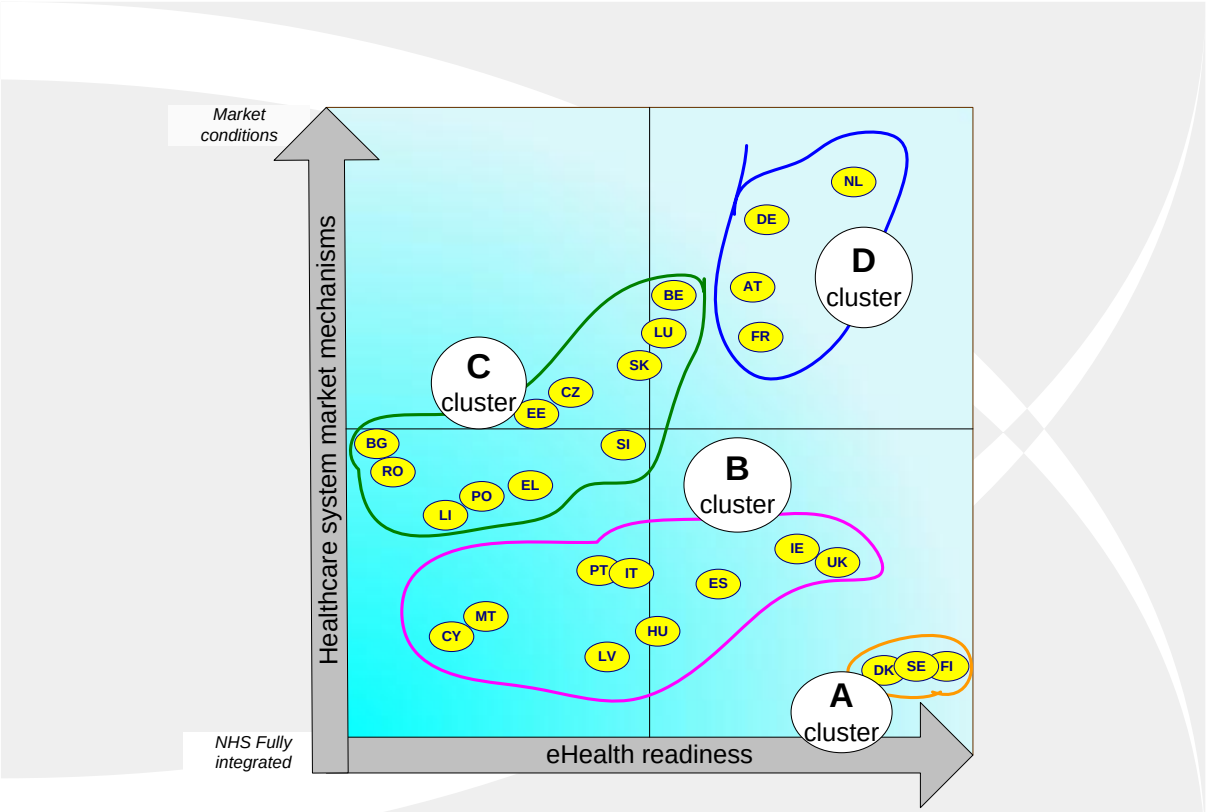

*Source*: SIMPHS2 Technical Annex.

As sketched in **Figure 1**, the research approach is based on the key and primary focus on the regional and/or local health and social care authorities as unit of analysis. In particular, the research strategy to gather the core data under "WP3 – Integrated Disease Management" (part of Step 2) used a case study approach in a variety of settings.

The scope and selection of case studies zoomed in under "WP3 – Integrated Disease Management" were defined in "WP1 - Methodological set up". A number of regional or local (depending on country Health Care System differences) health and social care authorities were selected across a few EU countries as a result of the WP1 exercise.

In particular, the WP1 case study selection started by a clusterisation exercise of EU Member States using a set of indicators. Four clusters on the basis of two axes – eHealth readiness and healthcare system market mechanisms - were identified as a result as depicted in **Figure 2**.

**Figure 2 - Member States distribution based on eHealth readiness and healthcare system market mechanisms**




Source: adapted from WP1- *Methodological Set up Report. Forthcoming* [1]

Clusters have been labelled alphabetically. Cluster D includes those countries with high relative eHealth readiness and healthcare systems with stronger market mechanisms. Within the cluster B, countries relying on Beveridgian models or characterised by one main purchaser of health services are found. Cluster A is characterised by a very high eHealth readiness. Finally within cluster C, although the level of eHealth readiness was dispersed and often lower compared to other clusters, it was considered that zooming into one of these experiences could provide further insights for drivers and barriers to ICT for health in general and to IPHS in particular.

As a result of this exercise, eight case studies were developed under WP3:

- Netherlands, Germany and France from cluster D;
- Estonia from cluster C
- the UK, Spain and Italy from cluster B; and
- Denmark from cluster A.

This selection aimed to provide a wide scope of experiences in countries with varying degrees of government intervention, different market mechanisms and different models of care, for instance in some of them the GP has a strong gate-keeping role (UK, Spain, Italy, Denmark, the Netherlands) whilst in others this role is weaker (Estonia, France or Germany).

The eight case studies portrayed an overview of the health and social care systems including socio-economic data, statistics on healthcare, health and social care organisation and their approach to chronic diseases and integrated care. An overview of the eHealth developments is also included. In-depth studies in each setting focus on IPHS applications, level of deployment and analysis of drivers and barriers to scale-up these initiatives.

From a clinical perspective, three chronic diseases were the foci of study: chronic obstructive pulmonary disease (COPD), cardiovascular diseases (CVD) and diabetes. Given the impact of these three conditions in healthcare systems, these were selected as the most prominent areas of study under SIMPHS1 and SIMPHS2. Thus, approaches to integrated care around these three conditions have been the object of study in the country case studies developed. These can be extrapolated to any other condition in most cases.

The analysis used in each setting used a three axis framework. These three axes are: (i) the Innovation process; (ii) the Governance of such process; and, (iii) the Impact evidence that may trigger innovation. We called this Innovation, Governance, and Impact Framework

This report represents D4.1. It aims to consolidate the evidence developed under WP3.

## 1.2 Specific objectives and structure of this report

This report represents the evidence consolidation of the case studies developed under WP3. Input from stakeholders was received through a two-day validation workshop held in Brussels on January 30th-31st 2012.[1] Their contributions have assisted in refining findings developed under WP3 and these have shaped the content of this document.

This document provides a comparison across countries on ICT developments with a specific focus on IPHS deployment and approaches to integrated care. Conclusions are drawn around integrated care, key barriers, drivers and lessons learnt as well as transferability of models of integrated care delivery.

More specifically this report follows a structure in line with the data gathered for each country under WP3 using a cross-country analysis for each section.

The introduction in Section 1 provides an overview of the rationale for the report, the research design and the clusters that have been used for the data collection.

Section 2 provides an overview of the different health and social care delivery models in each of the countries including socio-economic data, approaches to chronic disease management and ICT developments in healthcare.

In Section 3, an in-depth analysis of trends on IPHS deployment applying the three axes framework (Innovation, Governance and Impact) is provided. Drivers and barriers as well as lessons learnt extracted from the different studies are also analysed within this part.

Finally, conclusions are reached and policy options at EC level discussed in section 4.

[1] Additional details on the workshop can be found at: http://is.jrc.ec.europa.eu/pages/TFS/SIMPHS2.html

# 2. Evidence consolidation from WP3 on socio-demographic trends, healthcare policy responses and developments of ICT in health

## 2.1 Introduction

This chapter describes and analyses recent socio-demographics trends in European countries[2] which are having an impact on the sustainability of health and social care systems. The statistical data and facts have been retrieved from databases where details from most Member States are available (mainly Eurostat [2] and WHO [3]). Often, more accurate, extensive and recent data at national level is available in each of the country reports developed under WP3. Thus, depending on the purposes of the user, retrieving data from the country reports might be an attractive option. However, for the sake of comparability and consistency across European countries the data at national level has been sacrificed in most cases in this section in favour of international sources.

Based on the socio-demographic trends, the following section analyses the responses that different health and social care systems have developed. In this section, the eight country case studies are used as an illustration. Finally, the role of ICT in health is addressed in these settings. In this regard, data at national level from the case studies are used where appropriate for the sake of illustration.

## 2.2 Socio-demographics trends in Europe

As a result of the population increase over the last decade, today, the EU has an overall population of slightly over 502.5[2] million inhabitants with variations across and within its current 27 Member States (see **Table 6**, Annex I). When comparing this value with that of year 2000, it is observed that the population has grown by 4% in 11 years (from 483 million to 502.5 million).

Such an increase is not evenly distributed across Member States. Indeed, countries like Ireland, Luxemburg, Cyprus or Spain have shown a two digit increase in their populations during the 2000-2011 period with values of 18.62%, 18.04%, 16.5% and 15.24% respectively. In contrast, other countries, mainly some of the "new" Member States such as Bulgaria, Estonia, Hungary, Latvia or Lithuania, have gone through a serious decrease in their populations for the same period (Bulgaria being the most prominent example with a population decrease of 8.38%, see details **Table 6**). As described in the Country report of Estonia [4], such a decrease of the population is often due to migration trends as a result of income inequalities amongst Member States. These differences have led to significant numbers of often highly educated people – including doctors - emigrating in search of more competitive salaries which can be 4-5 times higher than the compensation for equal work in their home countries. Other countries such as Germany have also gone through a slight decrease of the population mainly explained by a long-lasting decrease in birth rates.

Not only are there differences in the population size across Member States but differences in the population density also exist (see **Figure 15**, Annex I). Malta is definitely an exception with a population density which is much higher than the EU27 average whilst countries like the Netherlands, Belgium, Germany and the UK are also well above the European average albeit far behind Malta. Besides differences across Member States there are also big differences within Member States as reported in the Spanish case study [5]. These variations in population density often reveal the presence of small communities scattered in rural areas or areas of difficult access. From a policy making perspective, such a reality may call for a different approach when developing policies and planning services to cater for the population needs. This is particularly true for health and social care organisation. As a result of varying population density as well as trends specific to the healthcare sector, the density of doctors and nurses also varies greatly across regions as is the

[2] Throughout this report the terms "European countries" or "Europe" or "EU27" refer to the 27 Member States of the European Union (EU). It is relevant to point that this regional definition of Europe or European countries differs from that used by other international organisations such as the World Health Organization (WHO).

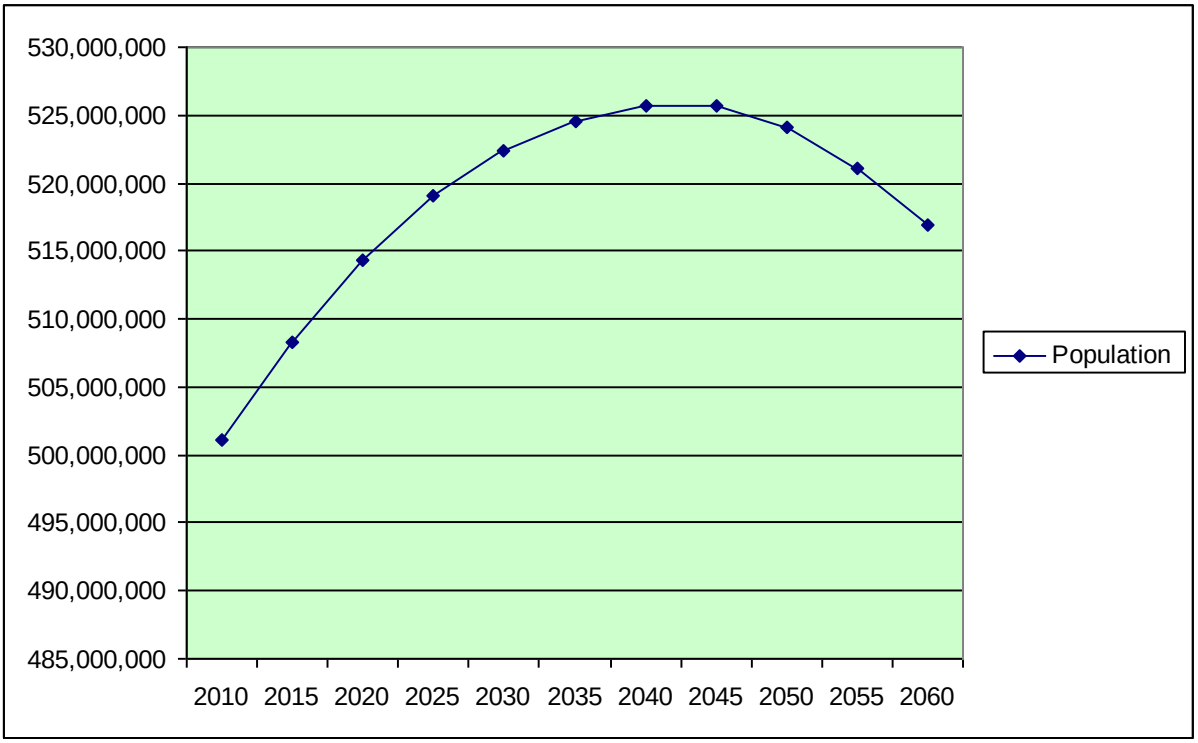
case in France with the emergence of what the French call "medical deserts" where lack of healthcare staff make it difficult to respond to patients' needs.

When it comes to education levels a positive improvement is observed. For instance, as illustrated in **Table 7** (Annex I), the percentage of the population aged 15-24 having received higher education in 2008 was higher than that for 2004 at all levels. In particular, this percentage on average was of 34.9 in 2004 reaching 48.6% in 2008 for levels 0-2[3]. Regarding levels 3-4, the increase went from 42.6% in 2004 to 44.1% in 2008 whilst the corresponding values for education levels 5-6 jumped from 6.3% in 2004 to 7.3% in 2008. This consistent increase across education levels is also reflected on a country basis in almost all cases with some exceptions. The improvement is much more dramatic when looking at longer time spans at national level as reported in the Spanish case study [5].

In the light of the above, it could be concluded that European societies are looking at a bright future ahead: a growing and better educated population. Being better educated is likely to result in better health and in a highly skilled productive society leading to promising economic growth [6] [7]. Unfortunately, when looking at additional data into detail, this shiny picture becomes greyer.

According to projections on population trends made by Eurostat [2], the population increase is expected to reach a peak of 525.7 million people in the EU27 by year 2040 to then start decreasing and reach a value of less than 517 million by 2060 as displayed in **Figure 3**.

**Figure 3 – Projections of the population (2010- 2060) in EU 27 Member States numbers of persons**

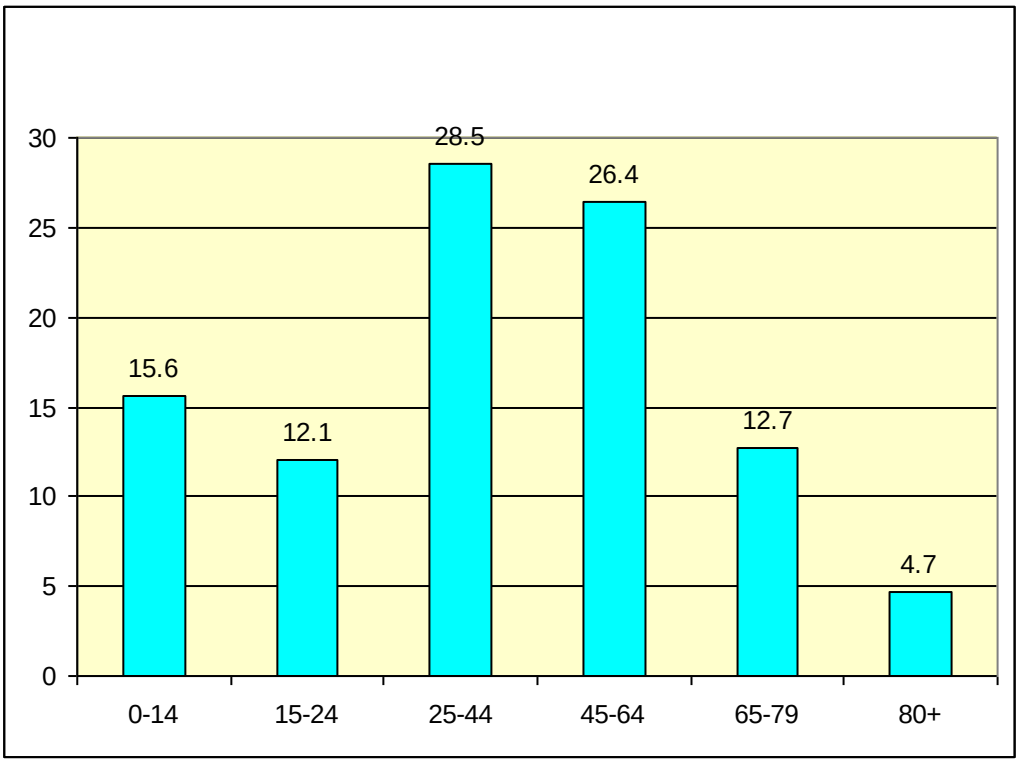



Source: Eurostat, 2011[2]. Note data from 2010 is actual data

In addition, as much as in recent years the European population has grown as a whole, this growth has been uneven in different age classes. As a result, and as depicted in **Figure 4**, in 2010 the population aged 65-79 represented 12.7% of the total European population and the population aged 80 years and over represented 4.7%.

[3] Levels 0-2 (ISCED 1997) = Pre-primary, primary and lower secondary education; Levels 3-4 (ISCED 1997) = Upper secondary and post-secondary non-tertiary education; levels 5-6 (ISCED 1997) = Tertiary education.

**Figure 4 - Share of the population in each age band in 2010 (%), average 27 EU Member States**

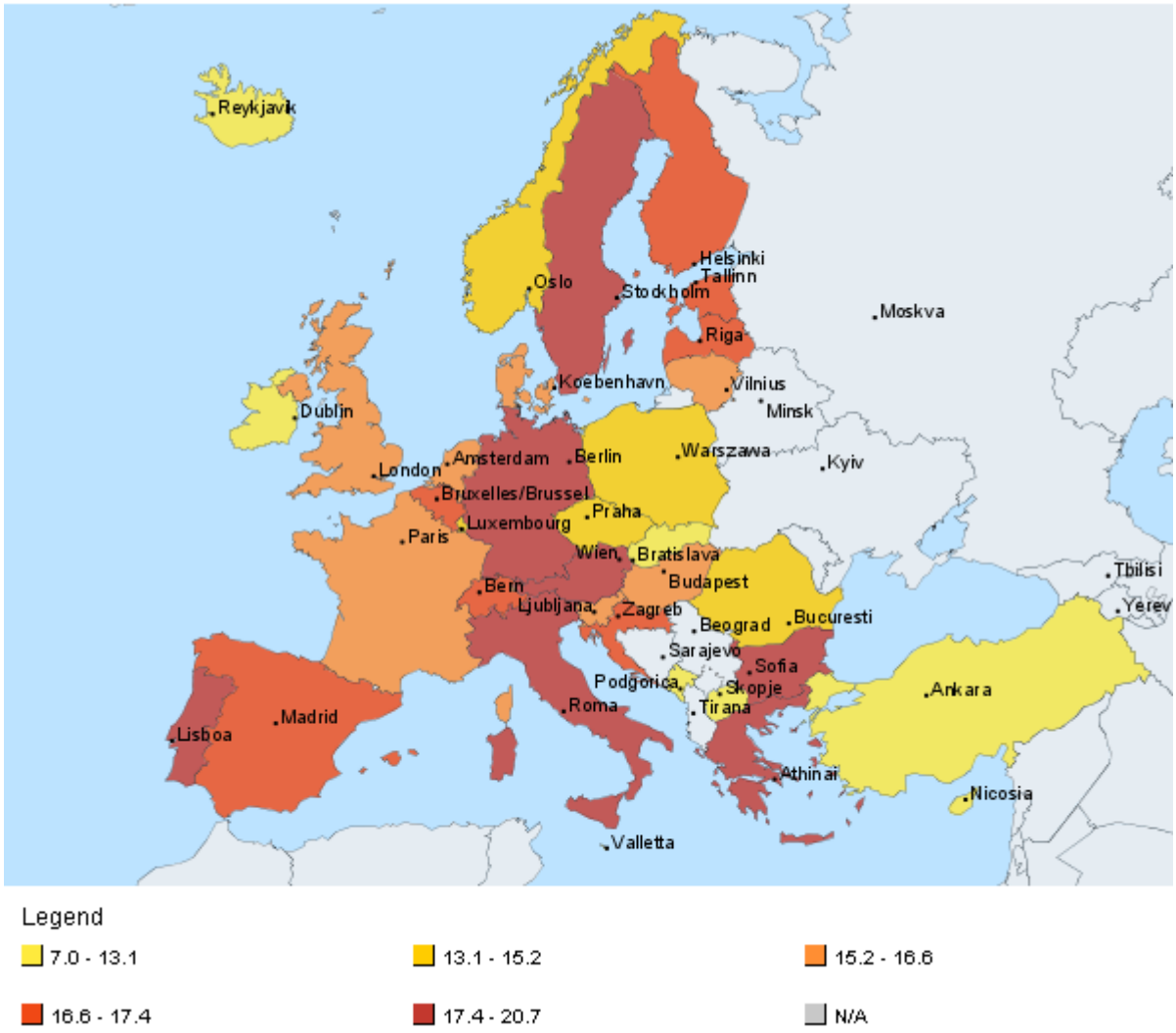



Source: Eurostat, 2011[2]

Thus, the population 65+ totalled 17.4% of the population in 2010, outnumbering those aged 0-14.

The weight of the increasing proportion of the population 65+ varies across countries. As depicted in **Figure 5**, the proportion of the population 65+ ranged from slightly over 20% in Italy or Germany amongst others to values below 13% which only apply to Ireland and Slovakia within the EU27 (details on the evolution of the proportion of the population aged 65+ for the period 2000-2010 in each Member State are available in **Table 8**, Annex I).

**Figure 5 - Proportion of the population aged 65+, EU27 and selected neighbouring countries, 2010**



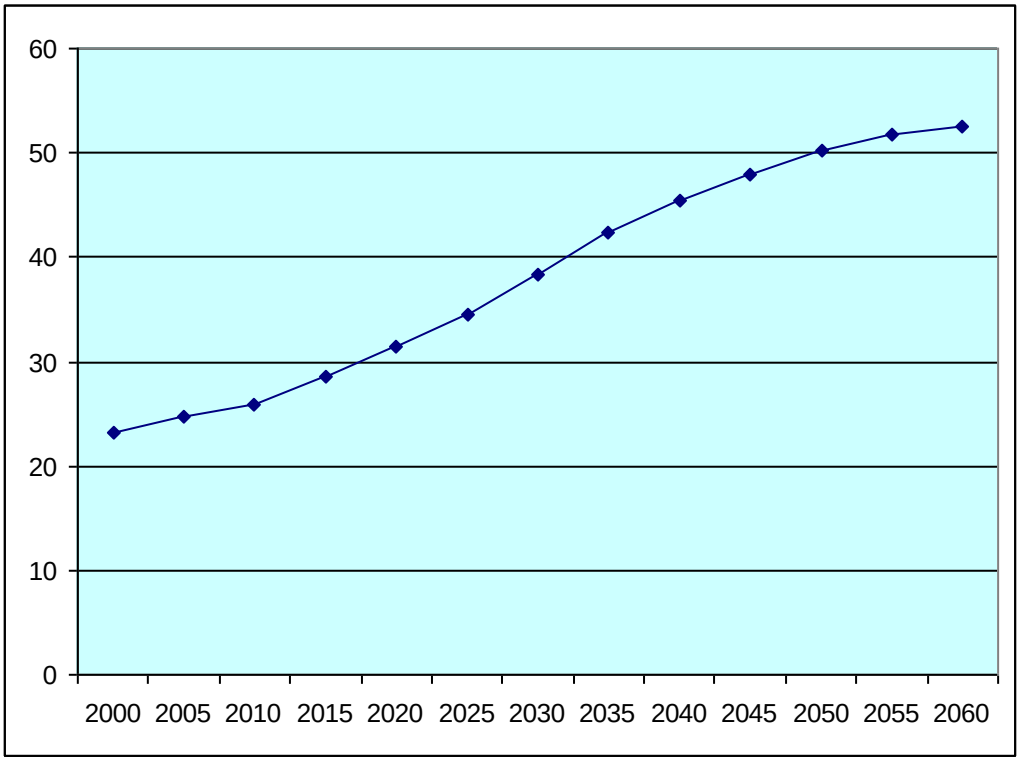

Source: map created by Eurostat software using Eurostat data[2].

**Figure 4** also portrayed that although the weight of the 65+ is becoming a concern, the greatest part of the population was represented by those in the age bands 25-44 and 45-64 which include tens of millions of post-war baby boomers. This is very relevant when looking at population trends and making forecasts.

The weight of the 65+ on those in working age can be represented through the so-called Old-age-dependency ratio. This indicator is the ratio between the total number of elderly persons of an age when they are generally economically inactive (aged 65 and over) and the number of persons of working age (from 15 to 64). This value was 23.2% for year 2000 on average for EU27 and jumped to almost 26% in 2010 (specific data per Member State is available at **Table 9**, Annex I).

Not only has this ratio shown a significant increase but the forecast, based on demographic trends, for the old-age-dependency ratio is to keep on increasing and reach a value of 52.55% by 2060 as illustrated in **Figure 6** (specific forecasts at national level are also available at **Table 10**, Annex I).

**Figure 6 - Old-age-dependency ratio, average EU27 for 2000- 2060**




Source: Eurostat, 2011[2]. Note: data until year 31/12/2010 are actual values whilst from 2011 onwards data presented are forecasts

This forecast is mainly explained by the effect of baby-boomer generation streaming into retirement and the decrease in birth rate shown by this generation. As a result, available labour forces in the EU are unlikely to ever reach this level in the medium to the long term.

The casual observer can be forgiven for regarding such trends with something less than alarm. Why should this be a cause for worry? The answer lies in the interaction between population change and the economy, on the one hand, and the economy and the tax base, on the other. In the light of an ageing population, the sustainability of European welfare is at risk. An ageing population translates into a decrease of those taxable as they are already beginning to draw their pensions in large numbers. In addition, the demand on health and social care systems of the ageing population is putting pressures onto those systems as detailed in the next section (see: Section 2.3 Trends and pressures on health and social care systems).

## 2.3 Trends and pressures on health and social care systems

### 2.3.1 Recent trends of healthcare systems

A quick overview on recent trends of healthcare systems can be summarised in two key messages: an increase in life expectancy (as a proxy of the health status of the population) and an increase in healthcare expenditure.

This trend is not only valid for European healthcare systems but also for other high income countries like Japan or Australia amongst others (see details in **Table 11**). For instance, the average life expectancy at birth in the EU27 was of 76 years in 2000 whilst the corresponding value for 2007 was 78 years.

In terms of reflecting the actual health state of the population, the value provided by HALE is more accurate. Healthy life expectancy (HALE) at birth includes a factor reflecting expectations of quality of life. Indeed HALE results from the addition of life expectancy values for different health states, adjusted for severity distribution making it sensitive to changes over time and leading to differences between countries in the severity distribution of health states. For the EU27 in 2007,

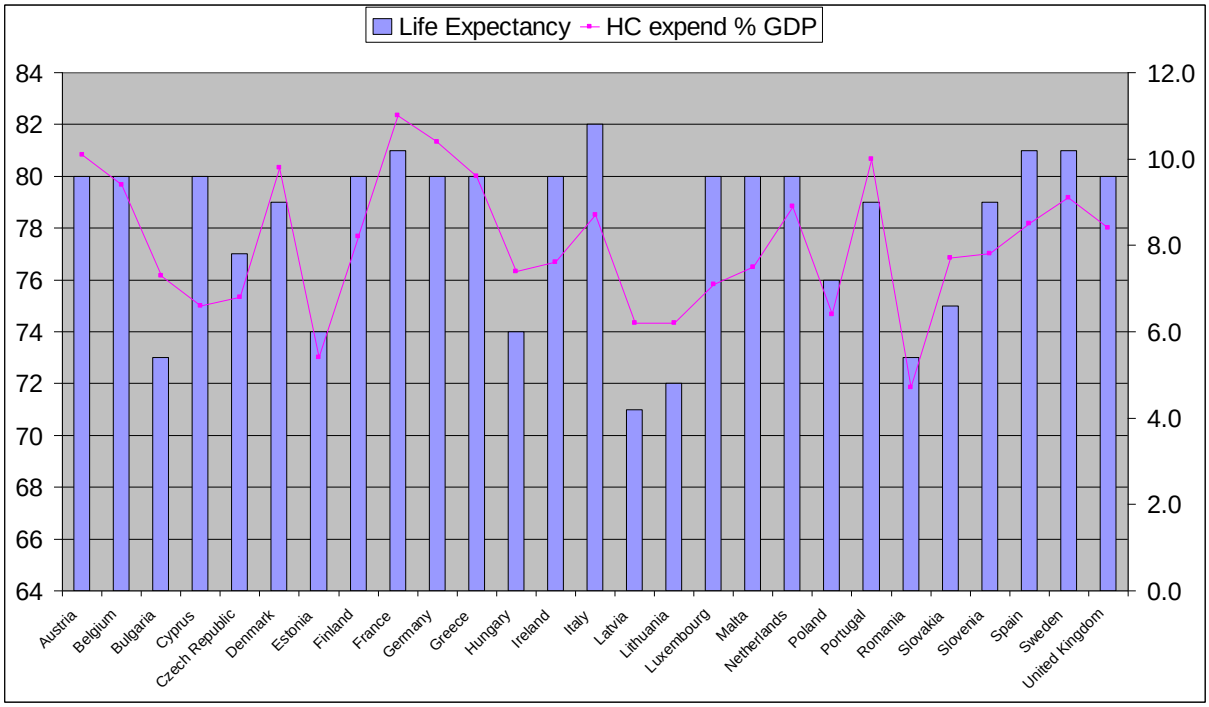
male had a HALE of 68 years whilst this value for females was 73 years. The HALE for both, male and female was 70. The higher values for life expectancy of female when compared to those for male is a common trend across most nations often attributed to male's higher consumption of alcohol, tobacco and drugs. In the last decades, these habits have increasingly been adopted by females thus causing a noticeable convergence on life expectancy between the two genders.

In the light of the two main trends related to increased healthcare expenditure and higher health status, the current aims of healthcare systems are twofold. On the one hand, the aim is to contain or decrease healthcare expenditure. On the other hand, the aim is to further improve the health status of the population. This goal does not only translate into extending their lives in absolute years but also in terms of extending their quality of life. Thus, increase their healthy life years and their life span. At European policy level, this aim was crystallised with the launch of the European Innovation Partnership (EIP) on Active and Healthy Ageing (AHA) in February 2011. Three areas to be addressed by the EIP were established: "*the three areas of prevention and health promotion, care and cure, and active and independent living of elderly people*". A target to increase the average healthy lifespan of European citizens by two years by 2020 was also established [8].

The ambition to reach these two goals (increase healthy life years and control expenditure) is based on the fact that spending more does not necessarily translate into higher life expectancy. For instance, as depicted in **Figure 7**, there are a set of countries with higher life expectancy and relatively lower healthcare expenditure as a percentage of the GDP. This is particularly true for countries like Spain, Sweden and Italy. In contrast, France also shows a high life expectancy accompanied, however, by a higher healthcare expenditure as percentage of the nation's GDP. Another reason for promoting healthy ageing is the fact that higher life expectancy does translate into more costs for health and social care because of a greater ageing population who is more likely to suffer from chronic diseases. This is clearly illustrated in France with the ALD[4] regime which provides 100% coverage for 30 chronic diseases and which has seen the number of patients included (and associated costs) increase significantly in recent years, making it unsustainable, under the pressure of a growing ageing population. Hence improving health status and prevention are seen as a way to contain costs.

[4] ALD stands for "Affections de Longue Durée" i.e. long-term diseases.

**Figure 7 – Life expectancy at birth (2008) vs healthcare expenditure measured as % of (GDP 2007), EU 27 Member States**




Source: WHO, 2011[3]

### 2.3.2 Trends and pressures on healthcare expenditure

A set of indicators can be used to reveal current trends on healthcare expenditure or even demystify some misconceptions related to this.

As detailed in Table 1, the role and contribution of healthcare financing agents per country vary. When comparing this data with that of **Table 11** (in Annex I), no clear relation between funding source and expenditure per capita or health status can be found. In fact, the USA represents the highest expenditure (both per capita and as a % of the GDP) and with the highest contribution from non-government funds. Here, the life expectancy at birth and the HALE is no higher than the EU average.

**Table 1 – Healthcare expenditure by financing agent (% contribution) in 2008. EU Member States and other high income countries**

| | General government excluding social security funds | Social security funds | Private insurance enterprises (including private social insurance) | Private household out-of-pocket expenditure | Non-profit institutions serving households | Corporations (other than health insurance) | Rest of the world |
|---|---|---|---|---|---|---|---|
| **Belgium (1)** | 12.4 | 62.8 | 5.6 | 19.0 | 0.3 | 0.0 | 0.0 |
| **Bulgaria** | 17.7 | 38.5 | 0.5 | 42.6 | 0.4 | 0.3 | 0.0 |
| **Czech Republic** | 5.0 | 77.1 | 0.2 | 16.1 | 1.2 | 0.4 | 0.0 |
| **Denmark (1)** | 83.8 | 0.0 | 1.7 | 14.4 | 0.1 | 0.0 | 0.0 |
| **Germany** | 7.1 | 70.2 | 9.7 | 12.3 | 0.4 | 0.4 | 0.0 |
| **Estonia** | 10.8 | 67.6 | 0.3 | 20.5 | 0.0 | 0.8 | 0.1 |
| **Ireland** | : | : | : | : | : | : | : |
| **Greece** | : | : | : | : | : | : | : |
| **Spain** | 67.3 | 4.8 | 5.8 | 21.5 | 0.6 | 0.0 | 0.0 |
| **France (1)** | 5.3 | 73.5 | 13.5 | 6.9 | 0.1 | 0.7 | 0.0 |
| **Italy** | : | : | : | : | : | : | : |
| **Cyprus** | 42.0 | 0.1 | 5.7 | 50.2 | 2.0 | 0.0 | 0.0 |
| **Latvia (2)** | 61.5 | 0.0 | 2.6 | 35.6 | 0.3 | 0.0 | 0.0 |
| **Lithuania** | 10.0 | 61.4 | 0.5 | 28.0 | 0.0 | 0.1 | 0.0 |
| **Luxembourg** | 8.5 | 73.9 | 3.5 | 13.7 | 0.4 | 0.0 | 0.0 |
| **Hungary** | 10.0 | 60.8 | 2.2 | 24.5 | 1.7 | 0.9 | 0.0 |
| **Malta** | : | : | : | : | : | : | : |
| **Netherlands (1)** | 5.4 | 76.7 | 6.2 | 6.0 | 3.2 | 2.5 | 0.0 |
| **Austria (1)** | 30.5 | 47.0 | 4.8 | 16.3 | 1.3 | 0.1 | 0.0 |
| **Poland** | 7.6 | 64.5 | 0.6 | 24.0 | 1.1 | 2.1 | 0.0 |
| **Portugal (2)** | 70.3 | 0.9 | 4.3 | 23.9 | 0.3 | 0.2 | 0.0 |
| **Romania** | 10.9 | 70.5 | 0.1 | 18.2 | 0.1 | 0.2 | 0.0 |
| **Slovenia** | 1.7 | 70.9 | 13.8 | 12.7 | 0.0 | 0.8 | 0.0 |
| **Slovakia (2)** | 6.4 | 63.6 | 0.0 | 26.6 | 0.8 | 2.6 | 0.0 |
| **Finland (1)** | 59.0 | 15.4 | 2.2 | 20.0 | 1.2 | 2.1 | 0.0 |
| **Sweden** | 82.3 | 0.0 | 0.2 | 16.5 | 0.2 | 0.8 | 0.0 |
| **United Kingdom** | : | : | : | : | : | : | : |
| **Iceland** | 54.9 | 28.3 | 0.0 | 15.3 | 1.4 | 0.0 | 0.0 |
| **Norway (2)** | 69.8 | 13.6 | 0.0 | 16.5 | 0.0 | 0.2 | 0.0 |
| **Switzerland (1)** | 16.2 | 42.9 | 9.2 | 30.7 | 1.0 | 0.0 | 0.0 |
| **Australia (1)** | 69.2 | 0.0 | 8.3 | 19.1 | 0.0 | 3.4 | 0.0 |
| **Canada** | 68.1 | 1.5 | 13.5 | 15.5 | 0.0 | 1.5 | 0.0 |
| **Japan (1)** | 15.1 | 66.5 | 2.5 | 14.8 | 0.0 | 1.0 | 0.0 |
| **Rep. of Korea** | 12.2 | 45.1 | 4.6 | 37.2 | 0.7 | 0.2 | 0.0 |
| **New Zealand** | 70.4 | 10.1 | 4.8 | 13.9 | 0.9 | 0.0 | 0.0 |
| **United States (2)** | 46.4 | : | 36.8 | 13.1 | 3.5 | 0.3 | 0.0 |

Source: Eurostat, 2011 [2]. Note: data is for 2008 for most countries with the exception of those with (1) denoting 2007 and (2) denoting 2006

Looking at type of costs that contribute to the healthcare expenditure provides a better overview. Three broad indicators are included here: costs of drugs and prescriptions, costs of hospital care and healthcare professionals' salaries. Thus, policies to control expenditure can aim at either of them.

Efforts to decrease expenditure on drugs and prescriptions mainly focus on promoting the use of generics and decreasing or penalising unnecessary overprescribing habits.

Regarding costs of hospital care, these can be analysed looking at activity data and indicators which may serve as proxies for efficiencies. Two indicators are used in this report. One is on hospital discharges (see Table 12 providing data for the period 2000-2009). Missing data in this regard is more frequent than one might think. However, it can be observed that in some countries (i.e.: Bulgaria or the Netherlands) an increase in hospital discharges per 100,000 inhabitants took place during this period. This might be explained by increased access, changes in treatment pathways or higher need from the ageing population. Out of these, policies to decrease costs can only focus on changes in treatment pathways and patient care that may avoid hospitalisations.

On the other hand, other countries such as Sweden or Estonia show a decrease in activity based in hospital discharge data. This might be due, to effective preventive measures, to rationalisation of resources or to the development of innovative care pathways that assist in keeping patients at home. As it will be later reported, these aspects definitely represent a trend in current healthcare systems. In order to decrease healthcare expenditure, the aim is to prevent hospitalisations or as much as possible treat patient at home rather than hospitalise them. Indeed, as portrayed in Table 13 (Annex I), the amount of hospital beds per 100,000 inhabitants has decreased since year 2001 in all Member States with the exception of Greece. The average for EU27 of hospital beds per 100,000 inhabitants was 629.8 in 2001 whilst the same value for 2009 was 550.9, reflecting the trend to decrease inpatient stays and keep patients at home.

When looking at long-term beds in nursing and residential care facilities as detailed in Table 14 (annex I) different conclusions can be drawn. In some countries like Denmark a slight decrease is observed, again in line with the trend to keep patients at home. In others, these resources have remained constant in the last decade. Such is the case of Belgium for instance. In others, an increase in these resources is observed. This is the case of Spain for instance. At the beginning of the millennium in Spain, the main characteristic of social and long-term care was that these services did not exist. Thus, often patients in need for those services were kept in hospital instead. In recent years, social care policies and resources were developed thus shifting those patients from hospital care to long-term and nursing care which is often less costly. In sum, the increase in the ageing population generates higher demand for long-term care and nursing which often were covered by pricy hospital services. In an attempt to contain costs, policies have tended to shift these patients to social care services by increasing the amount of long-term beds often less costly. In other cases, policies aiming to keep patients at home have also been developed.

An additional measure of hospital activity is that related to average length of stay (ALOS). As detailed in Table 15 (annex I), all countries (with the exception of Poland) reflect a consistent decrease in ALOS during the last decade. By looking at mortality data, it can be concluded that this decrease in ALOS has not resulted in higher mortality. Indeed, as detailed in Table 18 (annex I), the mortality rate has consistently decreased across all Member States in the last decade. Thus, it can be concluded that the decrease in ALOS is the result of efficiencies generated and developments aiming to keep patients at home in order to decrease hospital costs.

The third item associated to costs is that of healthcare personnel. When looking at details on practising physicians and doctors (see Table 16) as well as on nursing and caring professionals (see Table 17), the data shows a consistent increase in the number of these professionals. This fact is largely explained by the increase on the ageing population and the resulting increase in chronic disease generating higher demand for services. In the light of this increased demand, aiming to decrease costs by cutting healthcare professionals seems unrealistic. Actually, the concern here lies in the forecasted shortage of labour supply in this sector. Indeed, the Europe 2020 Strategy for smart, sustainable and inclusive growth highlights the need to reform labour markets, upgrade skills and match them with market demand. The need to plan for our ageing society and the additional healthcare resources which will be needed in the future is also identified. In particular, it is estimated that by 2020 there will be a shortfall of 1,000,000 health professionals in the European Union [9].

Different strategies addressing the foreseen shortage in health professionals and the increase demand resulting from the ageing societies have been developed. Harnessing the potential of ICT in healthcare, promoting integrated care and improving the coordination between health and social care are amongst them as will be covered in-depth later in this study.

#### 2.3.3 Trends and pressures on health and social care systems related to health status of the population – the impact of chronic diseases

As outlined earlier, besides reducing healthcare expenditure, a second aim for national healthcare policies is to further improve the health status of the population in terms of increasing life longevity

and quality of life. Different indicators can be used as proxies to reveal current trends in this respect.

Among these trends, the continuous increase in life expectancy (see **Table 11**) and the decrease in mortality (see **Table 18**) have been identified in the last decade across EU Member States. Here, it is also relevant to compare the data on mortality due to all causes (see **Table 18**) with mortality due to chronic diseases (see **Table 19**). By looking at both, in 2008 for instance, the average EU27 death rate due to chronic diseases per 100,000 inhabitants represented almost 20% of the standardised death rate. Thus, as much as a decrease in death rates due to chronic diseases can be observed over the last few years, these have represented a high proportion of the overall mortality. This situation is likely to persist.

A relevant indicator is also self-reported health-status of the population (see **Table 20** to **Table 28**). As detailed in table 15 for 2009, the total of those reporting to be in very good, good or fair health represent over 90% of the population in most Member States. In few countries this percentage is below 90% and only in Portugal and Poland it is below 80%. The case of Ireland is also interesting with over 98% of people considering themselves within these three health states. Indeed, over half the Irish population (54.5%) report feeling in a 'very good' health state.

Looking at self-reported health state per age range provides a better picture on health states and the perceived quality of life of those who are ageing. The highest proportion of those reporting being in a 'very good' health state is found in the youngest of those surveyed, age range 15-24 years old (see **Table 21**) across all Member States and this proportion starts decreasing as age ranges advance (see **Table 22** to **Table 28**). The only exceptions to this are Ireland and the Netherlands where the highest proportion of those reporting in a 'very good' health state is found in the age range 25-34 years and from there again a steady decrease is observed as the ageing population is reached. Also, as the survey reaches those aged 65 and above, the proportion of the population reporting to be in 'bad' or 'very bad' health states reaches higher levels. Notwithstanding that this is subjective data reported by the population, this subjective feeling is a sign of the impact that chronic diseases and associated co-morbidities have in the quality of life of the population.

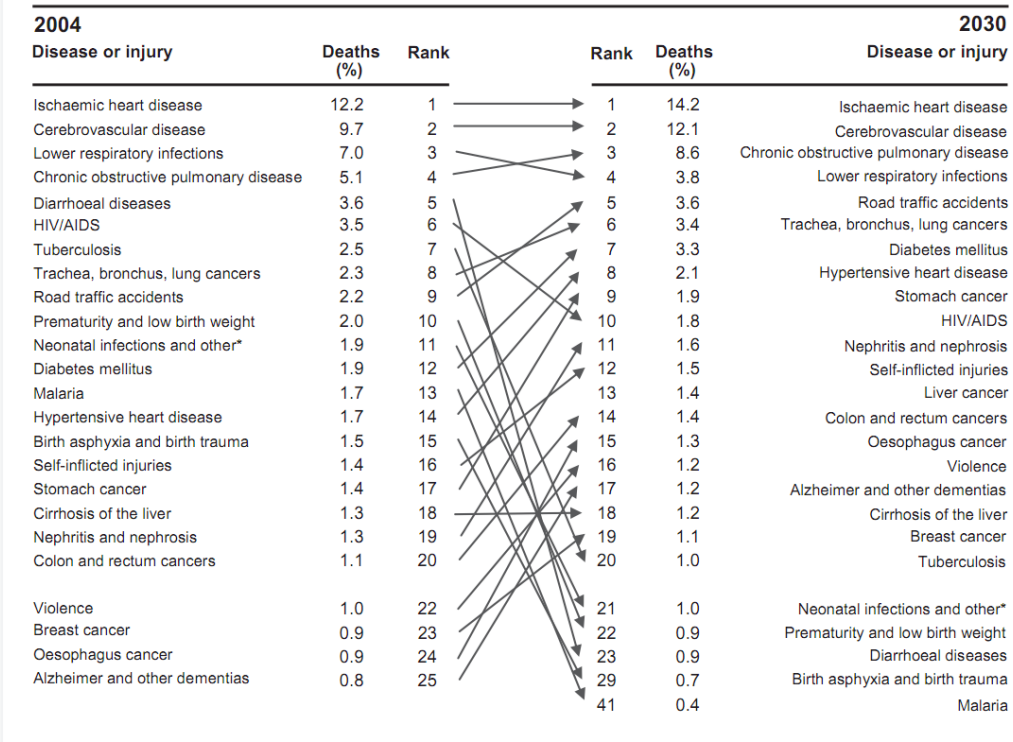
Given the two overarching objectives of healthcare systems (decreasing healthcare expenditure and improving quality of life), it is unavoidable for them to pay attention to chronic diseases.

On the one hand, chronic diseases represent a main source of demand of healthcare resources. For instance, due to the increased demand that they generate, a trend is observed towards higher number of doctor consultations per capita (see **Table 29**). In particular, the UK case study reports that the 30% of the population with long-term conditions accounts for 70% of NHS spending in the UK [10]. Thus, the objective of decreasing healthcare expenditure can only be achieved if chronic diseases are managed appropriately.

On the other hand, chronic diseases have an impact on the quality of life of the population. If quality of life is to be improved, emphasis should be made on improving the quality of life of those suffering from chronic conditions. In this regard, ICT are regarded as a tool to improve healthcare delivery and potentially having a positive impact on quality of life as will be covered in-depth later in this study.

In order to better grasp the impact of chronic diseases on European healthcare systems, three chronic conditions have been selected to illustrate their impact: chronic obstructive pulmonary disease (COPD), cardiovascular diseases (CVD) and diabetes. They have been selected as they currently are amongst the top causes of deaths and they are also the focus of SIMPHS. The forecast is not for these to decrease but to remain or even increase as illustrated in **Figure 8**. The consolidated evidence from the country studies which is presented throughout the rest of this document will be articulated around these three diseases.

**Figure 8 – Leading causes of death, 2004 and 2030 compared**



| 2004 | | | | | 2030 |
|---|---|---|---|---|---|
| Disease or injury | Deaths (%) | Rank | Rank | Deaths (%) | Disease or injury |
| Ischaemic heart disease | 12.2 | 1 | 1 | 14.2 | Ischaemic heart disease |
| Cerebrovascular disease | 9.7 | 2 | 2 | 12.1 | Cerebrovascular disease |
| Lower respiratory infections | 7.0 | 3 | 3 | 8.6 | Chronic obstructive pulmonary disease |
| Chronic obstructive pulmonary disease | 5.1 | 4 | 4 | 3.8 | Lower respiratory infections |
| Diarrhoeal diseases | 3.6 | 5 | 5 | 3.6 | Road traffic accidents |
| HIV/AIDS | 3.5 | 6 | 6 | 3.4 | Trachea, bronchus, lung cancers |
| Tuberculosis | 2.5 | 7 | 7 | 3.3 | Diabetes mellitus |
| Trachea, bronchus, lung cancers | 2.3 | 8 | 8 | 2.1 | Hypertensive heart disease |
| Road traffic accidents | 2.2 | 9 | 9 | 1.9 | Stomach cancer |
| Prematurity and low birth weight | 2.0 | 10 | 10 | 1.8 | HIV/AIDS |
| Neonatal infections and other* | 1.9 | 11 | 11 | 1.6 | Nephritis and nephrosis |
| Diabetes mellitus | 1.9 | 12 | 12 | 1.5 | Self-inflicted injuries |
| Malaria | 1.7 | 13 | 13 | 1.4 | Liver cancer |
| Hypertensive heart disease | 1.7 | 14 | 14 | 1.4 | Colon and rectum cancers |
| Birth asphyxia and birth trauma | 1.5 | 15 | 15 | 1.3 | Oesophagus cancer |
| Self-inflicted injuries | 1.4 | 16 | 16 | 1.2 | Violence |
| Stomach cancer | 1.4 | 17 | 17 | 1.2 | Alzheimer and other dementias |
| Cirrhosis of the liver | 1.3 | 18 | 18 | 1.2 | Cirrhosis of the liver |
| Nephritis and nephrosis | 1.3 | 19 | 19 | 1.1 | Breast cancer |
| Colon and rectum cancers | 1.1 | 20 | 20 | 1.0 | Tuberculosis |
| Violence | 1.0 | 22 | 21 | 1.0 | Neonatal infections and other* |
| Breast cancer | 0.9 | 23 | 22 | 0.9 | Prematurity and low birth weight |
| Oesophagus cancer | 0.9 | 24 | 23 | 0.9 | Diarrhoeal diseases |
| Alzheimer and other dementias | 0.8 | 25 | 29 | 0.7 | Birth asphyxia and birth trauma |
| | | | 41 | 0.4 | Malaria |

Source: WHO World health Statistics 2008[11]

In discussions related to chronic diseases, it is almost unavoidable to use certain terms such as prevalence, incidence, morbidity and mortality. These are defined in Box 2 below, in order to facilitate the reading.

**Box 2 - Definition of key terms used in this document**

**Prevalence**: the percentage of a population that is affected with a particular disease at a given time.

**Incidence**: rate of occurrence or influence ; especially : the rate of occurrence of new cases of a particular disease in a population being studied

**Morbidity**: the incidence of disease, the rate of sickness (as in a specified community or group)

**Mortality**: (a) the number of deaths in a given time or place. (b) the proportion of deaths to population

Often prevalence is compared to incidence whilst mortality is compared to morbidity.

Source: MedlinePlus (U.S. National Library of Medicine)

**Chronic obstructive pulmonary disease (COPD)**

COPD is an umbrella term for a group of lung diseases that include chronic bronchitis, emphysema and small airways disease. Lung damage over a long period of time impairs the flow of air in and out of the lungs and causes breathlessness [10].

Estimated to affect 600 million people worldwide [3], COPD is the 4th leading cause of death worldwide and expected to become number three by 2020 causing over 6 million deaths every year by then. Yet 75% of those affected remain untreated due to lack of diagnosis. Thus, prevalence figures for COPD are believed to be underestimated. Sufferers tend not to seek medical advice until the disease has progressed and the condition is severe.

Relevant here is the fact that Quality of Life (QoL) is severely affected in patients with COPD, with 80% of patients hospitalised following an exacerbation, with a health status rated or quoted by a physician as being 'worse than death'. Complementary sources provide the disability value for untreated COPD in terms of QoL as of 0.43. This value was obtained using a person trade-off method where death is weighted as 0 and full health as 1[12].

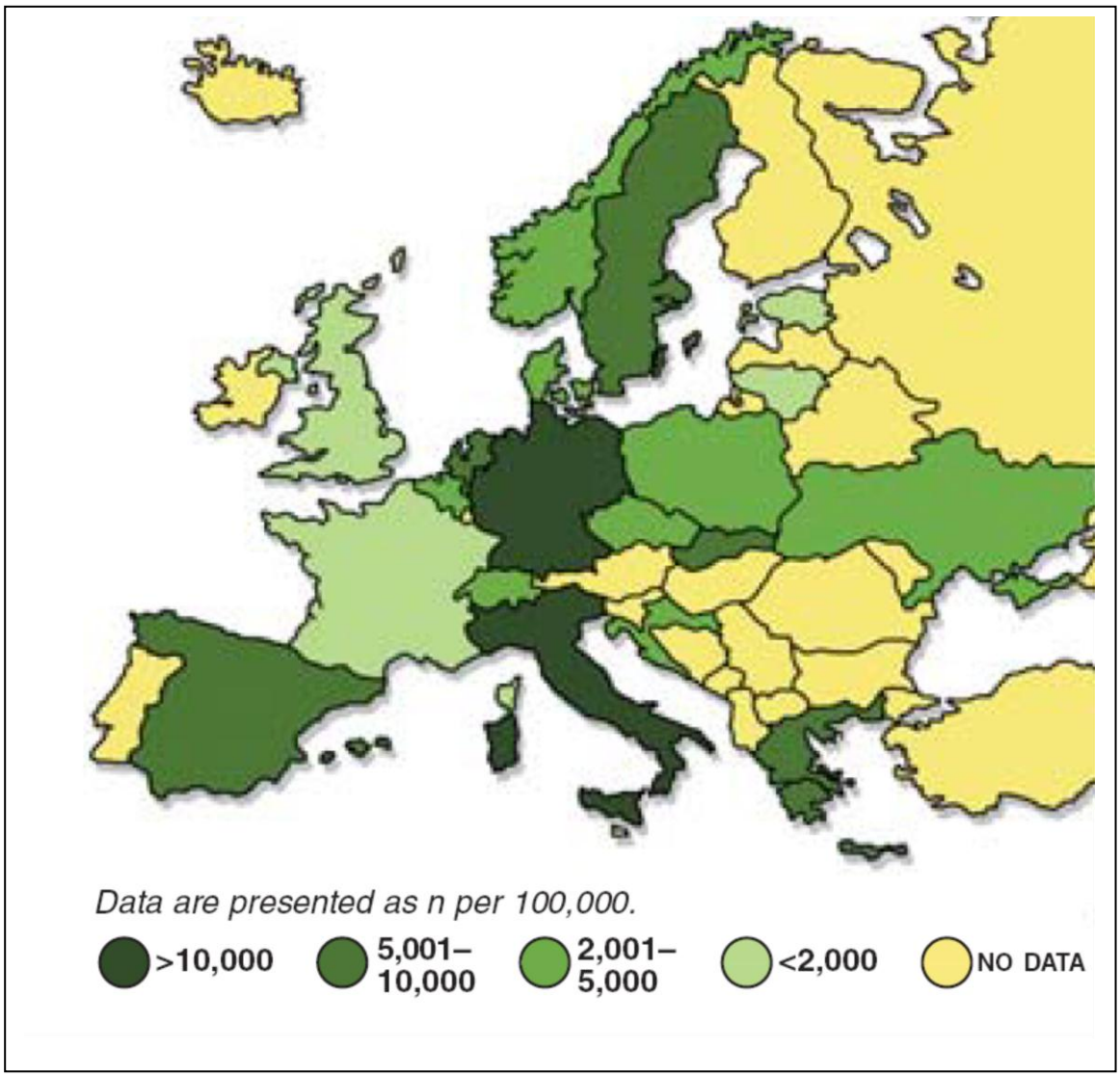
Approximately 200,000–300,000 people die of COPD each year in Europe. The Spanish country study shows a telling picture of this situation [5]. The prevalence of COPD in Spain according to the GOLD criteria [5] was found to be 10.2% for the population aged between 40 to 80 years old. Geographical variations amongst Spanish regions ranged from 16.9% to 6.2%. Severe epidemiologic problems related to under-diagnosis (which also varied per region from 58.6% to 72.8%) and under-treatment (again varying regionally from 24.1% to 72.5%) were identified. This reality is not specific of Spain, but also for most European countries.

Prevalence of COPD in European countries is estimated to range from 4–10% of the adult population (see **Figure 9** for geographical variations and associated data challenges).

In order to address the prevalence challenge a few approaches have been followed. For instance, a model was developed to estimate the prevalence of COPD from the known smoking status of the population given that smoking is the main determinant to develop COPD. With this model it was estimated that 1.8 million people suffer from COPD in Spain, 3.0 million in the UK, 2.7 million in Germany, 2.6 million in Italy and 2.6 million in France. As portrayed in the UK country study [10], the British Lung Foundation estimates that 3 million suffer from COPD in this country and specifies that only 900,000 are correctly diagnosed.

[5] The GOLD COPD classifications are the main method doctors use to describe the severity of chronic obstructive pulmonary disease (COPD). GOLD is short for the Global Initiative for Chronic Obstructive Lung Disease, a collaboration between the National Institutes of Health and the World Health Organization.

**Figure 9 – Prevalence of COPD in Europe.**

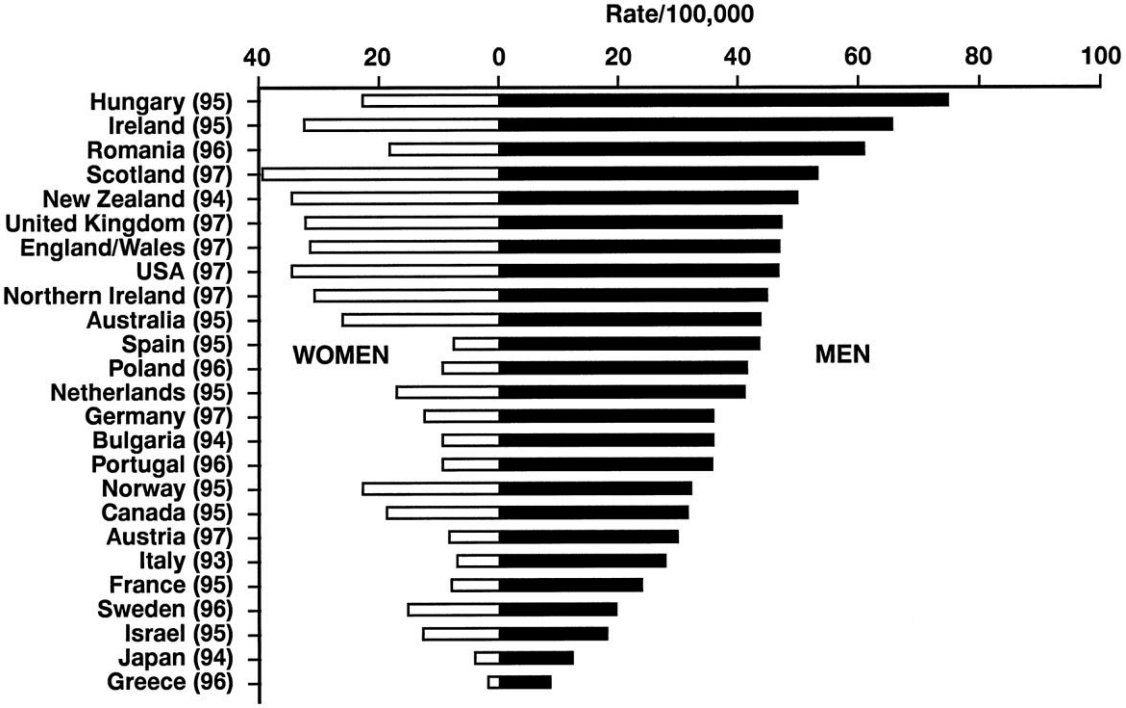



Source: OECD data reported in the European lung Book, 2003[12]

A different approach would be to look into hospital discharge data with a COPD diagnosis (see **Table 30**). However, bearing in mind the high level of re-hospitalisations that COPD patients go through, this indicator is seriously biased as a proxy for prevalence.

Mortality data can also be a good proxy, however data on this was also very limited. The most complete data set at national level dates from year 2000 [13] and is illustrated in **Figure 10**.

**Figure 10 - Age-adjusted death rates for COPD by country and by sex, ages 35 to 74 years**




Source: adapted from World Health Statistics Annual, WHO in Hurd, 2000 [13].

Alternatively, data at national level could be requested to some of the sources quoted (i.e.: WHO) or to national bodies. For instance, the UK country[10] study reported 24,160 people in the UK died as a result of COPD in 2005.

To sum up, for COPD lack of accurate data on prevalence and mortality represents a challenge and at most the severity of this disease and its impact on the healthcare system can be estimated. For instance, due to high hospitalizations of COPD patients in the EU, approximately 41,300 lost work days per 100,000 people are estimated every year. In Europe, productivity losses due to COPD are estimated to amount to a total of €28.5 billion annually.

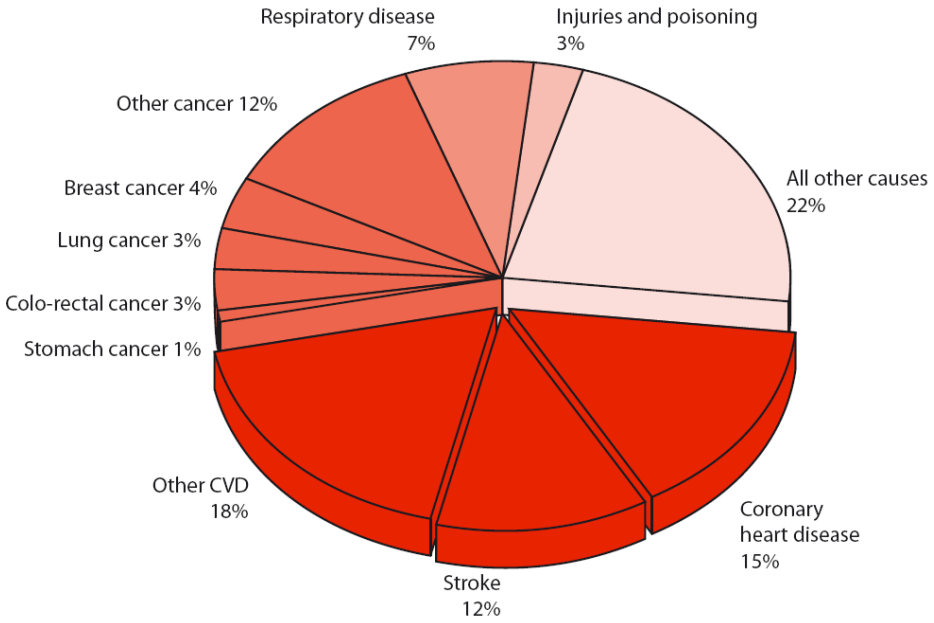
**Cardiovascular disease (CVD)**

Cardiovascular disease (CVD) - also known as heart and circulatory disease – is an umbrella term used for a variety of conditions such as coronary heart disease (angina and heart attack) and stroke. The *European Cardiovascular Disease Statistics*[14] was the first publication bringing together all available sources of information about the burden of CVD in Europe and it provides data on mortality, morbidity and associated costs amongst others.

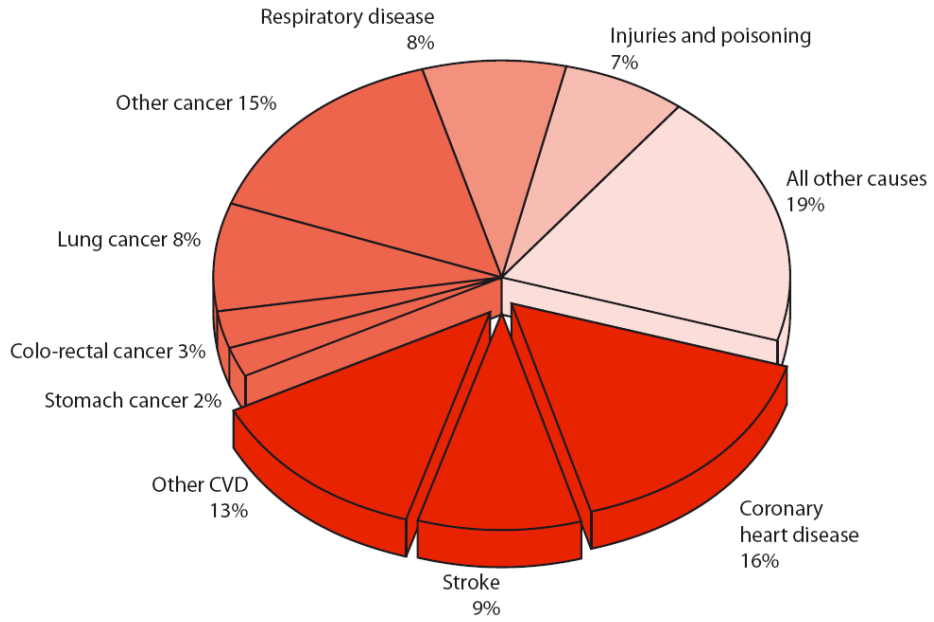
As detailed in **Figure 11**, CVD represents the main cause of death in Europe. Specific details on the death rate due to ischaemic heart disease in Europe are available in **Table 31** as an illustration on the prevalence of one of the conditions under the CVD umbrella term.

**Figure 11 - Death by cause in Europe (female and male), latest available year[6]**

Death by cause: female, latest available year




Death by cause: men, latest available year




Source: *European Cardiovascular Disease Statistics, 2008*[14]

As shown in **Table 31**, a dramatic decrease in the death rate has been observed in the last decade. However, when looking at hospital discharges for some of the conditions under the CVD umbrella (see **Table 32** to **Table 36**), their number has increased over time. Thus, while death rates have been decreasing over time, so has their prevalence.

[6] The latest year available vary on a country basis. This variation can be wide - i.e.: for Bulgaria it was 2005, for Italy 2002 and for Ireland 2006.

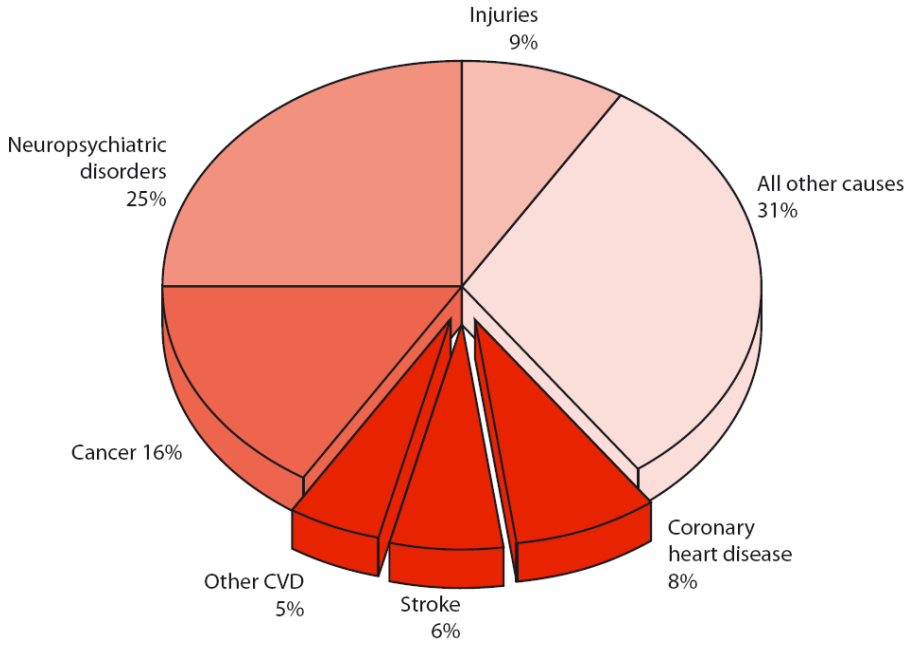
In terms of morbidity, data on age-standardised Disability Adjusted Life Years (DALYs) rate for chronic heart disease (CHD), stroke and other CVD is also available as illustrated in Table 2. Specific details for EU countries in terms of comparison to other diseases are available in Figure 12.

**Table 2 – Age standardised DALYs rate for CHD, stroke and other CVD per country, 2002**

| | CHD | Stroke | Other CVD |
|---|---|---|---|
| Albania | 1,107 | 1,006 | 884 |
| Andorra * | 313 | 271 | 266 |
| Armenia | 1,750 | 855 | 413 |
| Austria | 579 | 349 | 431 |
| Azerbaijan | 2,316 | 767 | 795 |
| Belarus | 2,497 | 1,239 | 543 |
| Belgium | 512 | 356 | 321 |
| Bosnia and Herzegovina * | 925 | 1,107 | 1,514 |
| Bulgaria | 1,344 | 1,188 | 1,485 |
| Croatia | 973 | 989 | 570 |
| Cyprus | 638 | 289 | 832 |
| Czech Republic | 945 | 629 | 452 |
| Denmark | 478 | 401 | 359 |
| Estonia | 1,449 | 819 | 714 |
| Finland | 687 | 411 | 299 |
| France | 259 | 271 | 360 |
| Georgia | 2,103 | 1,552 | 504 |
| Germany | 574 | 338 | 481 |
| Greece | 620 | 592 | 454 |
| Hungary | 1,137 | 731 | 654 |
| Iceland | 470 | 278 | 176 |
| Ireland | 671 | 361 | 359 |
| Israel | 370 | 214 | 284 |
| Italy | 409 | 335 | 363 |
| Kazakhstan | 2,452 | 1,469 | 1,326 |
| Kyrgyzstan | 1,885 | 1,939 | 687 |
| Latvia | 1,606 | 1,102 | 803 |
| Lithuania | 1,444 | 620 | 608 |
| Luxembourg | 403 | 420 | 397 |
| Macedonia, TFYR | 838 | 1,066 | 1,043 |
| Malta | 709 | 365 | 235 |
| Moldova | 1,922 | 1,327 | 312 |
| Monaco * | 247 | 250 | 322 |
| Netherlands | 460 | 329 | 411 |
| Norway | 503 | 309 | 267 |
| Poland | 949 | 598 | 657 |
| Portugal | 431 | 836 | 301 |
| Romania | 1,176 | 1,162 | 793 |
| Russian Federation | 2,630 | 1,747 | 1,174 |
| San Marino | 431 | 282 | 689 |
| Serbia and Montenegro | 1,087 | 1,102 | 1,149 |
| Slovakia | 1,037 | 387 | 795 |
| Slovenia | 552 | 524 | 492 |
| Spain | 368 | 294 | 274 |
| Sweden | 506 | 300 | 284 |
| Switzerland | 380 | 200 | 318 |
| Tajikistan | 1,886 | 571 | 1,912 |
| Turkey | 1,332 | 1,132 | 790 |
| Turkmenistan | 2,860 | 620 | 2,825 |
| Ukraine | 2,539 | 1,207 | 633 |
| United Kingdom | 657 | 359 | 298 |
| Uzbekistan | 1,907 | 975 | 1,159 |

Source: *European Cardiovascular Disease Statistics, 2008*[14]

**Figure 12 – Disability - adjusted life years lost by cause, EU 2002**




Source: *European Cardiovascular Disease Statistics, 2008*[14]

In terms of costs the European Cardiovascular Disease Statistics[14] also provided interesting data. According to this source in 2006, CVD cost the EU just under €192 billion, almost €110 billion of which were for healthcare costs and the remaining were from lost productivity and the cost of informal care. The direct healthcare costs alone costs each resident of the EU €223 per annum.

**Diabetes**

Diabetes is a common life-long health condition where the amount of glucose in blood is too high because the body cannot metabolise it properly. There are two types of diabetes. Type I cannot be prevented while Type II diabetes can be developed as a result of overweight unhealthy diet and lack of exercise; thus, by managing these factors it can be prevented. For both types of diabetes, managing life-style factors and glucose levels also prevent the development of co-morbidities associated with this disease.

The Diabetes Atlas 2010[15] estimated the total prevalence for diabetes in Europe at 8.9% with an associated healthcare cost at EU level of between USD 93.2 billion and 173.8 billion or between €134 billion and €249.9 billion during that year. This cost estimate was reached following an analysis using an age- and sex-specific ratios of health care expenditure for individuals with diabetes to individuals without diabetes called R, in each individual country. Data on R were not available for most countries. In countries where such estimates were available, it was observed that the average value of R fell between 2 and 3. Therefore, the health expenditure for diabetes were calculated with two alternative average R values, i.e. R = 2 and R = 3. Hence the cost ranging between two values, one for R=2 and the other for R=3.

Based on prevalence estimates of impaired glucose tolerance (IGT) and historical evolution on population and diabetes, the same source – applying the same assumptions for R - forecasted the cost of diabetes to the EU for 2030 to reach between USD 109 and 206.1 billion or between €156.76 and € 296.4 billion (details on prevalence, impaired glucose tolerance as an indicator of diabetes risk and management as well as costs per country are available in Table 37 to Table 39.

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In sum, the current estimated morbidity (where available) and mortality caused by these diseases is concerning. In addition, forecasts point at the fact that the prevalence is to grow in the next few decades. Further, the ALOS related to these diseases (see **Table 40** to **Table 45**) is often longer than that related to all conditions (**Table 15**) with the associated costs and pressure on healthcare systems. For the above reasons, countries are developing a set of strategies to address them in more adequate and effective manner, often aiming to treat patients at home. These strategies are outlined in the following section.

## 2.4 Evidence from the case studies: Health and social care organisation and approaches to chronic disease management

As discussed in the previous section, the aims of healthcare systems are to reduce (or contain) costs and to improve quality of life of citizens. Supported by relevant data and trends, details on the impact of chronic diseases on healthcare pressures have also been covered. In the light of the above, healthcare systems have started to develop a set of mechanisms in order to address the challenge of chronic diseases and ageing.

Drawing on the evidence gathered from the eight countries developed in SIMPHS2, this section starts with a brief overview of healthcare systems and how chronic diseases are tackled in Europe. It then addresses the evolution of models in the organisation of health and social care and ends with the analysis of specific strategies aiming to coordinate health and social care delivery to cover the needs of the ageing population.

### 2.4.1 Evolution of models in health care organisation

European countries have traditionally followed two broad models of health care organisation: the Beveridge and the Bismarck model (or a mix of both).

Roughly speaking the Beveridge model is a tax-financed model operating through a National Health Service (NHS) responsible for healthcare delivery. The Ministry of Health is the policy-making body responsible for the NHS and accountable to the pertinent body (i.e.: parliament for any health related issues. Examples of this would be Italy, Spain and the UK. Thus, in Beveridge models, authorities operating through the NHS are responsible for the overall healthcare delivery and for public health.

The Bismarck model instead operates through health insurance funds (HIF). Financed by a statutory contribution system (SHI), HIF are responsible for healthcare delivery. Examples of this would be Germany or the Netherlands. In these models, the role of governments beyond coordinating the fund collection is to act as a regulator and as a watchdog of both HIF and service providers. In addition, governments can also be responsible for certain payments. For instance, in Germany maternity payments and the insurance cover of children is paid for directly by the government. Also, here, service providers are entitled to certain funding, such as investments from the state.

These traditional models have evolved over time due to changing population needs and policies aiming to improve efficiency, cut costs or introduce control mechanisms. For instance, in Beveridge models nowadays NHS deliver services either by purchasing them to providers (purchaser-provider split) or through its own network of providers (integrated systems), or both. For instance, the UK has a clear purchaser-provider split whilst in Italy and in Spain where healthcare competences are devolved to the regions, both models co-exist. Examples in Spain would include that of Catalonia where 80% of the services delivered are the result of contracts with providers whilst in Andalusia GPs and primary healthcare centres (PHC), specialised outpatient clinics and physicians' offices, as well as 75% of hospital care, are publicly owned and managed.

Same as the NHS, HIF can either purchase services from providers or deliver these services through their own network of providers. Although the latter is less common, Germany offers some examples of this. [16]

HIF systems somehow introduce market mechanisms given that there is a competition between health insurance funds which is meant to introduce incentives for efficiency and cost savings. In this regard, the Netherlands represents the most market oriented healthcare system in Europe. Systems building on a Beveridge tradition instead have introduced the monopsony role of an NHS. Such a monopsony although relying less on purchaser competition provides a very strong negotiation power to the NHS over their providers which is meant to result in pressures on those providers for both price and quality given the NHS strong position as the main purchaser. Such a role is very apparent for instance in England as the English NHS represents the service purchaser on behalf of 61 million people. In Spain, a similar monopsony power exists, but as it is held by the regions and the largest one of these is Andalusia with just over 8 million people, the negotiating power is less strong than that of the UK NHS.

Regardless of whether the system is integrated or not, healthcare services are delivered through general practitioners (GPs), specialists and hospitals. Different payment systems to providers, even where the system is integrated, exist. These payments also play a role as they may be used to calculate their financing or a variable part of healthcare professionals' salaries. Thus, the payment system of choice (be it to calculate purchasing prices or financing budgets) represents an incentive to influence providers behaviour and to contain healthcare expenditure. For instance, currently in most European countries DRGs[7] represent a main form of payment to hospitals[17]. Even in the integrated system exemplified in Andalusia, DRGs are used to finance a big part of hospital activity. Prior to DRG, hospitals were often paid on a retrospective basis which incentivised over expenditure and unnecessary overtreatment. Hence, DRG represented a payment form to contain costs and to promote the development of efficiencies in hospitals.

On the other hand, GPs can be paid on a fee-for-service (FFS) basis or capitation. FFS is based on charging a fee for each service performed, thus the incentive under this system is on volume and inadvertently FFS may reward inefficiency, redundancy, excessive treatment, and duplication of work. A capitation payment system sets an amount for each enrolled person assigned to a GP or group of GPs.

In the light of the pressures generated by chronic diseases and patient empowerment, pay-for-performance (P4P) is considered as an alternative payment option. P4P is a payment scheme that rewards physicians for meeting a payer's predefined clinical and/or patient satisfaction benchmarks. P4P payments when applied do not represent the only source of income to physicians. P4P mechanisms have been reported to be a form of payment bonuses or add-on-payments made in combination with other payment system. Thus health policy makers try to influence GP's behaviours through different payment systems. This is also illustrated by a recent agreement made between GPs and insurance funds in France which introduce incentives related to fulfilling targets about specific chronic diseases indicators. This provides additional revenues to GP while promoting better and more efficient care.

Another mechanism to contain costs or generate efficiencies is introducing the role of a gatekeeper. A gatekeeper is an actor in the healthcare system that refers patients to hospital after a clinical assessment, as opposed to patients going to hospital directly. Thus, by controlling hospital visits costs can be controlled and patients only go to hospitals in case of emergency. In some countries the gatekeeping role is exclusively held by the GP who thus also controls referrals to specialists. Examples include Denmark, Italy, the Netherlands, Spain and the UK. Meanwhile, Estonia is aiming to strengthen the gatekeeping role of GPs and few specialists can be visited without a referral nowadays. In France and Germany, this role is held by either GPs or specialists, meaning that citizens are free to visit any specialist without GP referral but attendance to hospitals should only

[7] DRG stands for Diagnostic Related Group. DRG refers to any of the payment categories that are used to classify patients based on their condition and treatment received for the purpose of reimbursing hospitals for each case in a given category with a fixed fee regardless of the actual costs incurred. DRG is the most commonly used prospective payment mechanism.

take place when referral from either the GP or the specialists is obtained, except for emergencies. In France, in addition patients not using the referral system pay higher consultation fees when they go directly to a specialist who is not their "preferred doctor".

Other forms of control over expenditure are those aimed to influence the behaviour of system users or patients.

Healthcare systems such as Denmark, Spain or the UK are free at the point of service (with the exemption of pharmaceuticals). The rationale behind it is that healthcare should be available to all regardless of ability to pay. It has been argued that it may result in over-demand of these services. In order to control those, different mechanisms are in place. For instance, in Germany, some services are pre-paid by patients and later reimbursed by their HIF. This can be understood as a form to contain costs.

Nevertheless, the most common form to control costs influencing the demand side is that of co-payments, also called user charges or out-of-pocket payments (OOP). OOP can apply to pharmaceuticals, for physician consultations or even a small co-payment per day in hospital. As seen, in Spain and the UK co-payment mainly apply to pharmaceuticals. Italy recently introduced co-payments for ambulatory care. In Estonia, co-payments apply for a variety of services representing around a fifth of all health expenditure. In the Netherlands, OOP also represent a relevant source of healthcare financing. In Germany, user-charge legislation was enacted in 2004 and adults have to pay €10 if they visit a GP or a specialist in ambulatory care, although exceptions to specific cases apply.

**Disease management programmes**

Until recently, healthcare systems placed a strong emphasis on cure. In the light of the ageing population and the pressure of chronic diseases a trend has emerged in recent years. This trend can be defined as a shift from hospital centred healthcare to patient-centred healthcare and from “cure” to “prevention”[18]. Such a shift has called for the introduction of innovations which could assist healthcare providers in providing efficient services to patients and healthcare users. Two main types of activities result from this shift: prevention and disease management programmes.

In their most basic state, prevention activities often take the form of public health programmes mainly related to communication campaigns. In most sophisticated cases components of medical services are also included. For instance, a campaign communicating and informing citizens on the benefits of a healthy diet and exercise is a preventative measure. The impact of such campaigns is however quite limited. On the other extreme, a flu-vaccination campaign to all the vulnerable population during autumn is a tougher intervention and much more effective to prevent hospitalisations. The role of healthcare professionals in the two examples provided goes from no involvement in the first case to full active involvement in the second. In-between, there are many multifaceted activities. For example, an advertising campaign on healthy diet habits and exercise to the population can also be accompanied by the organisation of workshops in schools attended by teams of healthcare professionals who educate children in their habits. These are relevant given that the development of chronic diseases such as diabetes or CVD can be prevented by introducing healthy life-style habits at a very early age. Of particular interest would be the case of Spain with the highest prevalence of European child obesity. Indeed, the initiative involving healthcare professionals in primary care visiting schools is an example that takes place in Andalusia (Spain) and they receive an incentive as part of their variable salary for this.

In this regard, most of the countries studied are quite advanced although to different levels and here Estonia seems to be lagging behind. Progress in all of Europe has been made in anti-smoking policies aiming to prevent the development of lung-cancer and COPD. Nowadays, smoking has been banned in public facilities almost every European country. But again the extent of anti-smoking programmes varies across countries. Countries like the UK have developed quite sophisticated mechanisms, to such an extent that in some areas a financial incentive is not only given to GPs to decrease the prevalence of smoking but also to smokers who quit smoking.

Disease management programmes (DMPs) instead require the direct involvement of healthcare professionals and target patients suffering from the particular condition that the programme is addressing. Thus, patients also play an active key role in these programmes, they become much more responsible for their condition and learning to self-manage their own case is often a big component of the programme.

The example of the UK related to smoking can be used as an illustration between prevention and disease management the programme involves prevention measures (i.e.: applying high taxes to cigarettes and smoking bans) to avoid new cases of smoking. The disease management programme component is present when smokers quit smoking with the support of healthcare professionals often also involving the prescription of drugs. Monitoring the patient progress is a component of DMPs.

DMPs target conditions that have already been diagnosed and the emphasis is on monitoring, stabilising patients and on preventing the patients' condition to worsen. DMPs are developed for a variety of conditions and involve the implementation of guidelines. These guidelines are protocols developed for each condition and healthcare professionals involved in the programme are meant to follow them depending on the stage of the disease patients are in. These are developed for a variety of conditions including chronic ones. For instance, in the case of a diabetic patient, the first step would be to identify the patient suffering from the condition and introduce him in the registry. The following step would be to monitor the levels of sugar in blood aiming to keep them within the desired range. Here the role of adherence to treatment involving both prescriptions and life style is very relevant. The healthcare professionals is responsible for this monitoring which involves routine screening on the following indicators: HbA1c levels (an indicator of the amount of sugar in blood); (ii) blood pressure (iii) LDL cholesterol (as an indicator of diet control and improved metabolic processes); (iv) retinopathy (one of the co-morbidities developed as a result of diabetes); and (v) the diabetic foot tests (another common comorbidity resulting from diabetes). If properly monitored, the disease is controlled, and the speed at which undesirable effects start affecting patients and their quality of life (QoL) is delayed. Thus, through the programme the appearance of co-morbidities and associated costly hospitalisations as well as decrease in QoL is prevented.

DMPs start with the development of protocols and guidelines that define the action and the actor involved in each step of the process of care. Here, the role of health technology assessment (HTA) agencies has gained a prominent role. HTA agencies often consolidate evidence on healthcare interventions and provide recommendations accordingly. As part of their role, they also develop cost-effectiveness analysis of some interventions which rank from the evaluation of preventative measures or the implementation of guidelines and protocols to the inclusion of prescription medicines as part of the basket of benefits provided by the system. Here, the contributions of IQWiG in Germany or NICE (the National Institute for Health and Clinical Excellence) in England represent a model at European level. In Spain, the HTA agency within Carlos III Health Institute (ISCIII) is also involved in carrying out systematic reviews on chronic disease management guidelines and programmes amongst others. It is also relevant to point out that Spanish regions often have their own HTA body and the extent of their activities, their cooperation with ISCIII as well as their role in influencing health policy varies widely. In France, alongside the HAS which carries out evaluations and provides methodology tools and best practice, a number of agencies and independent public bodies have been created in recent years to promote coordinated care and the need for clinical and economic evaluation. This does not only apply to chronic disease management (CDM) but also to telehealth initiatives in support of CDM and ageing, whereby public call for tenders require candidates to include specific evaluation plans in their offers.

Relevant also for DMPs is the development of risk stratification tools. These tools have been developed to support healthcare professionals and policy-makers in targeting care more effectively in order to reduce emergency admission rates. They help identify and prioritise those patients to be enrolled in these programmes or for which greater attention is required. The UK seemed to hold quite an outstanding role in developing these tools, unfortunately the Department of Health has recently announced these developments will not be funded further under their research budget. In

Spain, regions like Catalonia and the Basque country have established the development and use of these tools as a priority. In Italy, the national prevention plan 2010-2012 comprises four action areas "the support and development of predictive medicine to evaluate risk and instituting preventive measures" being one of them. Thus, these tools are more and more considered as key in supporting the care process for chronic patients.

DMPs involve the role of a coordinator of the care process. In countries where the GP is the gatekeeper, they are also the coordinator in these programmes. In countries like Germany, the coordinator can be either the GP or the specialist. One of the actors gaining relevance in these programmes are nurses. Indeed, in England as of 2004, the clinical role of community matrons was defined as very experienced and skilled members of staff holding the role of case managers in particular for patients with complex and long-term conditions and intense needs was introduced. In France, the GP is the focal point of chronic disease management initiatives.

The coordinator in charge of the overall process is meant to interact with other tiers of care in order to properly manage patients' conditions. Thus, for instance, if the patient is hospitalised after discharge the coordinator is meant to coordinate with the hospital depending on the intervention that took place during hospitalisation. The coordinator will also interact with the specialist in order to monitor some of the parameters that are part of the overall process. Thus, the term continuity of care is a very relevant one and very much interrelated to DMP and often used indistinctively. Indeed, as defined in recent Danish healthcare policies "The programmes for the continuity of care aim at achieving high quality interventions and patient safety in the entire course of the disease as well as an appropriate utilisation of resources. Emphasis is on a systematic proactive action preventing exacerbation of disease, acute episodes and complications, and continuously monitoring the quality of the course of treatment". Thus the term is almost identical to that of DMP if not taking DMPs to an ever higher level. In sum, with no coordination between tiers of care, there is no continuity of care and the programme is unlikely to succeed.

**From disease management programmes to integrated care**

Another concept closely related to DMPs and continuity of care is that of integrated care. Integrated care from a clinical perspective (or clinical integration)[8], as defined by Suter et al, involves organising functions and activities around patient care and services. The focus is on continuity and coordination of care, disease management, good communication among caregivers, smooth transfer of information, and the elimination of duplicate testing and procedures [19]. Thus, integrated care can be understood as the way care is delivered by focusing on DMPs and continuity of care.

In DMPs, the incentive for the patient is a direct improvement in his/her QoL. Healthcare professionals are often financially incentivised to enrol patients and adhere to disease management programmes.

Germany was one of the first European countries introducing Disease management programmes (DMPs) for chronically ill patients. As of 2002, DMPs were introduced into the German healthcare system and now exist for the following common conditions: breast cancer, type 1 diabetes, type 2 diabetes, coronary artery disease, chronic obstructive pulmonary disease and asthma. They are provided by GPs and specialists in primary care and involve a structured monitoring of the patient in accordance with guidelines as described above. Further, anonymised patient data are shared with insurance providers and the National Association of Statutory Health Insurance Physicians in order to monitor the success of the DMP. Participation is voluntary for both patients and practices, but is

[8] Please note that Suter and colleagues clearly differentiate between integrated care and vertical integration of healthcare organisations. The latter involves sharing of human and physical resources and is highly structured, with a hierarchal system of governance, usually under one management. Vertical integration of healthcare organisations can be found in Beveridgian healthcare models with no provider-purchaser split and it does not imply that there is clinical integration. An outstanding example where both integrated care and vertical integration are found is that of the Veterans Health Administration (VHA) in the USA.

often encouraged through financial incentives for both such as a refund of the quarterly practice fee (Praxisgebühr) lower co-payments or payment of a premium (Wahltarife) for patients and payments linked to each patient for practices (currently €168). Thus, here incentives for patients also take a monetary form and insurers developed integrated care contracts with providers. .

In the UK, instead, the Quality and Outcome Framework (QoF) is a programme that provides GPs and incentive typically based on a mix of preventive care and chronic disease management benchmarks combined with capitation. The financial incentive through the QOF can represent about 30% of the total income that a GP perceives.

In Andalusia (Spain), a similar programme is in place which can represent up to 15% of GP's yearly income. Here the incentive is not only on DMPs but also on continuity of care. In addition, in each health district horizontal teams (called inter-centre teams) involving healthcare professionals from primary and hospital care have been developed. The yearly goals on chronic disease management and the incentive systems that each primary care centre (PHC) and hospital agree upon with the district healthcare authority are aligned through the involvement of these inter-centre teams.

Other regions in Spain such as Catalonia do not provide incentives for DMPs although plans to introduce them are amongst their policy priorities.

Similar to the case of Spain, in Italy, given the highly fragmented organisation of the Italian healthcare system, the planning and the implementation of prevention and disease management programs, so far, has been based on independent regional and local projects. With the new prevention plans, regional governments are committed to implement and adapt at local level the actions of the national plans within 2012. Therefore, developments of DMPs in these two countries can vary widely depending on the region.

A more sophisticated model is that of the Netherlands. This case study describes how after a fine-tuning exercise, the so-called Disease Treatment Combination (DTC) became the instrument to decide about quality of care and about price. The chain-DTC, an integrated payment system was established as a result. It aims to stimulate the development of a well-functioning integrated chronic care system. The study emphasizes that the implementation of disease management programs is rather complex. For example, care groups have a complex double-role, as they are both purchasers (in the chronic care sub-market) and suppliers (in the insurance market). This might increase bureaucracy within care groups – those responsible for delivering care - which is a barrier to the integration of care. Another risk identified is that delays in the implementation phase of disease management programs might lead to reduced ambitions, for example ambitions for new self-management strategies and effective collaboration between care providers. Furthermore, this source warns for the risks in financing the registration of performance scores instead of the actual overall medical performance per se. Instead of providing better quality of care, care providers could focus on increasing the performance indicator scores. In other words: this attempt to rationalise health processes by focusing on certain indicator scores might lead to negligence of the holistic approach which is key to approaching health. It remains to be seen how the implementation of the DTC will continue.

### 2.4.2 Evolution of models in social care organisation

Due to changes in social trends, relying on the role of the family to provide social care to their relatives has proved a challenge in the last decades. As a result, most European countries started developing and strengthening the role of government in planning, organising, delivering, and financing social care. These care models also include the so-called informal care which represents that provided mainly by relatives still present. Most social care models developed have local organisations at their core and the role and extend of informal carers in these models vary per country.

For instance, according to national law, the 98 municipalities in Denmark are obliged to offer home care services and adequate supply of nursing homes and dwellings for older people as well as conducting preventive home visits to older people. Either the municipalities provide the services

themselves or they outsource service provision to external providers. Family care plays a minor role in this country. The municipalities through local taxes and block grants, equalisation grants and temporary subsidies from the national government finance these services. The service is not free to any user in need but means-tested and it often involves a small co-payment. Recent data revealed that: co-payments applied to 3.8% of the population using these services. Most important is that the system results in most of the recipients living in their own home (80%), and 20% in nursing homes or nursing dwellings. Thus, there is not an over-reliance in nursing homes which are pricier.

In the UK, a similar model to that in Denmark exists. It is also means tested and provided by the local councils.

In Spain, the benefits basket for long-term and social care is defined at national level and comprises the following services:

- promotion of personal autonomy and prevention of dependency
- telecare
- home aids: house-keeping and personal care
- day centre for elderly people, for those aged less than 65, and specialist care day centre and night centre
- residential services:
    - nursing home for dependent elderly people
    - residential centre for dependent people, adapted to the type of disability.

Here, the delivery of social services is a regional competence. Regions provide these services through a network of social centres and services; it gathers all public institutions relying upon regions, municipalities, national reference centres for support of specific causes of disability, as well as accredited partner private centres. Regions have total freedom to articulate this network within their territory. NGOs and non-profit-making institutions are specially favoured in entering this network, acknowledging their expertise and long-standing status as key providers in many parts of the territory. Accreditation by the regional authority is also compulsory for non-partner private centres providing services in the regions. The benefits basket also includes financial benefits, based on the degree of dependency and financial status; they can take three forms and are mainly linked to support services provision outside the social services network. Nevertheless, the reliance on family and relatives is still strong in this country.

With the above examples, this section has aimed to illustrate how social care financing and delivery sources are different than those from health care and the role that local organisations play. The basket of services detailed for Spain does not very much differ from that offered in other countries. Exceptional about it may be the fact that telecare services are specifically included as one of the benefits.

It is also relevant to identify that long-term care and nursing homes are also included within this benefit basket. This represents an area where clearly health and social care may potentially overlap and need to coordinate.

The same conclusion is reached when looking at it from the angle of the user. In Denmark for instance 87% of the social care beneficiaries are aged 65+. In Estonia, a recent study concluded that formal social care services are needed by approximately a quarter of the 65+ population. Therefore, if the same target population (those 65+) are in need of both health and social care services, the need to coordinate these services to cater for their needs is crucial.

### 2.4.3 Coordination between health and social care

In the light of both health and social care addressing the needs of the same target population, integrated care becomes a very relevant concept as it focuses on coordination and communication not only between healthcare professionals but with caregivers.

The country where the convergence between these two services is most prominent is the Netherlands. As seen in 0, in this country health insurers purchase integrated care and care groups are responsible for delivering care. This is a truly integrated system as opposed to the rest of the countries that have been studied. However, as much as it represents a model to follow, given its recent implementation, as outlined earlier, there may still be areas for improvement.

In the rest of the countries under study, coordination between health and social care is weaker. Still, they interact. For instance, in Estonia where the push for DMPs is only starting - let alone integrated care - GPs are the ones responsible for making the assessment of the need for nursing care which is one of the services offered by social care.

In the case of Italy, a relevant milestone related to this is the establishment of a specific fund for non self-sufficient people and a DRG associated with it in the Emilia Romagna region. In addition, strong policies promoting and disseminating the availability of this DRG for dependent people have been put in place.

In the UK, primary care districts (PCTs) in England or NHS Boards in Scotland play also a relevant role at coordinating health and social care. These organisations are responsible for primary care delivery in their geographical area of operation. They do so by contracting with GP practices in the area. In addition, PCTs and NHS boards include community nurses as part of their staff. Community nurses often coordinate primary and social care services to cover the needs of patients within the community and also provide home nursing where required. They are often coordinated by the more senior role of district nurses. The role of community nurses and also often nurses in GP practices within DMP in very relevant in the UK. Their role often are involved in activities targeting patients who have recently been discharged from hospital in the form of sessions to train patients to self-manage their condition and identify symptoms that indicate their condition is worsening, thus helping them to have an extramural life with their condition.

In Scotland, efforts towards integrated care resulted in the establishment of the so-called community health partnerships (CHPs), as reported in the UK case study. These ended up evolving into two different structures: a health-only and a health and social care structure. In June 2011, there were 36 CHPs in Scotland with 7 integrated CHPs and 29 health-only CHPs. Membership of all CHP committees was defined by the Scottish Executive and included key NHS stakeholders such as elected members of local councils, GPs and members of the local public partnership forum. Thus, although the CHPs committees and their budgets often involved different stakeholders, in many cases the structure was mainly healthcare focused rather than integrating health and social care. In addition, a recent audit concluded there was a need for further cooperation and engagement between health and social care at CHP level in order to meet the targets established.

At a higher level of governance, efforts to better coordinate or integrate health and social care have also been identified.

For instance, in the UK, the responsibility for adult social care has recently been shifted from social services to the NHS.

In Spain, It was in 2009 that in an effort to improve integration of health and social services in long-term care provision the former Ministry of Health and Consumer Protection became the Ministry of Health and Social Policy (MSPS), thus assuming additional competences and responsibilities for social care. Unfortunately given the devolved nature of the system, this new structure has not yet been reflected at regional level. A recent law in 2011 has been passed imposing all regions to define a strategy to coordinate health and social services nationwide. The strategy is meant to be jointly developed by MSPS, the regions, local stakeholders and care professionals and to be delivered by February 2012. The strategy is also meant to include indicators on progress which will be reviewed on a two-year basis.

## 2.5 ICT developments in healthcare

### 2.5.1 Integrated care and ICT deployment

Suter et al highlighted that integrated care requires a system of patient records, service delivery and best practice protocols to be successfully delivered. Thus, many of the integrated care processes can only happen with the support of state of the art information and communication technologies (ICT) that allow effective tracking of utilization and outcomes. Successfully delivered integrated care is ideally standardised and delivered by multi-disciplinary teams to ensure continuity of the care process and incentives are provided to meet performance and efficiency standards. Finally, the authors conclude that successfully integrated care typically show a combination of features including appropriate ICT systems and mechanisms, strong governance structure and sound performance management with aligned incentives. From this perspective, it is relevant to assess the level of ICT deployment in healthcare and identify how ICT is supporting the delivery of integrated care.

Moreover the push for ICT in healthcare is driven by expectations that such systems will improve the quality of care and increase patient safety. ICT are also expected to improve efficiency of care in terms of appropriate, available, and less wasteful. In the light of this potential, ICT are regarded as a means to achieve the overarching goals of healthcare systems: reduce costs and improve quality of life. Indeed, heavy investments in ICT are one of the responses developed by government in the light of the ageing population. ICT in healthcare are not only seen as potentially improving quality of life and reducing costs but also as a means to support new forms of healthcare delivery.

**Table 3 - ICT healthcare expenditure per capita years 2003 to 2011 (including forecast)**

| ICT Spending healthcare per capita (in USD) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Austria | 84.5 | 92.5 | 95.8 | 112.9 | 111.8 | 122.8 | 129.4 | 135.7 | 143.7 |
| Belgium | 93.2 | 106.7 | 110.4 | 133.8 | 134.0 | 148.9 | 158.2 | 167.7 | 179.3 |
| Bulgaria | 4.0 | 4.7 | 5.4 | 6.8 | 7.4 | 8.6 | 9.0 | 9.4 | 9.7 |
| Czech Republic | 19.8 | 21.2 | 22.9 | 29.0 | 29.1 | 33.3 | 35.8 | 37.9 | 40.0 |
| Denmark | 189.8 | 214.2 | 220.4 | 270.3 | 266.7 | 293.3 | 311.6 | 330.0 | 353.0 |
| Finland | 112.7 | 128.3 | 127.6 | 155.1 | 153.9 | 169.2 | 178.8 | 188.8 | 201.5 |
| France | 108.8 | 120.1 | 119.7 | 142.6 | 136.5 | 146.8 | 152.4 | 158.3 | 167.0 |
| Germany | 106.5 | 115.6 | 115.6 | 136.6 | 134.9 | 147.2 | 154.3 | 160.9 | 168.8 |
| Greece | 35.4 | 39.3 | 39.7 | 52.9 | 55.7 | 63.3 | 68.1 | 72.4 | 77.0 |
| Hungary | 19.0 | 20.9 | 21.8 | 26.2 | 26.5 | 29.4 | 31.2 | 32.9 | 34.4 |
| Ireland | 123.6 | 147.0 | 154.5 | 187.5 | 196.9 | 221.4 | 236.0 | 250.0 | 264.3 |
| Italy | 79.2 | 90.9 | 92.5 | 107.7 | 108.9 | 119.7 | 125.1 | 131.0 | 138.3 |
| Netherlands | 140.0 | 158.9 | 162.2 | 196.9 | 195.5 | 215.3 | 227.3 | 239.8 | 255.6 |
| Poland | 7.9 | 8.8 | 9.6 | 12.3 | 13.2 | 16.1 | 17.1 | 17.6 | 18.3 |
| Portugal | 39.4 | 45.1 | 45.4 | 52.9 | 54.0 | 60.4 | 63.8 | 66.9 | 70.7 |
| Romania | 2.1 | 1.9 | 2.5 | 3.5 | 4.2 | 4.7 | 5.1 | 5.4 | 5.8 |
| Slovakia | 10.7 | 11.4 | 11.2 | 12.9 | 13.4 | 15.4 | 16.2 | 16.7 | 17.3 |
| Slovenia | 11.6 | 14.9 | 17.6 | 21.0 | 25.4 | 29.8 | 32.3 | 34.2 | 36.0 |
| Spain | 49.6 | 53.3 | 57.3 | 68.6 | 71.8 | 80.7 | 84.8 | 88.3 | 92.8 |
| Sweden | 209.1 | 229.8 | 230.7 | 282.4 | 274.1 | 298.9 | 317.3 | 335.5 | 358.3 |
| United Kingdom | 147.0 | 170.7 | 175.7 | 212.3 | 209.5 | 221.3 | 234.2 | 248.9 | 263.9 |
| Average 21 countries | 79.7 | 89.8 | 91.9 | 111.2 | 111.2 | 122.3 | 129.4 | 136.4 | 144.8 |

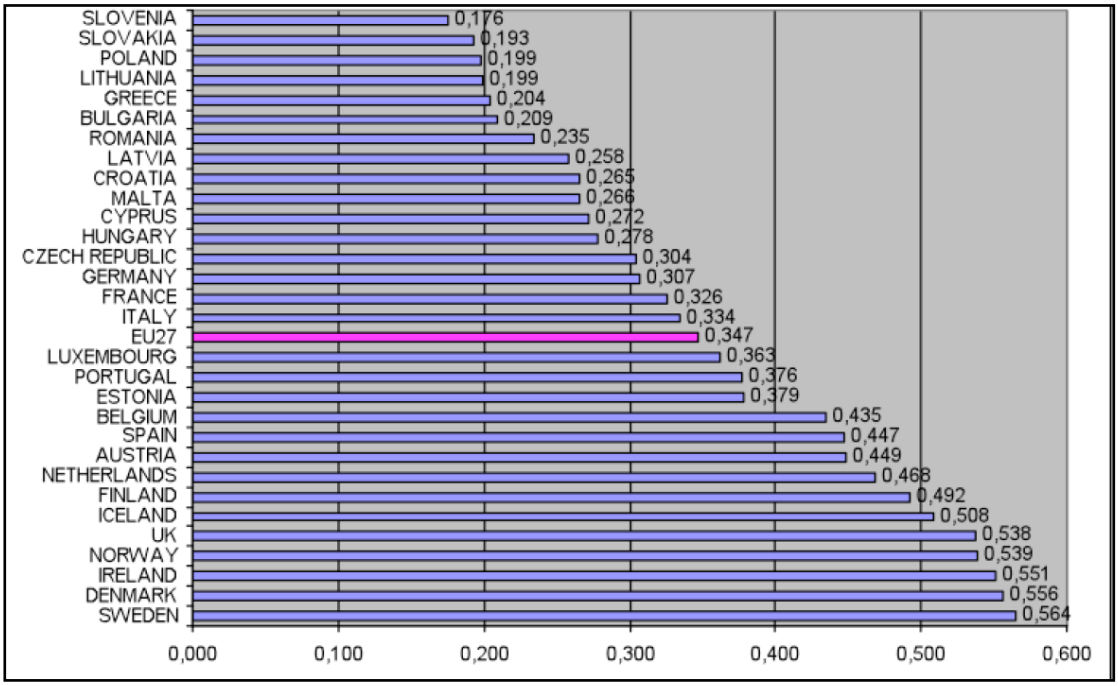
Source: WITSA[209].

As detailed in **Table 3**, investments on ICT vary widely per country. A trend however is towards an increase of ICT investments in healthcare over time.

A recently developed report by IPTS, provided an overview of ICT deployment in hospitals across Member States as depicted in **Figure 13**.

[9] The forecasts in Digital Planet 2008 have been revised relative to previous editions. Global Insight has incorporated its latest macroeconomic forecasts, developed new modelling methods, and implemented a new segmentation scheme to provide more accurate and detailed forecasts of ICT spending around the world.

**Figure 13 – Hospital eHealth Deployment Composite Index: country ranking**




Source: A Composite Index for the Benchmarking of eHealth Deployment in European Acute Hospitals, 2011[21].

When comparing the results on hospital eHealth deployment (as per Figure 13) with those on ICT expenditure (as per Table 3), some of the findings are very much aligned. It is observed how Scandinavian countries, the UK and Ireland rank highly in hospital eHealth deployment and also on ICT investments. In contrast, Germany expenditure is above the average of the EU countries covered and hospital eHealth deployment is below the EU average. The opposite is observed for countries like Spain or Portugal, ranking above EU average hospital eHealth deployment and below the average on investment for the countries covered.

### 2.5.2 The EHR as the core application for integrated care: state of the art across the 8 countries

Notwithstanding the usefulness of these indicators, and for the purposes of integrated care, it is also relevant to take into account deployment in other healthcare services beyond acute hospitals and the level of development and data exchange among different tiers of care.

In this regard, it is relevant to highlight the role of the electronic healthcare record (EHR) which is considered a central component of an integrated ICT system [22]. Already in 1998, Iakovidis [23] defined the EHR as "digitally stored health care information about an individual's lifetime with the purpose of supporting continuity of care, education and research, and ensuring confidentiality at all times". The author already made a distinction between an EHR and an EHR system which "operates on EHR in order to manage the information and provide information to qualified users in a user-friendly manner. Good EHR systems help the users to retrieve the information in a fast and user-friendly manner (interfaces), communicate easily with others, and make user's work more effective. From this definition we can immediately differentiate EHR systems from the medical record systems that are normally stand-alone systems".

Thus, for the purposes of continuity of care, the level of ICT deployment from the perspective of the overall healthcare system becomes relevant.

As reported by Lluch 2011[24], at EU Member State level, there is wide diversity in the implementation of ICT and in particular the development of Electronic Health Records (EHR). For instance, Finland implemented EHR in 2008[25]; Slovenia launched its eHIT project in 2008; Italy has recently budgeted €1.3 billion as part of its eGov 2012 Plan; England launched the centralised

National Programme for IT (NPfIT) in 2002 with an estimated budget of £12.7 billion (or €14.8 billion) though its completion deadline has been extended until 2014-2015 .

The eight countries studied in-depth under WP3 reported different levels of ICT adoption and implementation. They also provided a relevant overview of strategies and policies on ICT for health.

In Italy, driven by the potential of ICT to move the point of care away from traditional settings towards patients' homes, the National Healthcare Service's "Bricks" ("Mattoni") were established as a broader semantic toolkit aiming to ensure comparability and interoperability of regional healthcare services. This body has been complemented by the permanent inter-regional eHealth Board. The role of the board is to harmonize the different regional eHealth policies, and to help coordinated implementation of the respective projects. Current projects where collaboration is in place are: the electronic health record (fascicolo sanitario elettronico-FSE) lead by the Lombardy region, ePrescription, eBooking and the GP and Paediatrician network. In addition, the National Observatory for the evaluation and the monitoring of eCare networks (Osservatorio Nazionale per la valutazione e il monitoraggio delle reti eCare) has been established to define a set of indicators (technological, organisational, economical and clinical) necessary for a compared evaluation of eCare networks and for the definition of best practices. Thus, eHealth activities are the responsibility of the regions and the central government through its steering role and soft push through strategies and best practice exchange consolidates efforts at national level.

Spain provides a similar model to that of Italy with ICT deployment varying across regions. In the Basque country plans to develop a full EHR system and ePrescription service are at the core of their strategy to tackle the challenge of chronic diseases. In Catalonia, their middle-out approach is currently prioritizing the identification of all ICT investment in collaboration with all health stakeholders and to plan investments for the strategic projects as well as new funding formulas to achieve the modernization of the ICT sector for health. Their ePrescription service is already implemented throughout all of primary care and the Shared Medical Record System (SMRS) is being rolled-out. The SMRS is based on a decentralised management model, connected via interoperable systems using common standards. It allows doctors to access all the relevant information available on their patients ensuring continuity of healthcare. At the time of writing, there were 419 centres connected sharing 15,474,233 records relating to 7,217,789 people. Finally, the case of Andalusia represents a best practice model both at national and European level. At the core of Andalusia's eHealth strategy is Diraya, a unified EHR system. It integrates patients' health information and intervention details in primary care, emergency services, mental health services and ambulatory specialised care in the region. Diraya has been praised internationally as an example of a successful implementation of a region-wide EHR, eBooking and ePrescribing system. Currently the system is being mainstreamed to hospital care whilst the implementation of the CPOE application in primary care is almost completed.

In the light of the above asymmetries on ICT development at regional level, the aforementioned Royal Decree passed on August 2011 did not only address cooperation between health and social care but also issues related to ICT for health[26]. At national level, the bill does not only ratify the objective of having EHR and ePrescription implemented in all regions by the end of 2012 but it also establishes interoperability as a target to be achieved by the same date. As a starting point for this, the bill establishes that by February 2012 all NHS cards would have a unified and common format, as opposed to the current ones which vary per region. Thus, in contrast to Italy, the Spanish central government seems to have provided the final push that the regions required to consolidate ICT in health at national level and to promote interoperability amongst regions.

Investments on ICT for health in Estonia for 2008 were estimated to be a bit over €11.5 million. These amount was the result of € 10 million financing from healthcare providers (including hospitals, family doctors, private clinics, dental clinics and ambulance services), € 0.66 million contributed by the Estonian Health Insurance Fund (EHIF) and € 0.75 from the ministry of Social Affairs and the Estonian eHealth foundation. Developments in Estonia are very prominent. Estonia has a country-wide secure health data exchange platform called the Estonian Health Information

System (EHIS) which involves four main components: Electronic Health Record, Central Digital Image Repository, Digital Booking and Referral System, and Digital Prescription. All of EHIS components have been developed and integrated together and are fully operational to the extent that service providers make use of the system. Through EHIS, Estonia is likely to be only European country with a unique country-wide ICT system in healthcare. As of October 2011, approximately 55% (732,500 individuals) of the Estonian population have their personal digital patient record; the system contains over 5 million medical documents and is actively used by more than 450 healthcare establishments in Estonia. Because of its mandatory nature, all providers are expected to join into the system.

In the Netherlands, the architecture for the so-called electronic patient record was developed consisting of an overall scheme of regional data repositories which were connected by a so-called nation-wide switching system. Due to lack of confidence in the operational features of the system – culminating in mistrust in identity management and privacy issues – the Dutch Senate has just recently put the whole development of the architecture to a hold, after €217 million had been invested over a period of fourteen years. The organisation that bears responsibility for the national grid, Nictiz, is requested to develop a migration strategy in which regional activities remain supported but nation-wide exchange is no longer an option. In parallel to the national architecture currently "on standby", pilot projects in chronic care (not all ICT-related) have been launched for the period 2005-2013 supported by a €340 million budget. Of these financial means, part is dedicated to ICT-related care. It is not always possible to identify the precise contribution of ICT-related pilots and projects. The measures relate to innovation projects (testing novel concepts; the European Ambient Assisted Living is an important pillar for these projects with a yearly subsidy of €2 Million; the programme funds 50% of eligible costs; some of the projects within the AAL programme have a clear link with PHS, many are related to well-being more than healthcare), implementation projects (rolling out novel concepts over larger communities; this programme had €11.3 Million subsidy in the period 2006-2009; four out 66 implementation projects related to telecare), and transition projects (supporting transition processes in care; this programme supports more radical transitions which need to be realised in the Dutch healthcare system; it has a yearly budget of €13 Million for projects; the projects are usually larger projects directed at realising organisational change and are less focused on pilots with ICT). In France the DMP (French EHR) has been relaunched recently and new funding made available for the development of ICT based services for ageing

Four pillars represent the key to deliver the Danish eHealth strategy. The first pillar is represented by the initiatives promoted by the Local Government Denmark or LGDK strengthening integrated care and the use of ICT at municipal level. The "Municipal Digitalisation Strategy 2010-2015" is where LGDK encourages all municipalities to collaborate for the digitalisation, standardisation, and efficiency improvement of the public services offered by the municipalities. Strategies for social services and healthcare have been developed and both areas are already highly digitalised as a result. This applies for both case management and the delivery of services to citizens. However, untapped potential for improved electronic communication with especially GPs and hospitals as well as a lack of structuring of health data in the municipalities has been identified. Here the role of the National Board of E-Health (NSI) as second pillar responsible for managing the national administration of ICT in the healthcare sector, including the collaboration with regions and municipalities is very relevant. NSI establishes national standards, implements prioritised cross-disciplinary initiatives, and ensures that the development of ICT in the healthcare sector takes place in line with the ICT strategy for the healthcare system.

A third component is the health portal sundhed.dk launched in 2003 which functions as a hub for the communication between citizens, patients, and health professionals. The portal provides users with a basis for common knowledge and a comprehensive overview of relevant information and patient data. For health professionals, the open part of sundhed.dk gives access to national and regional clinical instructions, referral information, and the catalogue of medicine. The closed part gives access to patient data across the health sector via the National Patient Index with data from the National Patient Register, hospital records (e-journal), medication records, and lab systems.

The fourth component is that represented by MedCom promoting cross-sector communication between the parties in the healthcare sector. Through close collaboration with IT suppliers, professional companies, policy-makers and other user groups in terms of the practical implementation of the strategic objectives for the development of healthcare IT. The most frequent MedCom messages are prescriptions, discharge letters, referrals, laboratory results, laboratory requests, and local authority notifications.

Thus, in Denmark, through a middle-out approach, ICT deployment is very much advanced. Efforts towards nationwide EHR systems are into place and current approaches towards information exchange converge with this aim.

In Germany, even though, intra-organisational EHR are more or less common, for external information systems communication is still restricted, thus EHR exist but fragmented and in the form of silos across healthcare providers. Looking at the development of EHR in the past few years no proactive national strategy is identified. This means there is no organising power that regulates and controls projects and provides them with an overarching framework for actions. Two main initiatives have been developed to progress in conjunction on this. eFallakte (eFA)[10] and the project group electronic patient record (*Elektronische Patientenakte EPA 2015*). Through these initiatives, technical solutions and the architectural infrastructure for data exchange are expected to be delivered by 2015. However, challenges ahead are not only technical but also related to data security and associated organisational aspects from users and patients.

As earlier introduced, the NPfIT in England is not yet completed. The NPfIT aimed both at a common centralised IT system in the NHS and at having hospitals adopt the new IT system. Building on a pre-existing high penetration of ICT in GP practices, the development of "GP2GP" - a system that allows the electronic transfer of the medical records of a patient who moves from one GP practice to another - aimed to integrate these existing systems and to promote information exchange. The achievements to date incorporated in the planned delivery include:

- the development of the Spine (a central link to the patient register, the ePrescription service, messaging service, and the summary care record).
- an ePrescription service (EPS)
- an eBooking and eReferral systems;

The fully integrated EHR system involving the Detailed Care Record accessible to patients' GPs and the Summary Care Record accessible to all NHS staff treating the patient is not yet delivered.

As defined by NHS Scotland[27], the eHealth Programme is essentially a "programme of programmes" which points at the scenario of introducing platforms to access and retrieve data from different tiers of care rather than implementing a unique EHR system. Indeed, the penetration of ICT in primary care in Scotland is very high and platforms allowing for data sharing by means of overnight updates of NHS24 and A&E data are in place. In addition, twice a day patient medication data is transmitted from EHR at GP practices to a central drug summary database that is accessible to hospital and ambulance services. There are also some cases (local experiences) of patient portals where patients can introduce some information in their EHR as well as download their summary record. In the light of the above, the overarching goal of the eHealth Strategy for 2011-14 is interoperability which the Scottish government steers through a middle-out approach[28]. As a result, it does not centralise IT procurement but it supports the development process - i.e. by approving the adoption of SNOMED CT[29] whilst allowing direct involvement of NHS Boards. Other ICT developments nationwide include a digital channel for users registered with Virgin and Sky as well as an application for smartphone users launched by NHS24. The channel is an interactive TV service

[10] The case-based electronic patient record (eFallakte, eFA) is a platform that has been set up in the light of data protection requirements. All health data of an individual case are saved on this platform. Providers involved in a patient's care can request a table of contents of the available information electronically, while the patients themselves decide about access rights. The aim of eFA is to reduce technical barriers.

which provides relevant information to patients (NHSinform), and allows them to book their GP appointment and order repeat prescriptions. The plan is to expand the spectrum of services offered through this channel.

The experiences in England and Scotland reflect progress towards full interoperability well ahead of other Member States, it is still not clear whether and when the NPfIT will fully deliver and critics often blame the top-down approach (as opposite to the Scottish middle-out approach) as one of the reasons for the uncertainty surrounding the success of the programme[30].

So far, this section has provided some indicators on eHealth deployment as well as a description on current strategies and developments from the countries zoomed in. Out of all of them, Estonia is the only case where a truly EHR system is in place. Moreover, STAR the social care ICT system was being mainstreamed aiming at national deployment at the time of writing. In contrast, this country has placed less emphasis on integrated care. Once integrated care receives the final push required in Estonia, the process will be facilitated by the ICT tools already in place supporting this process. Other countries close to fully operational EHR systems are Denmark and the UK. In contrast, Italy and Spain show regional differences but aim towards convergence of systems. The case of the Netherlands although promising is currently on stand-by situation when it comes to ICT deployment which may hamper current progress on integrated care services delivery.

### 2.5.3 ICT for health: The role of the demand side

In the light of the active role that patients are meant to play in disease management initiatives and the patient-empowering role that ICT bring to healthcare, it is also relevant to introduce aspects from the side of eHealth users and patients.

**Table 4 - Internet use for seeking health information in 27 EU Member States (2005)**

| I have used Internet. in the last 3 months. for seeking health information on injury. disease. nutrition. improving health. etc.) | | | |
|---|---|---|---|
| | % of respondents | | % of respondents |
| **Austria** | 0.1602511 | **Latvia** | 0.073535892 |
| **Belgium** | 0.191399821 | **Lithuania** | 0.085266587 |
| **Bulgaria** | 0.049116891* | **Luxembourg** | 0.410491035 |
| **Cyprus** | 0.080041814 | **Malta** | 0.161733901 |
| **Czech Republic** | 0.034713085 | **Netherlands** | 0.407242357 |
| **Denmark** | 0.238382246 | **Poland** | 0.071422494 |
| **Estonia** | 0.163774139 | **Portugal** | 0.100267783 |
| **Finland** | 0.389710116 | **Romania** | 0.050800936* |
| **France** | 0.12968291* | **Slovenia** | 0.153678227 |
| **Germany** | 0.342261249* | **Slovakia** | 0.091329895 |
| **Greece** | 0.021608308 | **Spain** | 0.127510355 |
| **Hungary** | 0.09608787 | **Sweden** | 0.23210749 |
| **Ireland** | 0.104775278 | **United Kingdom** | 0.254573588 |
| **Italy** | 0.08727072 | **EU Average** | 0,159593929 |

Source: Eurostat Household Survey, 2005[31]– *2006 data

As detailed in Table 4, the countries where eHealth users are more active are Luxembourg, Finland, Germany, Denmark or Estonia. It is relevant here to denote the influence that the demand side may place as a push factor for further ICT deployment in healthcare. For instance, 86% of Danish

families had access to the internet from their own home in 2010. This data makes the Danes the most keen internet users in Europe. Moreover, the digital divide age-related is much lower in Denmark than in other European countries. In this country, patients' views that physicians not using electronic records are "second-rate," represented an additional factor compelling GPs to install ICT in their practices [32].

Another interesting case is that of Estonia with 71% of households in Estonia connected to the Internet and Internet penetration among the 16-34 age group almost at 100%. At higher age groups, the percentage using internet decreases significantly: in age group 55-64 approx. 50% of members use the Internet and of 65-74 year-olds only 25%. Not only the digital divide related to age is higher here but also the use of Internet connection based solutions may still be questionable in some very remote areas of Estonia.

Thus, although the data on demand-side factors related to ICT in healthcare as provided in this report is limited, its significance should not be underestimated. Those interested in more details on the demand site might be interested in the results from the Citizen Panel Survey carried out in SIMPHS2.[11]

[11] Details of the Citizen Panel Survey will become available at the SIMPHS2 site: http://is.jrc.ec.europa.eu/pages/TFS/SIMPHS2.html

# 3. IPHS developments and analysis

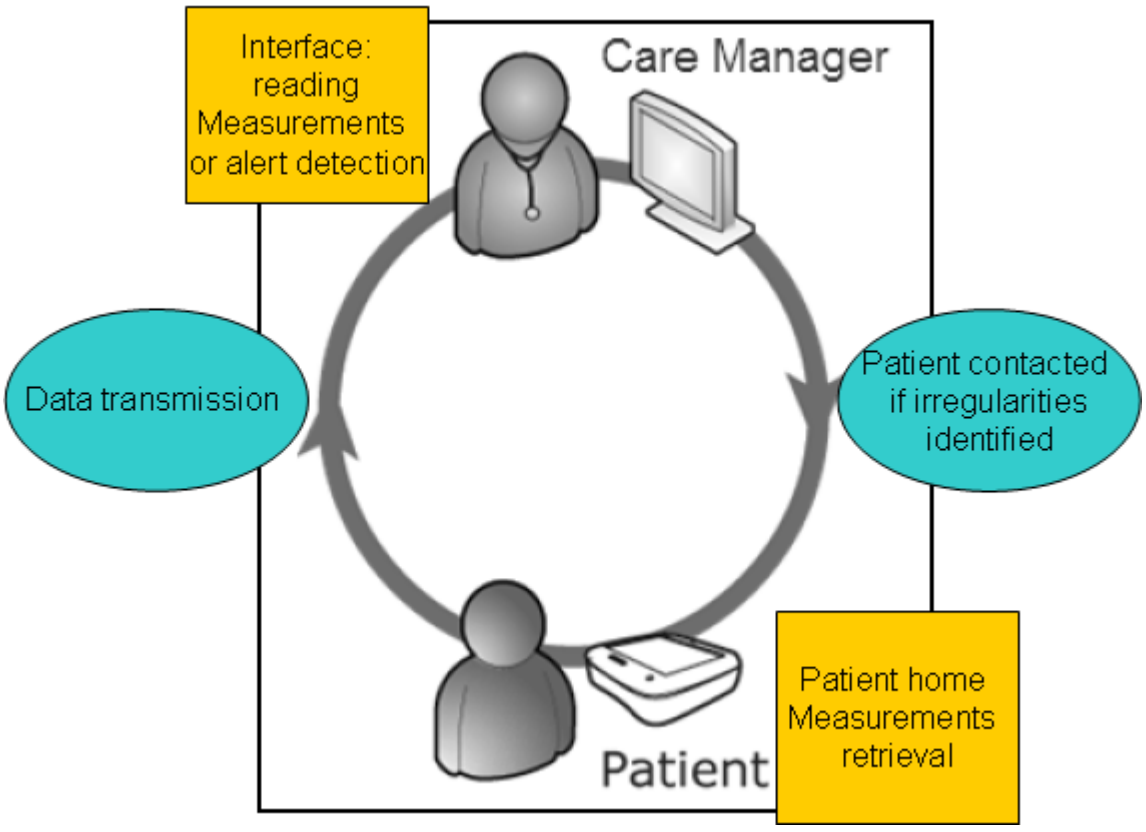
## 3.1 Introduction

Section 2 reflected the pressure that the ageing population and the associated chronic diseases developed as a result of longer life are posing on health and social care systems. How these two services are responding has been portrayed as well as the need for further coordination amongst different tiers of care in order to treat patients from home has been identified. Finally, developments on ICT and how these technologies are required to support integrated care have been covered. With these, the way is paved for the implementation of additional innovations such as Integrated Personal Health/Care Services (IPHS), which are the object of this section.

As mentioned with the definition of IPHS in Section 1.1, IPHS have an important role to play in addressing the health and/or social care needs of individuals outside of care institutions, hence the interest in IPHS applications. Examples of IPHS can be telecare or teleheath applications and within the latter the so-called Remote Patient Monitoring and Treatment (RMT).

In this section the evidence from the countries on IPHS experiences will be analysed applying the three axes framework (Innovation, Governance, Impact) and drivers and barriers for IPHS deployment within integrated care will be discussed. In order to understand the analysis that will be provided a snapshot on how these systems are being operationalised will be described first.

**Figure 14 - Snapshot of IPHS experiences studied**




Source: Author's development

IPHS involve a patient at home and a care manager at the other end. Data on the patient status can be retrieved in a variety of forms and the technologies used for this are diverse.

The applications can involve a basic first generation telecare alarm button which is pressed by the patient in an emergency and triggers an alarm at the care manager's end. More sophisticated telecare applications involve sensors. For instance, a sensor in the bed which can detect a longer than usual absence of the patient in the middle of the night and will automatically trigger an alert

to the care manager. In this case, technologies based for instance on bluetooth can be used to transmit data from the sensor to a receiver that will trigger the alert received by the care manager. Other third generation telecare applications would involve wearable sensors that the patient carries during daily activity.

From there, telehealth applications measuring more specific parameters have been developed. These measurements can be weight measurements (through a scale), blood pressure, heart rate, the amount of sugar in patients' blood (for diabetes), the amount of oxygen in blood (for COPD), the level of blood coagulation, or heart activity through an ECG. The devices taking these measurements would send the data to a computer in a PC or a set up box connected to a TV set (i.e.: through USB connections or through bluetooth technologies) and from there the data would be sent to the care manager via web or via mobile technology. The care manager will be at the other end of the interface and monitor the data received for each patient. Subjective measurements on the patient condition can also be monitored either via routine phone conversations between the case manager and the patient or through a software application in a computer or even through mobile phones with SMS applications. These subjective measurements can represent for instance the presence of coughing or problems breathing for COPD patients, feeling of tiredness, requesting whether ankles are swollen (for COPD and CVD patients). Note that without IPHS, these measurements are taken at the physician office or during hospital stay.

The applications always involve some form of communication between the care manager and the patient/user. Even in the most basic cases when no devices are used, a telephone support line is always present which is used for care managers and patients to communicate. When more developed technologies are involved in the communication process, data can be sent via bluetooth, mobile phone technology and internet. Often a combination of all of them is observed. Thus, IPHS involves technologies related to data transmission and technologies related to the data gathering, data storage, data retrieval and monitoring.

With the exception of third generation telecare, the patient plays an active role. In first generation telecare, it is the patient triggering the alarm. In the telehealth examples provided, the patient needs to actively take these measurements and send the results to the care manager.

A care manager receives an alert when an alarm is triggered and takes action upon it. Often the first step is contacting the patient through a phone call or though video-conferencing. In less technology intense cases, the care manager may contact the patient with no alarm triggered as part of the routine service. Thus, some form of call centre is always present. This call centre is also available for patients to contact care managers if they feel the need to. The organisation behind the care manager is also very relevant as will be unveiled in the analysis.

These applications will always involve a prior training to care managers on a protocol of action for each situation. Patients are also trained on how to use the service and the technology where applicable. With the exception of telecare applications, all patients are also informed that the service should not be contacted in case of emergency as this is a different type of service.

Having established the above, those technologies that involve communication from healthcare professional to healthcare professional with no patient involvement are outside the scope of this exercise (i.e.: tele-radiology). Also, implanted technologies (i.e.: RMT applications embedded within a pace-maker that can track heart measurements) are outside the scope of SIMPHS2.

As already introduced earlier, the SIMPHS project has investigated IPHS experiences in eight European countries following a regional approach as detailed in Table 5 below (see also project snapshots in Annex II – Overview of IPHS projects covered – project fiches):

**Table 5 – Projects analysed in SIMPHS2 at country and regional level**

| Country | Projects investigated |
|---|---|
| **Denmark** | |
| Region of Southern Denmark | The Patient Briefcase: a project involving OUH (Odense University Hospital) and Svendborg Hospital<br>- and the Anti-Coagulant (AC) treatment project also involving OUH and Skejby hospital<br>ePatch: project involving OUH and Glostrup Hospital<br>- The diabetic foot ulcer project involving Region of Southern Denmark and Region Zealand |
| | |
| North Denmark region | Telekat project |
| Capital Region of Denmark and the Central Denmark Region: | Integrated Clinical Home Monitoring Project (ICHM) project |
| **Estonia** | |
| Estonian islands of Saaremaa, Hiiumaa, Muhumaa, Ruhnu | VIRTU Project |
| East-Tallinn Central Hospital (3rd largest hospital): | DREAMING project |
| | ELIKO - a technology venture and project development |
| **France** | |
| Limousin Region - Département de la Corrèze | ESOPPE - Home security and Home comfort |
| Champagne Ardenne Region | DOMOCARE - Systemic approach for living at home – e-care @ home |
| Nationwide | Y-DOM - Home security and service staff coordination in mobility |
| **Germany** | |
| Baden-Wuerttemberg state | HeiTel case study |
| Two cities: Wiesbaden and Taunusstein | WohnSelbst case study |
| **Italy** | |
| Piedmont region | Two initiatives: My doctor@home and VCO |
| Lombardy region | telemaco/NRS |
| Emilia Romagna | eCare/CUP 2000 |
| **Netherlands** | |
| Groningen region | In Touch study – CardioConsult |
| Limburg region | TEHAF study - Health buddy |
| Twente region | COPDdotCOM |
| Groningen | Some details on the past project KOALA covered under SIMPHS1 were also included |
| **Spain** | |
| Andalusia | Hospital Univerisatio Virgen del Rocio (HUVR), Seville |
| Basque country | Evidence Based Medicine Clinical Unit Hospital Donostia, San Sebastian |
| | TELBIL project in Bilbao |
| Catalonia | NEXES project implementing Integrated care at Hospital clinic |
| **UK** | |
| England | The main focus was on the WSD and its three sites. Details on WSDAN with a specific emphasis on Hull and other experiences such as that in North Yorkshire and York (NYY) were also included |
| Scotland | |
| Lothian | Telescot project |
| NHS Highlands | Bute |

As seen, although there are some common IPHS features described here, in each experience the technology used can differ and the type of service provided and by whom will also vary. These aspects will shape the analysis leading to experience specific particularities whilst other issues will be general to most of the experiences portrayed.

## 3.2 Application of the three axes framework: Innovation, Governance, Impact

### 3.2.1 Analysis of the experiences from an Innovation perspective

Results from WP3 (i.e. the 8 Country studies) revealed that IPHS services delivered involve two types of innovation: technological innovation (innovation and its attributes) and organisational innovation. This is very much in line with the innovation developed by Greenhalgh and colleagues [33] which SIMPHS2 included as part of the three axes framework application.

**Innovation and its attributes**

From a technological perspective, IPHS involve a variety of technologies: those related to data retrieval, those related to data transmission and those related to the interface the care manager uses. The most relevant aspect for all of them is the need for flexibility. IPHS also involves two types of users: patients (and their carers) and care managers. Thus, acceptance from these two groups of stakeholders will determine how the innovation is diffused. All of these will be addressed within this section.

*(a) Patients and/or carers perspective*

Patients (and/or his carers) are the ones who will be using IPHS on a routine basis and who need to be comfortable using them.

Issues related to internet penetration and usage will also determine the kind of technology in use for data transmission and the level of user adoption. Many of the experiences studied relied on data transmission through mobile technology. In particular, this applies for socially deprived areas as well as remote and rural areas. Experiences in the Highlands in Scotland, in the islands in Estonia and in mountainous regions in Italy corroborate this fact. As far as these social and geographical differences remain, reliance on mobile technology as a means for data transmission will remain key for IPHS services delivery and to ensure access to IPHS services.

In Section 2, the patient-empowering role that ICT bring to healthcare was introduced. Related to this, findings have been a bit controversial. On the one hand, lessons from the UK experiences reflect that these technologies assist patients in learning about their condition and how to manage it whilst at some point a level of technology- dependency is developed by patients. The perception that patients actually become disempowered was also noted in other countries where it was felt that through IPHS the responsibility was being shifted away from patients. The objective is to empower patients rather than making them dependent. In order to overcome this unintended consequence, policy-makers seem very tempted in rotating these technologies. This would imply that a patient will be given the technology for a specific period of time after which the patient will have learned to self-manage the condition and then the technology will be removed. Once removed, the technology can be given to the next user in need and the same process will be repeated from user to user. From the outset, this comes across as an attractive solution. However, the effectiveness of this alternative has not yet been tested. On the other hand, positive experiences made in France through Living Labs for Healthcare show that patient empowerment is far more significant when representatives from patient organisations have been involved in the healthcare proposal from the conceptual design phase, not only as potential users, but as a full-time partners and decision makers for treatment planning, which is another interesting approach.

In addition, the data gathered needs to portray the relevant information to the care manager at the other end to be able to take action. In this regard, early IPHS experiences in Bute Island, prove that often off-the-shelf technologies were not appropriate. Involving stakeholders in the design working alongside technology developers was identified as strength. This is also confirmed by the experience made in France which shows that in order to build-up and retrieve intuitive and convivial

solutions, the patient should be part of his/her own healthcare thinking-process as early as possible in the process. Such a “co-concept’” process shared between patients, industry and healthcare actors, symbolises the “living lab” approach which turns out particularly efficient in the field of Healthcare organisation. The role of the industry offering flexibility and allowing for adaption is one of the key take-aways. Patients need to be able to manage the technologies, the more intuitive and friendlier the design the more likely they are to use it. On the other hand, some clinicians interviewed were also concerned that the industry eventually would provide technologies that do not really represent an advantage or do not assist in the clinical process. In these cases, the innovation as such is not questioned but it is just not useful for its purposes and it does not represent a solution.

As the IPHS market evolves and innovations have been developed involving stakeholders, these are becoming more and more transferable from one setting to another which opens the floor for faster widespread in the future. The "Living lab” approach mentioned above has been pointed out as a best practice in France in particular through the ESOPPE program – Home security and Home comfort case study whereby a large industrial group (Legrand) is actively developing innovative solutions for wellness and autonomy at home in the Limousin region, University R&D and industrial R&D being associated in a regional living lab concept with users and patients involvement. Further, more sophisticated telehealth experiences such as the HeiTel experience or the technologies used in the WSD Newham site in England, nowadays are likely to be easily transferable to other settings and the adaption process is likely to be shorter. Notwithstanding the advantage of reaching maturity and widespread use, flexibility still represents a relevant issue and it is likely to remain a must for any new innovations developed.

Moreover, providing training to both patients and care managers on the technology will also be required. It is also relevant to point that training is not only an educational tool for users but it is also a form of engaging them with the use of this technology. Thus, the training sessions as a means to involve and engage all users can play the role of system catalysers. Even when appropriate training is provided to both, a set of issues have been identified from both sides that need addressing.

From the patient side, in few cases the technology has been reported to be intrusive by users. In the beginning it might, but as they become comfortable with it, this feeling changes. Also relevant here is to compare some of the experiences explored. For instance, the My Doctor@home experience reveals that measurements were taken daily by the patient his/herself or by the carer (informal career, relative), however for more complex measurements, such as spirometer and ECG, measurements were done by a nurse during a scheduled home visit. Also, in Italy, the Telemaco/NRS experiences on COPD patients actually reflects how objective parameters are taken by the patient whilst subjective parameters (asking patients about general physical conditions, adherence to the care path, risk factors/ indicators such as symptoms) are gathered through routine phone calls.

Similar experiences in Scotland and England for COPD, instead, used software where the patient answered these subjective questions and these were transmitted to the care manager alongside the objective measurements. Some of these subjective questions such as the presence of sputum and its colour can be sensitive. Indeed, some patients under the COPD IPHS telehealth programme revealed that they feel more comfortable being honest about these matters with a computer than with a care manager. The learning point here is that there is variation on how much of the service is automated and left to the responsibility of the patient and how much is left to the care manager. This is likely to vary per country and even on a patient basis and throughout time. When designing any IPHS service trade-offs will have to be made on what is considered to be more effective for the target population. Often a slight service modification resulting in higher personalisation or depersonalisation on these issues can have an impact on the acceptance or reluctance form the patients side. It will also have an impact on the workload that is being posed to the care manager.

Based on the evidence gathered on this, two interrelated aspects will need to be borne in mind when making these decisions and trade-offs which go beyond the innovation and its attributes. One

is on how paternalistic the system will be and the other on how technology "savvy" the service users are. Related to the paternalistic approach, an example is the My Doctor@home experience in Italy describing that a series of SMS reminders to take measurements according to the agreed schedule are sent to patients. Instead a similar service in the UK did not use reminders. Maybe in the beginning the care manager would need to contact the patient to remind but after a while reliance on patients' self-management and responsibility was the standard. This seems to reflect social and cultural factors around this which would need to be taken into account.

Regarding technology "savvy" users, it has been detailed how the Danes are keen internet users and actually, the experiences in this country rely much more on patients responsibility working with the technology themselves as opposed to the approaches seen in Italy. Thus, it will be useful to take these indicators into account when designing the IPHS service delivery considering how much can be expected from patients and their use of the technology.

Notwithstanding this reality, there will always be a group of patients who will have no intention at all to use any form of technology. The size of these groups may vary with time and through settings as well as the reversibility of their attitude but currently, this is a reality that cannot be denied. In this regard, attempts to reverse the attitude of those who deny technologies can be made. Again, training might be one of them. The role of those patients who champion these technologies and are keen enthusiasts has also been considered to disseminate the use of IPHS amongst others patients. Based on this, in some cases the possibility of organising seminars with patients was considered and patient champions were very keen to participate and help other "peers" suffering from the same situation. The barrier for this was that related to ethical issues and anonymity of participants. Another way to gain acceptance of the technology is to pay greater attention to the "social link" aspect as identified in the French country study: innovative services which enhance communication and social link especially for the elderly have proven successful there. These services are provided on top of devices with adapted ergonomic and easy to use. Other examples include communication devices aiming to facilitate the mobility and coordination of carers coming to the home of the elderly. The communication and social link features appear to be a key factor and possibly a trigger for acceptance of these systems, which are viewed positively by the users and the carers helping the elderly person. As underlined in the SIMPHS2 validation workshop mentioned earlier, elderly users offered TV based health services in a French region were not interested in the health aspect but welcomed the social link which the TV channel provided them with, connecting them to their town, friends and relatives.

Finally, the influence that healthcare providers have in engaging patients to use these technologies is a major factor. However, for healthcare professionals to convince patients, first they need to be convinced themselves which has often proven to be a challenging endeavour.

Indeed, IPHS are often regarded as a threat to the sacred doctor-patient relationship. From the patients' side, patient organisations have raised concerns that IPHS represent an opportunity for healthcare professionals to avoid face-to-face interactions, in particular for those patients whose attitude is "less desirable". These concerns claim that these technologies can result in lower quality of care.

**Box 3 - Key lessons learnt - diffusion of innovation from a patient perspective**

- Access as a main driver for IPHS adoption even if relying on mobile technology data transmission
- Technology needs to be flexible in order to answer users' needs adequately
- Importance of providing user-friendly tools, systems and devices, which answer patients' needs and do not get sold simply because they have been developed in a certain way
- Importance of adapted ergonomics (e.g. for the elderly) to overcome resistance to technology
- Paying attention to the need of patients for social link and communication which can trigger technology adoption
- Striking the right balance between the level of automation of IPHS systems vs. human intervention, taking account of cultural factors (e.g. sms reminders vs carer phone call)
- Training users and using training as an opportunity to engage them
- Gaining the support of GPs who in turn influence their patients
- Making sure IPHS is not perceived as breaking the patient-doctor relationship

*(b) Care managers and care professionals*

From the healthcare professionals' side, there is also reluctance towards these technologies as they feel the technologies make them lose contact with patients. Often, this is due to how incentives are defined and to liability concerns as will be addressed in-depth in the governance section (see Section 3.2.2). Another reason for this reluctance is the concern that the care they provide will be replaced by "machines". Thus the reluctance is born from an unfunded insecurity that they would lose their jobs. Finally, it should be noted that for healthcare professionals, the relationship with patients represents their prime emotional motivator [34]. This is particularly true for those who have very frequent interaction with patients.

Developing appropriate dissemination strategies is relevant to overcome some of the threats related to the doctor-patient relationship. Through these strategies, communicating that these technologies are complementary and in synergy with face-to-face interactions is very relevant for both. Good examples related to this are portrayed in the Italy case studies where dissemination activities increasing awareness and setting the right expectations proved to be very helpful to engage with stakeholders and to eventually manage conflicts.

Looking at IPHS services from the side of the care manager, issues related to the innovation and its attributes influence how these innovations are disseminated and spread.

Flexibility of the system is very relevant for care managers. Systems are often designed on one-size fits all and this can have negative implications. For instance, personalising for each patient when an alarm is triggered has proven to be very helpful. Often patients have gone through a recent exacerbation or hospitalised. After discharge the parameter levels that will trigger an alarm shall be different than those when the patient is completely stable. Making flexible systems where the care manager can adjust these thresholds has proven to be very helpful. Moreover, often systems are designed providing objectives for patients in order to promote their self-responsibility and self-management of these conditions. This type of applications is very helpful however often default objectives established by the system are too unrealistic for the patients which becomes a source of anxiety and frustration. These feelings can result in work pressures for the care managers. Care managers being aware of it, have a need to iteratively adjust these objectives and personalise them in a way that they become more realistic for the patient on a case-per-case basis. Thus, systems providing these flexibility features are better accepted by the care manager as it reduces pressures on their daily work as well as on the patient.

Data overload has proven to be a challenge for the adoption of these technologies. IPHS data is rich and the first reaction by care managers is to panic. This can be overcome with training and with systems that display data on a friendlier summarised manner (i.e.: a graph instead of a table). In addition, making sure than only the clinically relevant data is that one displayed also helps. When

additional unnecessary data is also portrayed, resistance to use these technologies is higher. Moreover, the data needed may also be different depending on the care manager retrieving it. In most cases, the care manager is a nurse or a trained professional in charge of daily monitoring patients. When an alarm is triggered and if the situation requires it, a specialist doctor or a GP will be contacted to take action upon it. Hence, there has been a jump to a different tier of care. Healthcare professionals in this tier of care require data to make their decisions but they actually need this data synthesised and portrayed in a different manner. Often solutions that can cover the needs in this tier of care have not been found. An initiative however, exists within the Telescot experience in Scotland aiming to find conclusive results on this. This initiative aims to test a software developed by the Newham PCT (one of the WSD sites in England) with healthcare professionals retrieving different data summaries and in different forms and obtain some form of clinical consensus on what data to be included in different tiers of care and to integrate within the EHR. It is also expected that synthesising the data to be integrated within the EHR would result in lower resistance from these tiers of care.

Integration with other ICT applications that contain patients' clinical and care data is also very relevant. This refers to what Greenhalgh and colleagues[33] termed as inter-organisational networks reflected here by the different tiers of care. As will be unveiled in the rest of this chapter, interoperability will define the integration of different ICT applications and it has proven to be a key determinant in the adoption process.

The aim is to deliver integrated care. Data being stored in different systems which are not interoperable means that the data is not integrated. When data is not integrated, truly integrated care cannot be delivered. As detailed in Section 2.5, interoperability issues amongst different care providers is already hampering integrated care. Only Estonia has overcome this barrier and other areas like Andalusia in Spain are making good progress towards it. For the same reason, paying attention to interoperability issues around IPHS data is as relevant. In most of the experiences studied, interoperability was missing. In the worst of the cases, IPHS data was only available to the care manager who would make decisions based exclusively on this information. In the best of the cases, this meant that care managers consulted two different sources of information: that related to the EHR and that related to IPHS data. This is time consuming for care managers and the diffusion of these innovations can be hampered by these issues.

It is relevant to point that the forthcoming DALLAS programme financed by the Technology Strategy Board (TSB) in the UK imposes as funding eligibility criteria for projects to show significant advances towards interoperability.

Not only does lack of interoperability threaten the quality of care delivered and limits the diffusion of innovations from a care professionals' perspective but it also affects patients. Patients adhering to their treatment and using IPHS as advised can feel very frustrated when they attend the GP office and the GP is not aware of the IPHS data. This frustration may result in dropping the treatment. Thus, diffusion of innovations due to lack of interoperability can also be driven from the patients side.

**Box 4 - Key lessons learnt – care professional perspective**

- Developing proper dissemination and communication strategies to overcome GPs' reluctance which may be based on wrong incentives, liability concerns, feeling of losing patient relationship…

- Flexibility of the solution is also crucial for professional users, the technology has to allow for personalisation (e.g. parameterisation)

- Data overload creates resistance, which can be avoided by providing better display (e.g. graphic) options, data selection modules so that only relevant data is presented to users, taking into account that different users may require different data

- Ensuring interoperability with EHR to avoid extra workload for carers needing to maintain separate IPHS systems and affects patients who may have to provide information twice.

**The organisational innovation**

Research in the UK[10] reports that out of the two innovations embedded within IPHS systems, technology innovation and its attributes accounts for 10% whilst the remaining 90% correspond to the organisational change associated to it. Along the same lines, research in Germany also concludes that the innovation in IPHS projects is primarily a service and process innovation rather than a product innovation[16]. This may be due to the relative maturity of IPHS technologies compared to framework conditions and organisational readiness for IPHS which lag behind.

Until recently, patients suffering from chronic diseases have been managed by their GP or specialist. When an exacerbation or an emergency associated to their conditions arises, patients are admitted in hospital. After hospital discharge, they would go back to the community. Once in the community, the GP in most cases would receive a discharge letter from the hospital containing brief information on the events that took place during the patient hospitalisation. In addition, if considered appropriate by the GP, social services would be contacted to provide assistance to this patient.

As detailed in Section 2.4.3 efforts are being made towards better coordination between these tiers of care. In particular in the UK, the role of community nurses assisting discharged patients to get back in the community has been highlighted. They assist in coordinating with social care and involve the so-called "hospital discharge teams". As much as these efforts are welcome, truly integrated care implies better communication ICT-supported and coordination between tiers of care. Thus, integrated care involves a great deal of change in the organisations and a change in work routines from stakeholders involved. These are essential components to deliver patient-centred care, rather than the patient navigating through the different uncoordinated tiers of care. The innovation here lies in making this change happen.

In the particular case of IPHS, the system reorganisation required to deliver the service in the long-run goes even further. As reported in some experiences, IPHS involves a care manager reading the IPHS data. In such cases, the re-organisation to mainstream these applications lies behind this care manager. The generalisation of such an organisation model may be a way forward.

The model described in the experience in Scotland represents a good example. This model involves the development of trained teams to install telehealth and telecare (e.g. the team responsible for healthcare logistics and inventory of material, including the Pods (the devices used to take objective and subjective measurements on their condition on a routine basis) could be responsible for installations) and provide one-on-one training to patients until they feel comfortable with the technology (estimated at about 1 hour or less). During the training patients will also be informed that the tools they receive are only temporary support tools to learn to manage their condition, know when they are not well and understand what to do when they are not well so they can keep stable.

From the care manager perspective the reorganisation is as follows. These care managers are call-handlers trained to follow a protocol. They are responsible for carrying out the readings from IPHS data, detect irregularities and contact patients when the first alarm is triggered. They would also be the first point of contact when the contact is initiated by the patient. Thus, call-handlers become responsible for making the first triage. This may help sort out many of the alerts that are often false alerts thus freeing up nurse time for their core tasks. Call handlers are co-located with a team of social workers, the NHS24 team (the 24 hour emergency service) and ambulance services. After the first triage the call handler following the protocol will refer the case to the appropriate service, be it: social care services, NHS24, ambulance service or to the appropriate healthcare professional (be it the specialist nurse, the GP or a hospital clinician). Through this co-location, joint decision making and coordinated action on the best approach to take in each case can be made.

The proposed model comes across as feasible partly in the light of the recent service reform in the organisation of health and social care services across Scotland. According to it, adult social care services are now the responsibility of NHS Boards, which translates into adult health and social care

falling under the responsibility of the same body. Furthermore, in order to bring health and social care services together, their respective IT systems would have to be compatible. Social care services would need to have access to the EHR information for instance. Ultimately, EHR data, telehealthcare data and NHS24 data will have to be integrated. This integration is likely to take place trough platforms of information exchange, in a kind of middle-out approach, as opposed to a hypothetical long-term plan from NHS Scotland to centralise all information which would be much more of a top-down approach.

Through this new delivery model, Scotland expects their network of elderly care wards for long-term and social care services to become redundant. The long-term beds are likely not to be needed if patients' needs can be covered from home. The role of community rehabilitation centres (with no overnight stays) will be strengthened instead.

From a patient perspective, the path defined in this model is as follows. In the hospital, early discharge will be promoted. Patients will also be introduced to IPHS applications that would assist them in getting back to the community at an earlier stage without compromising their health. The hospital will also co-ordinate with the GP patient discharge. Responsibility from the patient will be passed onto the GP. The GP in co-ordination with the services above described will support the patient discharge by introducing him/her into the appropriate rehabilitation programme. By having information shared amongst all these tiers of care, the care delivered is centred around the patient and the patient will keep on being monitored in the community with the support of ICT in general and IPHS in particular.

In addition, through the use of trained call-handlers as human capital instead of nurses for routine IPHS readings, the work of nurses can focus in delivering services that require higher clinical expertise and added-value.

When looking at this model compared to how care is currently delivered, the following gaps can already be identified:

i. hospital care pathways need to be redesigned around this;
ii. coordination with the support services provided by call handlers, social care, emergency services and ambulance services needs to be in place;
iii. additional coordination between tiers of care (hospital, GP, rehabilitation and support services)
iv. ICT systems need to be integrated;
v. human capital needs to be developed, in particular, call-handlers and those responsible for installing the IPHS equipment and provide training to patients needs to be strengthened.

Bridging these gaps will enhance the delivery of integrated care and IPHS becoming a routine form of care delivery. In most of the experiences explored, however, a set of issues for this to happen have been identified.

One of them is the role of nurses in the IPHS service delivery. Nurses have been the ones responsible for operationalising IPHS and have become the reference for patients. Their role is considered key in achieving the objectives of IPHS services. However, this has represented extra effort from their side and this effort has not always recognised from an economic and organisational point of view which threatens sustainability. The introduction of the call- handlers' role implies that IPHS will absorb less time from nurses. Thus, nurses will still represent a key role in IPHS delivery whilst they will still have enough time to dedicate to clinical responsibilities. This may remove some of the workload and pressure from them. Nevertheless, a better definition of their incentives will contribute to better recognise their work as it will be later detailed in this section.

Some of the experiences studied involve social services and non-profit organisations. One of them is eCare/CUP 2000[12], in Italy. The eCare/CUP 2000 project actually started as a social service involving 50 councils in the Bologna district rather than a healthcare one. The project is not focusing on a particular disease but on the multi-faceted concept of "fragility" (users are classified as fragile not only from a medical perspective but also from a social one). This has allowed developing a series of complimentary "social services" around the eCare/CUP 2000 platform that further personalize the offering for users. Specifically, the services included under this initiative were:

- Call centre 24/7 (inbound and outbound calls)
- The health-social record –which is not integrated with the EHR system implemented at regional level
- Connection to the first aid
- Connection to GPs
- Monitoring of fragile conditions
- eBooking for healthcare services

As the reader may identify, none of the above service involve IPHS. Indeed, the monitoring service is carried out by care managers through routine phone calls to patients. The care manager in these phone calls goes through a protocol questionnaire with patients. This is done in the form of a conversation in order to avoid automated responses from patients. Thus, the innovation in the eCare/CUP 2000 experience is not exclusively-IPHS related. This innovation lies in the service reorganisation converging towards integrated care and it is considered relevant given the high maturity that the initiative has achieved (it was firstly initiated in 2003). Indeed, the project involves different tiers of care (i.e.: from non-profit organisations to GP) and coordinate patients throughout different tiers of care (i.e.: from carers assisting in daily activities such as shopping to organising appointments with health professionals). The integration of different domains such as healthcare and social service is the real added value of the service, each user-report is truly multidisciplinary and it is created by physicians, nurses and social workers.

eCare/CUP 2000 also details the cooperation difficulties faced when trying to involve professionals who were used to work in silos, at the beginning of the project. The promoters realised that it was more than just an organisational issue but a cultural process that had to be triggered. An expert in sociology applied to healthcare services assisted during the organisational change involving stakeholders in re-designing processes and decision making flows and to better target awareness campaigns and trainings.

Notwithstanding this progress, areas for improvement were further identified. Specific boards have been established to introduce these improvements as a result. For instance, as part of their fine-tuning exercise a specific board was recently opened to refine protocols and selection criteria for users with cardiovascular diseases. Integrating health and social care records into one would also benefit those involved. Also given the service (re)organisation in place and current developments targeting specific diseases, the way is paved for IPHS deployment. eCare/CUP 2000 leaders are currently exploring these options.

Another example along the same lines is the “Virtual elderly care services on the Baltic islands” (VIRTU). VIRTU is a 3-year pilot deployment project of personal integrated assistance using videoconferencing solution. The project is conducted at international level, but the SIMPHS2 Estonia study focused on Estonian partners and innovation development and dissemination within the participating municipalities in the Estonian islands of Saaremaa, Hiiumaa, Muhumaa, Ruhnu. The project aim is to provide teleconference solutions at homes and in the carers’ offices to enable video-connection between carers (and healthcare professionals) and patients and between patients

[12] For the purpose of this report and aiming to avoid confusion, the term eCare/CUP 2000 is used to term the specific service of the eCare network offered through CUP 2000 targeting fragile elderly people in Bologna and Ferrara (Emilia Romagna).

themselves. In addition to the municipalities, research institutions and NGOs are also involved in the project. However, there is no healthcare professional involved as a partner in the project at the moment. The larger-scale aim is to create a functional social and health care service model based on the use of virtual technologies for the archipelago areas. Thus, here, all stakeholders involved in delivering social care are getting together with a technology partner in order to deliver the service. Once the service reaches a critical mass (currently there are only eight participants in Estonia), their aim is to involve healthcare professionals. Thus, extending the service reorganisation to healthcare services.

A different IPHS service delivery model is that offered by the VCO telemedicine experience in Piedmont (Italy). This initiative targeting patients with chronic conditions was launched by the local health enterprise (ASL) which is the organisation responsible for evaluating health needs and providing comprehensive care for a geographically defined population. Thus, ASLs in Italy manage or contract primary and hospital care. The operational service delivery within Telemedicine VCO is provided by the contractor: from providing patients with the devices and the related training to the technological platform and contact centre management with patients. Prior to implementation, involvement from ASL authorities and clinicians mainly focused on establishing the monitoring protocol that prescribes the number and the frequency of the measurements and the action plan when an alarm is triggered. Under this outsourcing model, clinicians can focus on patient clinical aspects reducing at the minimum the time devoted to "technical" or operational aspects. The organisational change under this model is more discrete than that portrayed in Scotland for instance.

Other initiatives explored have developed a stronger re-organisational component. For instance, the multi-intervention experience in the Basque country (Spain) led by the Evidence-Based Medicine Care Unit in Hospital Donostia aiming to reduce CHF inpatients readmissions and visits to emergency involved both primary and hospital care and the service delivery was internalised. A more recent initiative also within this same centre is tackling patients at geriatric centres and primary care is also involved. Another example is that of Hospital Clinic in Catalonia. This hospital, after a few experiences involving IPHS and routinizing coordination with primary care for some of their services, is now moving to a transitional phase from existing pilot experiences to extensive deployment of health and social services supported by NEXES - supporting Healthier and Independent Living for Chronic Patients and Elderly project funded by ICT Policy Support Programme Area. NEXES is a multi-intervention programme and the ICT services involved are mainly delivered in-house. Also, the Telekat initiative in Denmark is being rolled-out involving all tiers of care. The Danish technology supplier involved has ensured that integration with all relevant electronic patient and care record systems across all tiers of care is in place. Thus, these cases are leading to truly integrated care.

Finally, it is also relevant to highlight those initiatives that are primary care led. One of them is the TELBIL exercise in the Basque Country (Spain). This initiative was initiated by a champion motivated by the work developed by the Evidence-Based Medicine Care Unit in Hospital Donostia. Thus, a porosity effect took place crossing from one tier of care to another which enhances the diffusion of these innovations. However, the experiences where primary care is definitely taking the lead are those in the UK. Indeed, the role of primary care is so prominent in this country that finding hospital led experiences is almost a rarity. This does not mean that they do not exist. Indeed, one of the earliest published experiences on IPHS and clinical phone support are those lead by the enthusiastic team at Hull university hospital (England).

Primary care in cooperation with social care services led the biggest RCT on IPHS deployment in the world. This is the recently completed Whole Systems Demonstrators WSD) programme in England. The Whole System Demonstrator (WSD) programme was conceived as a two year research project funded by the Department of Health and originally aiming at finding out how technology can help people manage their own health while maintaining their independence. The final trial evaluation assessed the added value of telehealth and telecare over a reorganised service and not the benefits

of whole systems redesign compared to conventional care. Moreover, the trial did not aim to assess the effects of individual technologies used but of telehealth and telecare supported services[35].

To sum up, as detailed in the examples above, initiatives can be initiated by different stakeholders be it at social care, primary care and hospital care. Those that have been initiated at social care level involved higher personal interaction with the patient (i.e.: regular phone calls or video-conferencing). The level of re-organisation can be more radical (i.e.: a reorganised model of care delivery ion Scotland) or it can be more discrete (i.e.: in particular when many of the IPHS service is outsourced). Also, reorganisation can take place prior to introducing a technology (i.e.: eCare/CUP 2000 in Italy) in which case the technology when used is likely to consolidate the organisational change. In contrast, many initiatives use the technology as a catalyser or stimulator of this reorganisation.

Nevertheless, initiatives involving the closest to integrated care are those where the reorganisation component is stronger (i.e.: Evidence-Based Medicine Care Unit in Hospital Donostia with geriatric patients; NEXES in Hospital Clinic or Telekat in Denmark). Often those delivering solutions closer to integrated care already have a historical background of working together with other organisations be it other hospitals or in cooperation with primary care. These makes individuals within this institutions more opened to other ways of working and the organisations are more ready to assimilate new innovations.

A key success factor to promote these innovations is the role of champions. Champions have a strong sense of responsibility and feel in control of their destiny and actions. Their motivation and engagement is very strong and can play a 'contagion' effect amongst their peers. Thus, champions are relevant players when diffusing innovations. In every experience identified, the presence of one or more champions has been key to ensure delivery. However, this is not enough and additional involvement from other stakeholders complemented with the appropriate governance is required to ensure long-term, sustainability of IPHS deployment. Otherwise, they end up in numerous pilots dying and never becoming routine form of care delivery.

Not only champions are relevant but also nurses have been identified as the connecting hub across tiers of care, patients, technology and call handlers in all experiences identified including those that are hospital led such as, for instance, HUVR in Andalusia. Indeed, it is difficult to imagine them happening without the intervention of nurses. Thus, for the smooth running of these services, acknowledging their work and providing incentives where appropriate is an issue to consider. Barriers to IPHS deployment are of different nature, but facing resistance from the nursing community can be a very challenging one. Thus keeping the nursing community motivated is of paramount relevance.

One of the reasons why nurses have ended up gaining such a prominent role is because physicians have shown little interest and involvement in many of these initiatives, passing on the work to the nurses. In most cases and often capitalising in their expertise of the specific conditions they are managing, they are able to make decisions by themselves with little need for physician input. There is a need to further involve physicians in these initiatives. Relying only on a few clinical champions does not seem a sustainable model in the long-run.

In those experiences, that are primary-care led, lack of GP involvement has proved to be a major barrier to diffuse these innovations. The impact of their reluctance is detrimental in both, the short and the long run. In the short run, prior to being mainstreamed these technologies are first tested at pilot scale. Here, various country studies found that the lack of GP involvement results in low and/slow patient enrolment in these pilots. Hence, their resistance often do not even give an opportunity for IPHS to prove their value.

In cases when pilots have taken place, the results from these pilots can result in mainstreaming. However, the lack of GP involvement in mainstreaming hampers the delivery of truly integrated care. As seen, three main reasons for this resistance have been identified: lack of appropriate incentives; the threat that IPHS pose to the doctor-patient relationship and liability issues.

Addressing them will assist in IPHS deployment. These three aspects will be covered in Section 3.2.2.

A third innovation that is being observed in parallel with IPHS deployment is the introduction in the patient selection process of 'risk-stratification' tools as addressed in Section 2.4.1 (Disease Management Programmes). These tools have proven useful to identify patients eligible for IPHS treatments and would help assist the impact of these technologies per type of patient and severity of their condition. Also, learnings from IPHS applications are often used to adjust and fine-tune the models behind these tools. Thus synergies and cross-fertilisations between IPHS and risk stratification tools are being identified. They feed each other in improving and refining their applications.

**Box 5 - Key lessons learnt – organisational innovation**

***Planning and introducing change***

- Both IPHS and Integrated Care require better coordination and communication between tiers of care

- Re-organisation and IPHS implementation can be initiated from primary care, from secondary care or from social care, all three are valid approaches

- Starting with reorganising social care services e.g. for the elderly complementary services can be added incrementally until more sophisticated services like IPHS can also be introduced

- Integrated care means changing work routines, implementing IPHS also requires changing work routines: both should be envisaged in conjunction

- Breaking silos in health and social care requires cultural changes, involving a sociologist in the redesign phase can assist in that respect

***Re-organising services***

- Co-location of IPHS trained care managers with emergency services (call handlers) allows for coordinated action and joint decision making

- Most advanced integrated care has been achieved where the reorganisation component has been strongest

- Most advanced cases of integrated care are those where coordination and communication between health and social care was already very good

- Integrating health and social care record is an advantage: establishing common patient records between primary, secondary and social care first can speed up integrated care and facilitates IPHS implementation.

***Roles and responsibilities***

- Champions are needed to promote IPHS and integrated care but it is not sufficient in the long run; for mainstreaming and in the long run, commitment from other stakeholders and good governance are also needed

- Creating new roles such as an IPHS care manager role facilitates IPHS implementation

- Involving all stakeholders from the start is important to avoid resistance

- Keeping the nurses community motivated is equally important: nurses often play a key role in IPHS implementation although this is not recognized through incentives nor reduction of other workload

- Promoting GPs involvement in IPHS implementation is paramount, as they influence strongly participation of patients

**Better use of resources**

- As the technology set-up needs to be done by those selling the technology (contractors), there is an added value in using them for providing patient training, which moves that workload away from care professionals whose resources can stay focused on care rather than technical problems

- IPHS care delivery can be outsourced with more or less involvement of the health and social care staff (e.g. from full outsourcing with call centre to only outsourcing technology provision and installation)

- IPHS enables earlier discharge from hospital hence freeing beds for other patients or other purposes

### 3.2.2 Analysis of the experiences from a Governance perspective

SIMPHS Deliverable D1.1 on the SIMPHS methodological set-up portrayed a governance typology introduced by Coiera in 2009[28] which is specific to ICT for health. The author identified three different approaches: top-down, bottom-up and middle-out. This section will report on findings related to governance identified in the country studies which require policy consideration. In particular, those relate to barriers identified for widespread IPHS diffusion will be highlighted. Finally, those issues will be structured along the lines of the three typologies introduced by Coiera.

**Funding and financing issues**

Funding represents a form to incentivise IPHS uptake. In particular, funding to cover for technology purchase up-front costs has been identified as a relevant matter. Different sources of funding have been identified in the experiences explored under WP3.

When initiatives are bottom-up, covering for technology upfront costs can be a serious challenge, which often leads to developing strong partnerships with the technology provider. An extreme case is the experience at HUVR in Andalusia where the technology costs were borne entirely by the technology provider. A similar case was portrayed in the early stages in Hull hospital in the UK, in the Patient Briefcase in Denmark and in pilots undertaken by the Evidence Based Medicine Clinical Unit of Hospital Donostia, San Sebastian (Spain) where the technology provider, a local SME, carried the costs under its own R&D budget. In France, there is a long tradition for industry stakeholders to develop and promote technological devices and related services through own funding, with a strong focus in recent years on services and applications helping to keep the elderly living at home safely. In a second step, these industry stakeholders cooperate with health and social care actors to mainstream, which influences funding streams.

Such a strategy may be feasible when a technology provider wants to enter a market or be a first mover on a new market. Moving to less extreme cases, in other initiatives such as NHS Highlands or those in Catalonia and the Basque country, the technology provider is often an SME who is involved as a partner and the upfront costs or the "value for money" are often lower than in other instances. This helps optimise the funding made available to carry out the pilots, in particular given the fact that often funding takes the form of co-funding as opposite to 100% funding.

Finally, initiatives closer to a top-down approach such as the WSD in England benefit in terms of the volume of units purchased which also generates economies of scale.

Thus, covering for upfront IPHS costs is an issue that needs to be addressed. Relying on industry funding is not sustainable. In this regard, it has been observed the case of the UK which mainly relies on funding from their own government (i.e.: the Technology Strategy Board or the Department of Health). France follows a similar approach insofar the government clearly promotes ICT for health and independent living through dedicated funding mechanisms alongside other mechanisms that support SMEs and start up with e.g. loans through a dedicated organisation under the French Ministry of Economy, Finance and Industry, and the Ministry of Research (OSEO). In particular, the French government has made €40 million available in 2011 through open calls for the development of innovative communication solutions for better health, well-being, autonomy and prevention as well as new usages. The aim is to foster the emergence of viable economic models in eHealth through the implementation of demonstrators of a representative scale, involving a large number of partners. Demonstrators are understood as going beyond experimentation, to optimise a technology and overcome economic and societal barriers.

In Germany, funding is diverse. The HeiTel experience is financed by the insurer (AOK) whilst WohnSelbst is jointly funded by the Federal Ministry of Education and Research (BMBF) and the industrial partners involved.

Other countries such as Spain show different patterns. For instance, the experiences in the Basque country were funded by the Basque Health Service; instead, the case of Catalonia obtained funding from the European Commission whilst the experience in Andalusia relied on some funding at central level (ISCIII) and the technology partner. In Italy a mix of national, regional and EC funding is also observed depending on the region.

Denmark portrays some cases when initial EC funding supported some IPHS initiatives. However, the main key play here is the PWT Foundation which started by funding many pilots and currently aims at national implementation of some of these applications.

Estonia relies heavily on EC funding. Not only national funding sources are limited but also, the ELIKO project is an initiative aiming to develop economically feasible IPHS services which is likely to indicate affordability issues to imported IPHS tools and technologies.

In Section 3.2.1, two types of innovation were identified those related to the technology and those related to the re-organisation of services. Obtaining funding, regardless on the source, has been identified as a driver to cover for the costs of both innovations. In particular, policy-makers in Scotland insisted that the initial TDP funding promoting tele healthcare had mainly been dedicated to the re-organisation of services and the establishment of community partnerships.

These different funding sources cannot directly be associated with bottom-up or top-down approaches. Most likely, they are the result of specific healthcare system characteristics, the maturity of the service (e.g.: HeiTel experience financed by the insurer in Germany and based on pre-existing experiment), funding and policy priorities.

From the outset, it seems reasonable that funding is allocated in line with policy priorities. For instance, Section 2.4.1 portrayed that Estonia was lagging behind when it came to chronic disease management and integrated care. Thus, it does not come as a surprise that national funding for IPHS deployment is also lacking in this country. once integrated care is a priority at policy level, funding associated to it is more likely to be available.

Instead, countries with strong emphasis on chronic disease management and long-term conditions such as Denmark and the UK have also allocated funding to IPHS. These two examples are relevant to identify the trends on sustainable IPHS deployment.

As seen, in Denmark, the PWT started by funding many pilots / demonstration projects and is now launching a programme more focused on national implementation building on their most successful pilots. Thus, they are seeking to bridge the gap between pilot projects and national implementation, by consolidating success stories. One could therefore clearly argue that while the projects in this study started from enthusiasts and a bottom-up approach, today's IPHS and RMT development follows a middle course solution in which policy level support and funding meets a consolidation of the experiences learned from so far in the successful pilots.

The UK portrays two different cases: Scotland and England. Scotland, motivated by the evidence from their pilots, decided to roll-out. A main re-organisation of services at policy level involved merging the Scottish Centre for Telehealth and NHS 24 as a first step to put in place a new e-Health strategy. Co-funding from the Scottish government and the DALLAS (Delivering Assisted Living Lifestyles At Scale) programme is in place in order to deploy IPHS at scale. England was also aiming at scale programmes through the DALLAS programme. However, the recently published results of the WSD evaluation represent a key milestone in this process and a catalyser for new trends[36].

Prior to December 2011, widespread roll-out of IPHS in England represented a challenge. In particular, recent commissioning reforms and budget constraints resulted in clinical commissioning groups being at an early stage of development, and interest in telehealth being limited to a handful

of GPs. The picture changed when the early indications from the WSD were published in December 2011 showing very positive results from an impact perspective. Following this publication, nation-wide roll-out was announced by the Prime Minister. These developments were too recent at the time of writing, however, so far, private sector leaders have agreed to "put their hands in their pockets" to fund the initial investment in telehealth. This initiative aims at easing the financial constraints associated with mainstreaming in the light of current NHS budget cuts. Also, from the government side, the Prime Minister also announced: "even in these difficult times, we commit not only to protect the science budget but also to announce an extra £495 million capital funding for science this year". Finally, an extra £150m government funding for home care was also announced at the same time. Thus, financing to support the mainstreaming plans is secured whilst these financing sources come from government budgets outside those allocated to the NHS.

To sum up, Denmark, England and Scotland offer examples aiming to mainstream IPHS application. In both, Denmark and Scotland funding is in place to overcome the up-front technology cost barrier amongst others. In the case of England, it looks like government funding is also used to cover these costs. Commitments to control these costs through the provision of affordable solutions or even through some form of cost-sharing have been made by the industry as well. This commitment is possible in England for two main reasons. On the one hand, the NHS in England relies on a heavy monopsony power. On the other hand, the industry commitment relies on attractive research incentives and tax-benefits to the industry established by the government. Thus, those countries aiming to apply the English model of negotiating with the industry shall bear in mind the concessions that the Brits give to the industry.

In the light of the above, trends point towards healthcare financers to cover for the up-front costs of these technologies. This trend aims to eliminate start-up financial barriers and it also seems reasonable in the light of recent results proving these technologies to be cost-saving. Variations or complementary policies of this funding scheme can also take place aiming to contain costs. For instance, rotating the technology between different users or negotiating with the industry whilst committing to boost innovation as the UK is planning. Another option would be to introduce a co-payment for IPHS as it is often applied in basic telecare services both in the UK or Denmark.

So far only technology upfront costs have been discussed given that those are easy to isolate. However IPHS also embed a service support behind them and the cost of the service, although more difficult to isolate, shall also be considered to obtain a full picture.

It is also relevant to point that following our clusterisation exercise, the UK and Denmark belonged to two different clusters. Nevertheless, these two healthcare systems build on a Beveridgian tradition. In this regard, seeing IPHS mainstreamed nationwide in other settings with less Beveridgian tradition may unveil additional forms of funding/financing. For instance, an emerging model in Germany points towards a relevant role for the pharmaceutical industry. Here, a specific case of an anticoagulant drug was distributed alongside the IPHS tool to measure blood coagulation for treatment and monitoring patients. The rationale behind this model is product differentiation and positioning through value-added services. However, the funding model may not be so different. At the end of the day, the distribution channel of these technologies may be a different one but the drug financier is still the one paying for the technology. If there is co-payment for drugs, then it is likely the user pays a portion for the technology costs. It is not clear however who the service provider in this instance is. An issue that would need to be further explored if this model is here to stay.

To conclude, for some ICT applications in healthcare, the cost is not borne by the healthcare financer. This is the case of pharmacies in many European countries where the applications for the ePrescription is financed by each community pharmacy. For IPHS, it is likely that the financier ends up bearing this cost, at least to a certain extent, thus eliminating barriers for service roll-out.

**Box 6 - Key lessons learnt – funding and financing**

- Technology upfront costs may be provided by technology providers; while this functions as market entry strategy, it is not sustainable in the long run. Hence IPHS initiatives need to be designed taking due account of long term funding requirements including those related to service costs
- Funding IPHS and integrated care may be coming from national, regional or EC budgets, with equal chances of success, the key is in long term funding strategies.
- Successful integrated care cases have been based on funding being made available for re-organisation of services, looking at funding from a technology perspective only is bound to fail.
- Top-down or bottom up funding is a result of healthcare system design and policy rather than a choice to be made per se.
- However, bottom-up approaches often consolidate through government intervention moving towards a middle out course which shows the limitations of bottom-up initiatives when it comes to mainstreaming.
- IPHS is closely linked to Chronic Disease Management (CDM) policies: where there is no focus on CDM, IPHS is not being promoted which begs the question for industry of whether there is a point in promoting IPHS when CDM policies are lacking.
- Introducing co-payment for IPHS may be an avenue to be explored.

**Governance to address healthcare professionals' barriers to ICT adoption**

Resistance to adopt ICT from healthcare professionals have been identified. This also applies to IPHS uptake. The sources that lead to this resistance are of different nature. In Section 3.2.1, three main sources were identified: lack of appropriate incentives; the threat that IPHS pose to the doctor-patient relationship and liability issues.

*(a) Incentives*

Lack of appropriate incentives has been identified as a barrier for widespread ICT adoption in general and for IPHS uptake in particular. Not only lack of incentives represents a barrier but misalignment of incentives amongst healthcare professionals and different tiers of care may also hamper IPHS widespread adoption.

Section 2.4.1 introduced different payment systems to healthcare professionals such as FFS, capitation and P4P. It was detailed how FFS payments may unintentionally lead to inefficiencies, rework and overtreatment. When looking at FFS payments from an eHealth perspective, FFS represents the perfect recipe for ICT uptake from healthcare professionals. Using ICT and obtaining the most up-to-date information on the patient medical record would avoid rework and tests being repeated. As argued by Kleinke[37], FFS means that "bad quality is good for business". Thus, the unintended incentive behind FFS is actually to reject most ICT applications.

Achieving new forms of healthcare delivery such as integrated care supported by ICT and quality improvements requires new payment designs. This issue have been identified both in the literature [38]and in the field work specific to IPHS applications carried out under WP3.

Alternative incentives to FFS promoting ICT adoption have been identified. One is direct payment for eCare services or pay-for-use. This payment has been used in a variety of settings and for different applications such as direct quarterly payments for ePrescribing activities[39 40] or the case of Denmark where both primary care physicians and specialists are being paid a fee for email communications with their patients being the fee for email double than the phone one[41-43]. Such a payment system represents a form of FFS for ICT use which may be an attractive option to promote uptake but it does not necessarily promote quality of care. As concluded by Bates[44], initially, rewarding providers for adopting ICT applications (including grants and subsidies to cover for start-up costs and eCare payment to stimulate initial use) seems a policy option, with a gradual move over time to pay-for-performance (P4P).

ICT for health is not an end in itself but a means to promote quality of care, thus an incentive promoting quality may seem more appropriate in the long-run. As a result, pay-for-performance (P4P) is considered as an alternative option. As detailed in Section 2.4.1, P4P is a payment scheme that rewards physicians for meeting a payer's predefined clinical and/or patient satisfaction benchmarks. P4P payments often take place in the form of payment bonuses or add-on-payments made in combination with capitation systems for instance. P4P programmes typically base their incentives on a mix of preventive care and chronic disease management benchmarks. As detailed in Section 2.5, it is difficult to imagine integrated care without the support of ICT applications. Having established the relationship between integrated care and ICT, there is wide consensus that P4P payments represent the most appropriate payment system as it directly aims at promoting chronic disease management whilst also promoting the use of HIT supporting the care process [45-47].

The UK healthcare system has been regarded by the international community as a system where P4P payment represents a success case. In 2004, the Quality and Outcomes Framework (QOF) was introduced in the UK — a mechanism intended to improve quality by linking up to 25% of general practitioners' (GPs) income to achievement of publicly reported quality targets for several chronic conditions. In a recent study, Doran and colleagues concluded that improvements associated with the QOF financial incentives seem to have been achieved[48]. It is also argued that QOF payment mechanism is one of the explanatory reasons for the high use of ICT amongst GPs in the UK[44]. As much as this seems reasonable from the outset, evidence proves that the penetration of computing in GP practices in the UK was already very high prior the introduction of QOF in 2004, as reported by Protti in his studies in Scotland (94% penetration)[49]and England (97% penetration)[29]. On the other hand, periodic reporting on the QOF is also required for GPs to be reimbursed and currently, HIT represents the most useful means for reporting purposes. As a result high ICT penetration in GP practices prior 2004 may have been further enhanced.

Notwithstanding the high uptake of ICT in GP practices in the UK, resistance to IPHS uptake by GPs was reported in the UK country study. In most cases, IPHS use and the service delivery of these applications was passed onto the nursing community. It is likely that this is due to other barriers beyond incentives. Amongst those, fears to lose face-to-face interaction with patients, liability concerns and how IPHS data is structured have been identified. It remains to be seen whether addressing these issues whilst maintaining the current incentive systems results in widespread IPHS adoption.

On the other hand, even in cases when GPs have shown low resistance to IPHS adoption, their involvement has been weak and nurses have taken responsibility for it. Thus, it is not only about overcoming barriers but about engaging GPs. If they engage with these technologies, they would recommend patients to use them. Patients are more likely to embrace these technologies when their doctors advise them to do so. Hence, having the GP community engaged also has an impact on patients' uptake. Indeed, this was one of the main take-aways from the German experience in WohnSelbst. Here, patient recruitment proved to be very challenging given the lack of involvement from GPs. As an alternative, the mayor of one of the cities involved showing his support resulted in higher patient enrolment. Recruitment issues also had to do with the specificities of the context in terms of setting (i.e. rural, with more limited access to healthcare and other services), level of education and socio-economic status of the target population.

It is also relevant to point that passing the IPHS service onto nurses puts doctors in a very comfortable position: they perceive the financial benefits of improving patients' outcomes from IPHS and it does not interfere with their daily work. This is valid mainly in the UK given that the QOF payment system applies to GPs and not necessarily to the nursing community.

In most cases studied, regardless on whether the experiences were hospital or primary care run, nurses are at heart of the IPHS service. Exceptions to this are the VIRTU project in Estonia relying also on social workers and the eCare network in Bologna (Emilia Romagna, Italy). The latter has been defined as a "community health service" in the truer sense of the word.

In some of the cases reported, a nurse has been dedicated with the specific task of handling IPHS. This is particularly true when the service is outsourced such as the VCO experience in Piedmont (Italy) or the HUVR in Andalusia. However, even in these cases, when there is a need to reach the healthcare service, nurses represent the main contact point. Hence, it is relevant to acknowledge their role. So far, the experiences portray an overreliance on nurses' intrinsic motivation and dedication to the service. Other types of incentives for the nursing community would be recommendable. These incentives can take different forms such as formal recognition of their work, avoiding work overload or the use of financial incentives.

In the light of the work overload that the nursing community is facing, some experiences use trained call-handlers or operators as a first contact point. Such is the case of the eCare/CUP 2000 project and the plan in Scotland. This represents an attractive option on its own. However, it is also recommendable to adopt and use IPHS services in combination with other policies aligning healthcare professionals' incentives. This is relevant given that at some point some of the cases may require guidance and assistance from healthcare professionals thus trespassing from one tier of care (call handlers) to another one (healthcare professionals). Moreover, how call-handlers are incentivised is also an issue worth exploring. Activity parameters generally used in call-centres may be useful. However, those would also need to be associated to other parameters specific to the healthcare sector such as health outcomes or the avoidance of unnecessary healthcare utilisation.

From the hospital side, lack of incentives and misalignment of the incentives there are have also been identified. In most cases, IPHS services are not reimbursed at hospital level and the picture from a hospital perspective is quite contradictory.

On the one hand and in the light of current DRG reimbursement hospital payments, the incentive is to have patients hospitalised as it means more business. This was prominently portrayed in the UK case study, as well as in the Andalusia HUVR case. It was further mentioned by experts at the SIMPHS2 Validation workshop 30-31 January 2012.[13] Even more extreme is the case of Estonia. Here, the incentives for hospitals to target the replacement of hospital bed-days with IPHS applications is low as the revenue model of the hospitals for long-term care is based on EHIF (the Estonian Health Insurance Fund) funding per day spent in hospital.

On the other hand, pressures as a result of waiting lists alongside DRG payments represent an incentive to decrease length of stay and keep patients at home. This was portrayed in the HUVR experience in Andalusia (Spain). Nevertheless, in most cases, hospital led experiences have been driven by this and by a thirst for clinical innovation, rather than by appropriate incentives in place.

Such a misalignment and contradictory reality is potentially a barrier. The research under WP3 identified two cases were this was specifically addressed. These were Italy and Denmark

In Denmark, DRG levels available for the healthcare sector are only in place for the replacement of direct ambulatory visits by telemedicine. In general, documentation is needed about the effects of RMT and IPHS across the sector boundaries. When this documentation is in place, it will form a better foundation for creating a fair incentive system across traditional sector boundaries. Moreover, the PWT Foundation's projects dealing with IPHS and RMT are focusing very much on how to deal with incentivising through DRGs across the different sectors in a fair way. The SST handles the evaluation of these projects' effect on investments versus savings across the sector boundaries and potential national implementation projects await such results. Similarly, in France, a law has been passed which allows for reimbursement of telemedicine, but the corresponding application decree only entered into force in April 2012.

Italy also shows interesting insights from a governance perspective. Here, DRGs have been redesigned by the government in cooperation with the regions in order to include telemedicine into the definition of home hospitalization (OAD) and integrated home care (ADI). Unfortunately, the operational level has not progressed in line and the current reimbursement model has not evolved

[13] Details available at: http://is.jrc.ec.europa.eu/pages/TFS/SIMPHS2.html

in pace with the changes in care delivery models and the financing models in these new care paths are complex. Indeed, this misalignment between policy and implementation was identified as a challenge for generalising IPHS deployment in the Mydoctor@home experience.

Additional efforts which may help overcome the incentives misalignment barrier have also taken place in Italy. For instance, since 2007 a specific fund for non self-sufficient people (fondo regionale per la non autosufficienza- DGR 509 / April 2007) and a specific tax for it was established in the Emilia Romagna region. This fund is meant to cover all the expenditures for classic health and social services for non self sufficient people across all ASLs, municipalities and since 2006/ 2007 also for the development of ICT enabling services. This mechanism has represented a catalyser for the eCare/CUP 2000 project to widespread.

Notwithstanding these efforts, additional policies are required to align incentives across tiers of care. Even if DRGs at hospital level were defined for IPHS applications, it is not clear how the patient management would be transferred from hospital (or home hospital) care to primary care. Once this is clear, defining aligned incentives would also become clear. A potential model to be suggested is that of Andalusia, Spain. Here, goals on chronic disease management and the incentive systems for all healthcare professionals are defined on a yearly basis. Both, primary care centres (PHC) and hospitals define these objectives and indicators for performance measurement in agreement with the district healthcare authority. In addition, inter-centre teams are responsible to ensuring coordination between these tiers of care. The different actors involved thus have aligned incentives.

Another interesting case may be that of the Netherlands, given that integrated care is at the core of the healthcare purchasing activity. Although IPHS is not a routine service in Andalusia nor in the Netherlands, some of their policies have set an environment which would make good settings for IPHS applications.

In addition, cooperation with social care shall also be promoted. The experience where prominent efforts have been made related to this is that of Scotland (UK) with the creation of community partnerships. However, in some cases, their delivery is still questionable. Also interesting here is the case of Italy where empowering primary care and integrating it with social services recently became a policy priority. Specific activities have taken place reorganising primary care and reinforcing group practice, introducing economic incentives for GPs and promoting integration between primary care physicians and district services such as social care, integrated home care or prevention.

To sum up, efforts integrating primary and social care have been identified. Often these are followed by outcome focused incentives aligning their interests. In addition, efforts have also been found where hospital incentives have also been addressed. The research has not identified experiences of IPHS deployment where incentives across all tiers of care have been aligned. In contrast, experiences where there is better incentive alignment for chronic disease management between primary and hospital care have been found. Those could potentially shed some light towards aligning incentives for IPHS generalisation.

**Box 7 - Key lessons learnt – incentives**

- Lack of incentives and misalignment of incentives act as a barrier to IPHS deployment.
- Fee for services (FSS) systems lead to inefficiencies, double work and overuse of healthcare resources, hence direct payment for using ICT based services (including IPHS) might promote their use but not necessarily quality of care.
- Pay for Performance (P4P) seems to be the most appropriate incentive model as both CDM and IPHS can be promoted.
- Financial incentives alone are not sufficient, engaging healthcare professionals is also important
- IPHS needs to be included in hospital DRG payment schemes, paying due care to how to compensate for staff involvement (e.g. doctors, nurses).
- Nurses play a key role in IPHS implementation but incentives to acknowledge their efforts are lacking.
- Definition of incentives should be closely linked to the definition of care pathways, so as to avoid misalignment of incentives across different tiers of care.
- Incentives can also be specifically targeted at fostering integration of health and social care.
- Specific funding mechanisms have proven helpful to bridge the gap emerging from misalignment between reimbursement policies for IPHS and actual implementation at operational level (e.g. hospital).
- There is evidence of alignment of incentives for CDM between primary and secondary care, lessons may be learnt from this for designing incentives for IPHS.

*(b) The doctor patient relationship*

The existing clinical culture demonstrates a variety of attitudes regarding the role that ICT can and should play in patient care. Concerns reveal that the technology might interfere with an almost sacred relationship between doctors and their patients potentially dehumanising the care process and encouraging impersonal "cookie cutter" approaches to the deep human problems that emerge in the context of disease and its management. In many instances [50] as a result, the predicted "patient–health care interface" facilitated by HIT has turned into an unpredicted threat to the "doctor-patient relationship". Hence, resistance to ICT uptake is also rooted in its impact on the provider-patient dynamic and their face-to-face interaction [51]. IPHS are no exception to this.

This threat can be partly explained by the incentive system detailed in section (a). if IPHS decreases the demand for face-to-face interaction, on a FFS payment system it represents less business for healthcare professionals. However, the incentive system is not enough to justify this concern. Even in settings such as the UK where GPs receive an incentive based on outcomes, resistance to IPHS has also been identified and the perception that these technologies are a threat to the doctor-patient relationship has been identified.

Indeed, the Ipsos-MORI report providing an understanding to what matters to staff in the NHS exploring emotional factors reached a similar conclusion [34]. It was found that the relationship with patients was the prime emotional motivator for the majority of healthcare staff. Whilst colleagues, profession and organisation were also identified as relevant; yet, these were secondary factors. Frequency of contact with patients (i.e.: those regularly involved in treating patients) was a prime determinant for this attitude. A study in Belgium focusing on nurses, reached the same results [52]

By contrast, in the same Ipsos-MORI study [34], participants perceived the modern NHS as the reverse of this rather humane and idealised model. Democratic ideals were considered to have been exchanged for a competitive marketplace where the management of costs determines the type of care a patient receives and the processes behind the care delivered. This new NHS has, in their experience, been subject to endless change, operating to a politicised agenda, and where a fresh initiative (with no rationale) is imposed regularly. The English NHS is seen as autocratic in style, serving a business agenda, driven by financial considerations and irrelevant targets. ICT can

represent a perfect example of this new NHS: a fresh (non rationale?) initiative, inhumane, imposing new ways of working, depersonalising care and threatening the doctor-patient relationship. The latter representing their prime emotional motivator.

The case of Denmark shows an experience where this barrier has been addressed through pressures from the demand (patients) side. Here the literature already reports on patients considering GPs to be "second rate" if they did not use a PC during consultation[43]. Indeed, it has also been reported how keen Danes are when it comes to ICT and this represents a driver for healthcare professionals to adopt these technologies.

In order to overcome this barrier, the Italy case study also portrays some experiences such as the telemaco/NRS experience. Here, a strong emphasis on communication campaigns and dissemination activities such as seminars and training took place. The aim was to increase awareness, to set the right expectations and to eventually manage conflicts. In particular, making clear that ICT is complementary to face-to-face interaction rather than substitute it is a relevant message to portray.

A third intervention to address this is to introduce these technologies and their role as part of the care process during healthcare professionals training and development. Some WSDAN sites in England worked with newly established Health Innovation and Education Clusters (HIECs) and with local universities. Unfortunately, it has been reported that although some HIECs have the potential to influence pre- and post-registration training and development of nurses and other health care professionals (for example, through online toolkits), at the moment there is no national programme to change work practices or to build workforce skills that are most appropriate to telehealth [53].

To sum up, the feeling that IPHS represent a threat to the doctor-patient relationship represents a barrier for these services to be mainstreamed. This is not exclusively related to the financial and incentive system in place. In order to overcome this barrier, communication and dissemination strategies have proven to be helpful. Additional policies may address the demand side generating pressure on healthcare professionals or on the provider side preparing them at development career stage. These however can only be effective in the longer run and no immediate outcome can be expected. The literature on the topic also suggests applying social cognitive theory to overcome this barrier [54] [55]. Additional research on this may provide additional strategies to overcome this barrier.

When it comes to social care the picture portrays a different reality than that of healthcare. The medical model stresses the importance of the face-to-face encounter, and GPs and nurses are often driven by their need for hands-on patient contact. In contrast, many social care models have outsourced home care services to third parties and social care practitioners typically no longer see users unless there is an emergency or clients' care needs have changed. Therefore, it has been argued that there is less resistance to change among social care practitioners because IPHS is not so different from what they already do[53]. On the other hand research by the French CGIET (Ministry of Industry) focusing on ICT and the Social care sector while confirming the relevance of that sector in the context of ageing and the transformation of care also highlights the difficulties encountered with developing ICT based services in the social care sector.[14]

[14] See: http://www.cgeiet.economie.gouv.fr/Rapports/Rapport_Caracterisation_du_secteur_medico_social_pour_le_developpement_d_offres_TIC.pdf

**Box 8 - Key lessons learnt – socio-technical factors**

- IPHS and more generally ICTs for health are perceived as a threat for the patient-doctor relationship, especially by healthcare professionals who feel this is their main emotional motivator.
- Cultural factors need to be considered e.g. in "ICT skilled" countries patients can act as a driver for adoption by care professionals, in other contexts communication campaigns, awareness raising activities and training may be needed to demystify IPHS and ICT for health and overcome this barrier.
- Training on IPHS in healthcare professional training is currently lacking.
- Social care may have a different attitude to IPHS due to the different ways of delivering social care, however the social care sector is less familiar with ICT developments which may act as a further barrier.

*(c) Liability issues*

Concerns related to liability and accountability have also been identified. These apply in general to ICT for health. In the particular case of IPHS, it has been described how IPHS generate large amounts of data. Physicians in particular are concerned of being made liable for lack of action. An imaginary example will be used to provide further insights on this. Let's imagine a patient sending IPHS data to the server and doctors being busy with their daily activity not reviewing these data on a daily basis but on a weekly basis for instance. It may be possible that the readings already show the patient condition worsening and because their GP is not reading it, in a period of two or three days the patient may end up in A&E services being hospitalised. Even worst, the patient may pass away. Would the GP be made responsible for this death?. Who is accountable in this case?

Another example along the same lines would be that of a doctor going away on a long week-end holiday. Is the doctor expected to follow up the IPHS data during the holiday break? Is the GP expected to receive sms alerts and to take action upon them? Would the GP be made responsible if something happened to one of the patients?

The above examples simply reflect that there is a lack of legal framework related to accountability and liability issues. This fact was identified in most countries, being the Netherlands the most prominent case. Indeed, due to unknown liability regulations, care professionals are scared to use IPHS. This may explain why the work is often shifted to the nursing community, thus blurring the responsibility related to these services.

In addition, as portrayed in the Estonian study and according to EC regulations, telemedicine services shall follow the principle that the one commissioning telemedicine services is also responsible for the quality and the results of these services. Thus, this situation also persists when the service is commissioned.

Out of the countries studied, Denmark represents a case where this issue has been addressed to a certain extent. The National Board of Health (SST) published the so-called “Guidance concerning responsibilities in doctors’ use of telemedicine” (c.f. VEJ nr. 9719 of 09.11.2005). According to these guidelines, "a GP must perform an autonomous assessment of whether the information about the patient, which the GP in question has received, is relevant and sufficient". In contrast, the same guidelines conclude: "for the use of telemedicine, specific local instructions and procedures must be developed to ensure a safe and sound course of treatment for the patients". Thus, although progress has been made, some of the issues are still blurred and further action may be required.

To sum up, there is a lack of clarity in the legal framework surrounding IPHS services. This represents a barrier for widespread adoption. Clarity and accountability and responsibility on IPHS shall be defined. When defining it, concerns shall not only bear in mind patient protection. A legal framework that facilitates deployment and use would also be welcome.

**Box 9 - Key lessons learnt – legal framework**

- IPHS generate data sometimes on a continuous basis which raises concerns for those in charge of handling that data; uncertainty about liability issues create resistance to being involved with IPHS systems.
- Guidelines are needed to define procedures and instructions for ensuring safe and sound course of treatment.

**Interoperability**

Interoperability severely restricts the potential to provide integrated care to patients and users. The research on IPHS shows no case where there is data integration between existing ICT applications such as the EHR and the IPHS data. Data fragmentation is currently the standard, instead. This is due to lack of interoperability. IPHS require work-practices used in traditional healthcare delivery to be changed. This is already a challenge. Lack of interoperability requires healthcare professionals to consult more than one data source. Besides, in "paper based" hospitals as found in the Netherlands study, IPHS encounters resistance because it requires healthcare professionals to fill in the usual paperwork and doing extra work digitally for IPHS. This represents higher workload and a risk of information misalignment or inaccurate records. Thus, the impact on changes in work practices is even tougher when there is no interoperability. This additional work represents another barrier for IPHS adoption.

Experiences where progress towards interoperability has been set as a priority have been identified. These include for instance the Patient Briefcase project in Denmark or the experience in Emilia Romagna, Italy. Here, a series of eHealth services based on the regional health information system SOLE, which connects all healthcare providers in the region, are under development. Besides the development of the regional EHR and of the region wide eBooking system, on the basis of the semantic and technological infrastructure called SOLE, Emilia Romagna is developing different eCare networks for fragile citizens. As much as every eCare/CUP 2000 user has a personal digital record which is based on the OLDES platform, at the moment, it is not integrated with the regional EHR which is based on the SOLE platform. Standardization and integration of the records is currently planned but not underway. Finally, in the UK, it has been detailed how the forthcoming DALLAS programme imposes as funding eligibility criteria for projects to show significant advances towards interoperability.

As much as at governance level, interoperability has been identified as key barrier and efforts to address it are in place, these interventions need to be multilevel.

On the one hand, IPHS are unusually complex information systems that support the delivery of integrated care, interoperability between devices and organisations, and health care and social care functions, while maintaining quality, patient/user safety, and confidentiality.

Defining and enforcing standards and processes represents a first step. This process can be phased. For instance, it can be started in a specific tier of care and all the different applications used within this tier to be integrated. From there, moving from there to different tiers of care until all relevant tiers of care and stakeholders are involved.

In addition, cooperation from the industry is a must for this to happen. This is relevant when different types and sizes of industry providers are found. Some applications such the EHR are often delivered by 'big players' represented by large companies often operating at multinational scale. IPHS technologies show a much more diverse type of providers involving, SMEs and local providers as well as 'big players'. Anecdotal evidence shows reluctance from 'big players' to cooperate with these local enterprises and SMEs on interoperable systems. Here, higher transparency on how the industry deals with these processes is required.

To sum up, an integrated information system is a prerequisite for the effective operation of IPHS. The lack of shared standards and an ability to integrate data and information is commonplace, and

represents a significant weakness across all of Europe. The lack of standardisation in relation to how data are structured, stored, transmitted and accessed, leads to fragmentation as opposite to integration. Multilevel policy intervention and the involvement from all stakeholders, including the industry, are required to improve this situation.

**Box 10 - Key lessons learnt – interoperability**

- Further efforts are required for interoperability, as there is a general lack of integration between EHR and IPHS data resulting in double work for care professionals, in spite of attempts to remedy this situation.
- Lack of integration annihilates the potential of IPHS to lead to more efficient care delivery.

**Governance approaches - findings summary**

When it comes to ICT for health and the NPfIT, Coiera[28] defined the English model as a "top-down system architecture, standards compliance, and procurement process". Such an approach generates a context where there is no easy migration plan for any existing systems. With the top-down approach, existing systems that do not comply with national standards will typically be shut down and replaced by compliant ones with the associated costs this entails. This results in new compliant systems not necessarily fitting local needs as well as the systems they replace, which were often site-specific acquisitions. As the NPfIT evolved it received serious criticism and questioning. In addition, it has been argued that the top-down approach triggered higher resistance from healthcare professionals. In the light of these pressures and with the change of government in 2010, the NPfIT adopted more of a middle-out approach.

When it comes to IPHS, the approach to the WSD still dragged some of the top-down features concerning three sites involving a high number of stakeholders, common objectives and a common evaluation for all of them. Room for innovation in each of the sites was limited to choice of technology providers and system adaption. Operationally, little differences were identified amongst them. However, when the programmes were completed two of the sites (Kent and Cornwall) decided to mainstream using their own funding sources given the lack of further government involvement on IPHS deployment, hence slightly shifting to a middle-out approach. Government intervention and funding at the time was also in place through the recently launched DALLAS programme. The programme although involving tough requirements when it came to interoperability was perceived a more hands-off than the WSD.

In December 2011, early findings from the WSD evaluation showing very positive results from an impact perspective were made available[36]. Shortly after, the government publicly announced IPHS mainstreaming at national level. The political will to mainstream has its foundation on the results of an independent academic evaluation. Nevertheless, it is likely to follow a top-down approach at least when it comes to IPHS technology procurement. On the other hand, and in light of recent changes transferring commissioning away from PCTs, Clinical commissioning groups (CCG) involving GP practices are becoming the new commissioners. At the time of writing, a likely scenario is that of CCG being mandated to deploy IPHS for those patients in need requiring the service whilst national purchasing and procurement frameworks would restrict CCG choice of IPHS provider.

An advantage of this model is that interoperability and service quality standards are likely to be promoted and harmonised. Guidance, support and skills development are likely to comply with central requirements, regulation and incentives. The constraints associated to this model are those already outlined such as limited room for additional innovation, barriers to entrepreneurship and little flexibility for adaption to local needs.

Other settings have also been identified following a top-down approach when it comes to ICT for health. For instance, the Estonian Health Information System (EHIS) initiated in 2009 was very clearly a top-down process in the form of strong political will behind the project. The same applies to Andalusia in Spain. These settings have achieved high interoperability in their health information systems and health-related data exchange has been facilitated as a result. Neither of them

however shows signs of IPHS mainstreaming in the short-run. Instead, it could be argued that their limited IPHS deployment is the result of little political intervention and the cases found mainly involve local entrepreneurs and clinical champions. Although these small initiatives may at some point get the attention of policy makers, these innovations are likely to find funding limitations and barriers to be diffused meanwhile.

When the government' s role relies on creating a common set of technical goals and underpinning standards that can sit between the IT industry and the needs of healthcare providers, Coiera uses the term middle-out approach[28]. The middle-out approach, according to the author "acknowledges that government and providers all have different starting points, goals, and resources. Government does not mandate immediate standards compliance, but helps fund the development process. When the public interest is strong, government also has a key role to provide incentives and support that encourage clinical providers to acquire systems that are technically or functionally compliant, and to pursue innovations that keep their systems compliant over time". The Scottish and the Danish models represent very good examples of this.

In many ways, Denmark has been a pioneer in the use of electronic communication in and across the healthcare sectors. As described in the Denmark country report, MedCom was established as a joint project organisation to provide common standards for communication and infrastructure in and across the primary and secondary care sector. Also, more recent initiatives such as sundhed.dk have given way to a common infrastructure and have served to construct health related content in a way so that both health professionals and citizens have a common access to data. Furthermore, the continuity of care programmes from the National Board of Health has provided a common way of delivering care for chronically ill patients across traditional sector boundaries, thus aligning ICT progress to healthcare needs. Most important, involvement has not been limited to healthcare professionals and the industry, but the government has involved citizens in this process. Hence, taking advantage of the demand side as push factor for ICT deployment.

In the particular case of IPHS, the Danish case study has also portrayed how most initiatives were initiated by a group of entrepreneurs taking advantage of funding made available. As these emerging initiatives were improved, refined and grew, they became the target for first large scale implementation projects at regional level within Denmark. Factors positively facilitating this process were the support of basic legislation already in place and strategic support from all main players (e.g. the local governments, the regional Health IT organisation and the national Board of eHealth) as well as the new government platform. This, together with funding support programmes like the Public Welfare Technology (PWT) Foundation and incentives like the DRG reimbursement rates for telemedicine helped to bring down barriers and speed up the development of IPHS in Denmark.

Other examples of middle-out initiatives being rolled-out are those found in some regions in Italy and in some Spanish regions such as the Basque country and Catalonia. For instance, in the Italian region of Piedmont, the project MyDoctor@Home is mainstreaming to 5,000 patients. The roll-out is facilitated by the use of a technology platform based on a cloud computing model (Platform-as-a-Service) and by the development of a DRG for this treatment at regional level. Similarly, the Lombardy region is mainstreaming COPD oxygen therapy at home IPHS supported under the telemaco/NRS initiative. Such a process has been catalysed by the creation of a DRG reimbursing the service and by the development of NRS as a regional common framework for new experimental initiatives related to chronic disease management which institutionalised the original Telemaco initiative. Finally, the roll-out of the eCare/CUP 2000 experience in Emilia Romagna has been driven by three key aspects. These are: first, by the funding established for non self-sufficient people; second, by the demographic structure showing a current and future population older than the national average; and, third, by the creation of CUP 2000. CUP 2000 is a captive company providing the call-centre service owned by local authorities and hence not obliged to comply with all the complex public authorities' regulations.

The current Strategy to Tackle the Challenge of Chronic Diseases in the Basque Country has been established as a middle-out approach for all health actors. Before this strategy was launched both

initiatives were running with the support of the Basque Department of Health. Still, although IPHS deployment is growing, the widest initiative is that of the Evidence Based Medicine Clinical Unit in Hospital Donostia which can be considered still in pilot phase. The Hospital Clinic experience in Catalonia is in transition phase from existing pilot experiences to extensive deployment of health and social services supported by NEXES. Although the Catalans also follows a middle-out approach, financing mainly relies on EC sources at this stage.

Similarly to Catalonia and the Basque country, the Netherlands and Germany show a pattern of scattered initiatives in IPHS deployment. The most promising of them is the COPDdotCom experience in Twente (the Netherlands) where the recently launched follow-up study CoCo aimed to mainstream at hospital level. CoCo focuses on economic effects and setting up a business case in order to come to structural financing and moving from the pilot phase to structural implementation. Playing health insurers a stronger role in the Netherlands and Germany, the government intervention is very marginal and stronger policy involvement is likely to be required if IPHS are to be deployed at scale.

Indeed, Coiera introduced the so-called bottom-up approach and exemplified it with the case of the USA. The US healthcare system is a highly fragmented and decentralized system, at the other extreme. The limitations of such an approach are mainly due to the fact that standards development and compliance are almost a voluntary affair. In bottom-up approaches, governments often rely on market forces to drive the most effective solutions. As a result, bottom-up systems do not necessarily portray a close alignment with national policy goals. As much as the cases of the Netherlands and Germany are not as extreme as the USA, it can be stated that these countries have chronic disease management as a policy priority whilst their developments on the EHR and on IPHS are not in line with these goals. On the other hand, the Obama administration ended up interfering in order to promote the "meaningful" use of health information systems and data exchange across the USA healthcare sector.

To sum up, the experiences across Europe have identified cases where IPHS are being mainstreamed within both top-down (England) and middle-out (Scotland, Denmark and some regions in Italy) approaches. In all these cases, the process has been facilitated by funding schemes promoting pilots and testing these initiatives. Specific financing and reimbursement schemes for IPHS deployment as a routine service have been identified in Italy and Denmark through DRG payments.

The main difference between middle-out and top-down approaches sits at the stage at which government interferes and the form in which their involvement takes place. Also, middle-out approaches rely and give room for clinical champions and entrepreneurs to feel motivated. Regardless on the governance approach, at some point, the service needs to be institutionalised to be mainstreamed. Such an institutionalisation in middle-out approaches needs to be managed taking advantage of these entrepreneurs who initially launched it. Tensions are also likely to arise as a result. For instance, when an experience is in pilot stage often technologies that do not comply with standards such as skype are in use. From the moment they become institutional, these technologies need to be sacrificed due to for instance data security reasons. These situations often lead to frustration from the innovators who end up feeling that mainstreaming did not mean "success" and feel a loss of ownership of the initiative. Managing them properly is likely to keep them motivated and ensuring there is a role for innovators within the system.

Finally, within Cluster D especially in Germany and the Netherlands, experiences seem to follow much more of a bottom-up approach which may result in a mismatch between policy priorities on integrated care and the lack of EHR systems supporting this process. Stronger government intervention is likely to be required if IPHS deployment is to be pushed. France represents a different example within this cluster as the French government is strongly promoting applications around Ambient Assisted Living involving industry players through a more top-down approach. However, it is also relevant to point that in the Netherlands and Germany, the power that insurers

hold is perhaps more prominent than in the case of France where the statutory health insurance (CNAM) has not had a very prominent role in Health IT policy and funding.

**Box 11 - Key lessons learnt – governance**

- Top-down approaches to introducing ICT for health tend to be rigid (giving little room for additional innovation and local adaptation, creating barriers to entrepreneurship), costly (old systems get phased out), and bound to encounter stronger resistance than middle-out approaches.
- Top-down approaches are best to promote interoperability and service quality standards; they also allow for guidance, support and skills development likely to comply with central requirements, regulation and incentives.
- In some cases where interoperability (e.g. region wide or national EHR in place) has been achieved there is little evidence of IPHS deployment, while in other cases where joint organisations have been set up to provide common standards and infrastructure across tiers of cares, involving all kinds of stakeholders IPHS is progressing. Hence interoperability alone is not sufficient, other factors determine deployment.
- Bottom-up approaches to IPHS (i.e. market led) are not sufficient for IPHS deployment because such initiatives remain disconnected from policy objectives.
- Middle out and top down approaches appear to be more conducive of IPHS uptake as they allow for a mix of elements to be present: funding, interoperability, DRG, CDM, and service reorganisation.
- The main difference between top-down and middle out approaches lies in the stage in which government interferes and how it gets involved.

### 3.2.3 Analysis of the experiences from an Impact perspective

In the light of healthcare systems' ambitions to increase healthy life years and to control expenditure, evidence on the impact of IPHS on them is of paramount relevance. This is not only relevant for policy-makers but also from a healthcare professionals' perspective. Research under WP3 found that healthcare professionals' reluctance to test or adopt IPHS applications is founded by the lack of evidence. The need to build the "business case" around IPHS was identified as an enhancer for IPHS uptake.

Unfortunately, the evidence to date does not seem to be sufficient. Despite widespread enthusiasm amongst eHealth practitioners, a relatively small body of evaluative data exists on eHealth applications and IPHS in particular. A recent examination of the impact of Health Information Technologies carried out by Bates and Bitton[56] identified seven domains needing further development. Telehealth was one of these domains.

The rest of this section will first outline the results found from the field work carried out under WP3. Next, it will discuss some of the issues encountered around the impact assessments and how these influence decisions. Additional in-depth insights and technical issues surrounding IPHS evaluations will not be covered in this document. These will be included where appropriate under WP5 "Support to Impact assessment".

#### Summary evidence on impact from WP3 case studies

Annex II – Overview of IPHS projects covered – project fiches for all countries studied under WP3 including data related to their impact assessment when available.

In Italy, the four experiences studied provided diverse results when it came to impact. The meta-analysis under my Doctor@Home estimated that IPHS provided financial gains based on results from another study assuming an average cost a day of hospital stay for COPD patients of €268.2. These results also showed a reduction in specialists' visits and reduced exacerbations in the intervention group.

The VCO study involved 128 patients and analysed healthcare utilisation of these patients before and after the intervention. The results concluded a decrease in: A&E attendances (-80%), in hospitalizations (-56%) and in ambulatory visits (-63%). Stability in key clinical parameters was also observed during the intervention. From a qualitative perspective, patients felt positive about the new treatment. In particular, the majority felt they received the appropriate training to use the devices and the devices were judged easy to manage. In addition, the service associated to IPHS was considered effective and timely and in general patients felt and improvement in their condition as a result of being better followed and cared for through IPHS.

Under the eCare/CUP 2000 experience, the results were similar to those obtained under VCO. In addition, eCare/CUP 2000 also included as an outcome measure the effective integration of social and health resources as a qualitative result. The same applies to Telemaco pilot which led to mainstreaming under the NRS. A continuous, systematic and comprehensive assessment was conducted, covering effectiveness, costs, access, user satisfaction and organisational impact. The findings concluded that the service resulted in a reduction in service utilisation however were not statistically significant because of the small size of the sample. From a qualitative perspective, the results revealed high satisfaction rates and user acceptance of Telemaco

Notwithstanding the statistical limitations of the quantitative findings, Telemaco provided interesting insights in the economic analysis done on comparing four hospitals, as shown in Annex III – Cost per patient in different hospitals involved in the Telemaco experience, Italy. Looking to this data, it is observed that costs vary significantly from hospital to hospital. This variation confirms that the problem of reaching economies of scale can be determinant over the long run. Smaller hospitals activating a smaller number of patients might find the services difficult to manage risking to allocate resources that will be underexploited, or to assign extra workload to already busy staff that will be not able to deliver the service. It will be important to encourage shared service models also for the clinical/ nursing part of the project, with a hospital or a third party.

In Denmark, similar to Italy, evaluations and results are varied. Under the Patient Briefcase initiative, the MAST (Model for Assessment of Telemedicine)[57] evaluation framework was used to assess the impact involving 133 patients in the intervention group. Instead, in the Integrated Clinical Home Monitoring Project (ICHM) the role of evaluating the project and its outcomes has been delegated to the National Board of Health's department for HTA, namely DACEHTA. Results for the Patient briefcase and for ICHM were not available at the time of writing. The assessment of the Telekat experience indicated a reduction in the number of admissions and in the length of stays for COPD patients under telehealth treatment. Results from the ePatch experience concluded that the quality of the data retrieved was good (equal or better than the previous service). Patients also found the technology easy to use. In addition, it was estimated that approx 1,500 strokes can be prevented with the intervention every year potentially resulting in € 67-100 million annual cost savings. Furthermore, both nurses and patients graded the use of the ePatches as either "satisfying" or "very satisfying". The Diabetic Foot Ulcer Project applied data from a study in Sweden adapted to the Danish reality in order to estimate the impact of this initiative. The Anti Coagulant (AC) Treatment Project was presented to the Danish National Committee on Biomedical Research Ethics, which assessed that it was not a clinical trial or an intervention-trial. Hence, the assessment provided no clear results.

In France, the current approach to evaluate ICT interventions in healthcare is GEMSA - Grille d'Evaluation Multidisciplinaire Santé Autonomie or Multidimensional Evaluation Grid for Health and Autonomy. GEMSA is based on five specific categories: strategy, technology, quality and usage, organisation and economics[58]. In this framework, strategy includes aspects of clinical effectiveness, health problems and applications' characteristics as well as socio-cultural, and liability issues. Safety issues are covered under the technology domain. The organisation domain encompasses organisational change linked to ICT deployment whilst the economic aspects related to health resource utilisation and any associated efficiencies associated to ICT use are covered by the economics domain. Finally, the patients' perspective is covered under the Quality and usage domain. The GEMSA evaluation grid has been tested as part of the European project Interreg IVP "Sudoe"

where the evaluation of telemedicine projects is a specific task in the description of work. Results were not available at the time of writing.

In Estonia, the only data available related to impact are the Dreaming project preliminary results showing a decrease in hospitalisations after the intervention.

In Germany only preliminary results at confidential level from the Heitel initiative were available at the time of writing. These findings were positive in terms of showing lower levels of service utilisation (A&E attendances, number of hospitalisations and length of stay at hospital) in the intervention group. Lower mortality was also observed in the intervention group when compared to the control groups. These initial results are very promising and show that telemonitoring can be highly beneficial for CHF patients.

Out of all experiences studied in the Netherlands, only the Koala project completed a quantitative impact assessment. According to these results, the total of the societal costs and benefits for the Koala patients were €18,800 per PM (quality of life improvement). The quality of health of the patient and the quality of healthcare with Koala were similar to the quality level experienced with conventional treatment according to the researchers. The study concluded that clinical and economic effects of Koala could become positive as a result of lower hospitalisations provided the Koala system would be implemented in a substantially larger group of CHF patients.

In Spain, the evidence available on impact was also limited. The impact of the multi-intervention programme at the Evidence Based Medicine Clinical Unit in Hospital Donostia was measured comparing the length of stay for inpatients readmissions in the hospital and number of A&E visits during the intervention period with the same indicators from the previous year for 40 patients. A decrease of the two indicators was observed. Building on these results, a second study was carried out in the form of RCT involving 38 patients (18 for the control group and 19 for the intervention group). Statistical significant differences in length of hospital stay (227 days for the control group vs. 83 days for intervention group) were found.

Preliminary results from the TELBIL project revealed that hospital stays tended to be shorter in the intervention group treated with IPHS. TELBIL also evaluated users' satisfaction through a series of focus groups. Healthcare professionals involved identified the benefits associated to IPHS deployment not only in terms of cost (decrease in hospital admissions) –effectiveness (improve quality of life) but also in terms of improvements in the clinical decision process and better coordination primary and secondary care as a result. In addition, they felt an improvement in patients and caregivers satisfaction and in their knowledge to self-manage their condition. Finally, the also expressed the need to strengthen and consolidate these benefits through additional self-care activities (i.e.: trainings) and policies promoting coordination between tiers of care.

Finally, in Hospital Clinic (Catalonia) several RCT were carried out on COPD showing positive health outcomes and effectiveness of the interventions. All these trials involved over 100 patients and the main outcome were reduced exacerbations with the associated reduction in hospital admissions and increased quality of life. A cost-effectiveness analysis is planned within the NEXES multi-intervention project.

Evidence in Scotland (UK) was found from the evaluation of the initiative in the Highlands for 80 patients comparing the periods March-November in 2008 and 2009 (i.e. pre and post-Pod installation). A reduction in service utilisation was found. In particular, there was a decrease in GP visits (from 47 down to 28), in A&E attendances (from 9 to 2) and in hospital admissions related to COPD, both in terms of numbers (from 11 down to 1) and days of bed occupancy (from 72 to 8). From the users' perspective, findings revealed that patients felt comfortable and safe using the telehealth technology, did not find it difficult, and felt that it improved awareness of their condition and was helpful in their setting. Healthcare professionals also valued positively these applications although a number of issues concerning training, communication, and integration with existing work patterns were identified [59].

For Telescot, the quantitative evaluation was not completed at the time of writing; however, interviews revealed that the Telescot COPD pilot aims to evaluate in terms of cost-effectiveness analysis (cost per QALY[15]). Preliminary results show that the analysis is highly sensitive to the cost of the equipment. From a qualitative perspective, tele-monitoring was perceived by patients as improving access to professional care [60]. The findings here are similar to those in Bute in terms of telehealth helping patients to be more responsible and more aware of their condition rather than the benefit being from the technology itself: as patients get used to the equipment they actually learn to look after themselves. Thus, rotating the technology from patient to patient seemed also a reasonable option to stakeholders involved in the Telescot experience.

Findings in the UK were also found for the Telehealth pilot in North Yorkshire and York. Here the impact assessment focused on service utilisation (details are available in Annex IV – Evaluation results from North Yorkshire and York (NYY), England) of 91 patients before and after the use of telehealth. A decrease in hospital admissions accompanied by an increase of attendance to A&E was observed. The impact was quantified concluding that telehealth delivered at least £85,000 (about €99,000) gross savings based primarily on non-elective admission avoidance.

Last but not least, the most relevant findings related to impact are those from the WSD in England (UK). Being the largest RCT of its nature in the world (with 5,721 service users plus 470 carers involving 238 GP practices) their results have generated high expectation around the globe. The impact evaluation involved three themes from a quantitative perspective: service utilisation, clinical effectiveness and cost-effectiveness. The qualitative evaluation involved patient and professional experiences as well as a study on service delivery and organisation. The early indications of the WSD show that, if used correctly, telehealth can deliver a 15% reduction in A&E visits, a 20% reduction in emergency admissions, a 14% reduction in elective admissions, a 14% reduction in bed days and an 8% reduction in tariff costs. More strikingly they also demonstrate a 45% reduction in mortality rates[36].

**Box 12 - Key lessons learnt – impact**

- Lack of evidence is one of the main reasons for reluctance to adopt IPHS although a lot of evidence is available, but often based on small scale pilots whose results cannot be generalized.

- Main quantitative impacts measured are reduction in A&E attendance, ambulatory visits, number of hospitalization, length of stay; in addition IPHS contributes to prevention (e.g. reducing exacerbations, strokes) and has shown to reduce mortality (WSD).

- Qualitative outcome include user and patient satisfaction, quality of life improvement, as well as organisational impact.

- Economies of scale need to be taken into account and hospital size plays a role in that respect, as smaller hospitals may not have the resources to manage IPHS adequately resulting in IPHS being more costly; shared service models may be a way forward.

- Recently developed assessment methodologies adapted to telehealth are currently being tested in a range of European or national experiments (MAST, GEMSA, WSD).

**Challenges identified in the evaluations**

From the summary findings in the above section, the reader is likely to grasp that problems are found when it comes to providing evidence from a quantitative perspective. Often, no quantitative evaluations took place or these were underway at the time of writing. Also, different methods were used to evaluate the impact. Indeed, field work in Scotland revealed concerns from policy-makers regarding the lack of consensus amongst the research community on methods to assess the impact of IPHS.

[15] QALY stands for Quality Adjusted Life Years.

Recent work published under the WSD Action network (WSDAN) provided further insights associated to the complexity of IPHS evaluations[53]. IPHS involve both health and social care services. Nevertheless, health and social care practitioners show marked differences in the value, design and function of programme evaluations and preparation of business cases. Healthcare leaders showed a preference for evidence-driven evaluations. This is very much in line with current practices in healthcare placing high emphasis on *evidence-based medicine*. Social care leaders instead looked for improvements that would reduce anxiety or stress on the part of carers based on observation, or through non-randomised, uncontrolled participant surveys on quality-of-life issues or focus groups on users perceptions of these innovations. This approach can be termed *practice-based evidence*. The different views held by health care and social care leaders about how to use evidence and evaluations reflect their respective leadership styles, strengths and weaknesses. Social care respondents appeared to be entrepreneurial and have a higher tolerance for taking risks. The style of healthcare practitioners instead can be conservative or limited in scope. These findings may help explain the confusion that some policy-makers raised when it came to evaluations.

Out of the results under WP3, when it came to quantitative assessments most of them assessed the impact on resource utilisation focusing on number and length of contacts with the healthcare system. In addition, limitations were found due to low number of patients under study which lead to results not being statistically significant in some instances. Very few were RCT, given that again the amount of participants in an RCT is very relevant for the results to be relevant. This actually reflects very much of a "chicken and egg situation". On the one hand, healthcare professionals claim the need for further evidence before embarking on IPHS experiences. On the other hand, their reluctance to IPHS uptake can represent a barrier to recruit patients for pilot projects to provide evidence, as found under the German case study.

The most comprehensive piece of evidence is that offered by the WSD.

**Box 13 – Research questions addressed by the Whole System Demonstrator**

The WSD research questions were structured in five main themes as outlined below:

- *Theme 1: Service utilisation*. Does the introduction of telehealth or telecare result in reduction of service utilisation and costs of care?
- *Theme 2: Clinical effectiveness*. Does the introduction of telehealth or telecare result in improvements in quality of life, well being, self care, and carer burden?
- *Theme 3: Cost-effectiveness*. What are the economic consequences of introducing telehealth and telecare?
- *Theme 4: Patient and professional experience*. What is the experience of service users, carers and health and social care professionals during the introduction of telehealth and telecare?
- *Theme 5: Service delivery and organisation*. What organisational factors facilitate or impede the sustainable adoption and integration of telehealth and telecare?

Source: Bower et al, 2011[35]

As outlined in Box 13, the five themes under study manage to portray, structure and overcome some of the challenges associated to these evaluations. On the one hand, theme 4 and theme 5 provide more of practice-based evidence. In addition, theme 3 includes the use of EQ-5D health state classification which is a subjective measure of quality of life involving social dimensions. Themes 1 to 3 emphasizing the healthcare angle also embed some social dimensions. In addition, the high number of patients involved and the fact that the evaluation took the form of a RCT, satisfy the evidence-based approach.

Another approach is that proposed by the Methotelemed project, known as MAST. The overall aim of MethoTelemed is to provide a structured framework for assessing the effectiveness and contribution to quality of care of telemedicine applications. The model uses the EUnetHTA Core model for interventions as the point of departure. As seen, the Patient Briefcase initiative in Denmark was using the MAST framework for the impact evaluation. Differences between the

approaches used under the WSD compared to MAST are very technical and likely to be relevant only for experts in the field of health economics. For instance, WSD used the instrument EQ5D to gather data on self-reported health status whilst MAST uses SF36 instead. Also, costs of service utilisation used under the WSD used national Payment by Results tariffs and reference costs. MAST instead recommends using actual costs.

Notwithstanding these differences, the WSD methodology has proven to be feasible, whilst the MAST methodology has been questioned due to (lack of) feasibility. For this reason amongst others, the results of the Patient Briefcase would be of particular interest.

MAST defines itself as a "multidisciplinary process that summarizes and evaluates information about the medical, social, economic and ethical issues related to the use of telemedicine in a systematic, unbiased, robust manner". Thus, producing a basis for decision making[57]. The WSD evaluation is likely to meet these criteria in their assessment of telehealth and telecare. Nevertheless, it is also relevant to point that the WSD evaluation assessed the added value of telehealth and telecare technologies over and above the effects of a wider service redesign and not the benefits of whole systems redesign versus conventional care. Hence, issues concerning the generalisability of the results exists[35]. The GEMSA approach described in the introduction to Section 3.2.3 is also very much in line with the above, aiming to tackle both qualitative and quantitative issues associated to IPHS services.

**Box 14 - Key lessons learnt – evaluation and methods**

- There is limited availability of quantitative evaluation outcomes to date.
- The complexity of evaluation for IPHS is compounded by the different views of social and healthcare stakeholders on the design and value of evaluations.
- Social care leaders are more risk oriented and can live with practice-based evidence while healthcare leaders need evidence-based evaluation to make decisions.

**Impact and the policy-decision to mainstream IPHS**

The field of Health Technology Assessment (HTA) was born with the objective to produce independent research information about the effectiveness, costs and broader impact of healthcare interventions. Aiming to bridge the gap between evidence and policy, HTA agencies at regional and national level were established. The role of these agencies is to provide guidance on healthcare interventions based on evidence. Through this role they contribute to set the standards for high quality care across health and public health. Often they also provide guidance on social care interventions. Within their role HTA agency work with the pharmaceutical industry validating their RCT and providing guidance to healthcare systems on the interventions under study. As a result of their role, they also contribute to foster research in particular when they conclude that there is not enough evidence to provide guidance on a particular intervention.

IPHS have often suffered from lack of involvement (or interest) from HTA agencies. The most prominent case is that of the National Institute for Health and Clinical Excellence (NICE) in England. NICE is internationally renowned for its role in making recommendations to the English NHS. When NICE have approved a drug, the drug is meant to be used consistently across the country. However, the agency has not been involved at all in the WSD evaluation or in any other evaluation on IPHS applications. As stated by a recent WSDAN publication[53], a major challenge remains as long as the role of IPHS technologies in case management is not recognised by NICE. Indeed, given that NICE plays a key role fostering research and disseminating innovations across the NHS, their involvement

through for instance the MTEP[16] or through other arms of the agency would contribute to further diffuse these innovations.

Other settings instead have already identified the role that HTA agencies can play in diffusing these innovations. For instance, in Denmark it has been describe that the Danish HTA agency (DACEHTA) is responsible for the evaluation of the ICHM experience on various chronic illnesses. Spain also portrays two cases in this regard: one in the Basque Country and one in Catalonia. Aiming to facilitate the deployment of this type of initiatives as part of their strategy in chronic disease management, the Basque Department of Health has emphasized the involvement of health professionals and the HTA agency when assessing their impact.

The Catalans have institutionalised this role. The recently reformed Catalan Agency for Health Information, Assessment and Quality (CAHIAQ) has now the mission of generating relevant knowledge to contribute to the improvement of the quality, safety and sustainability of the Catalan Health Care System and thus easing the decision-making process for citizens and health care managers and professionals. According to its extended mandate, the CAHIAQ will continue to perform its traditional responsibilities in HTA and the healthcare evaluation services area, as well as managing calls for research. In addition to this, new responsibilities will be taken in quality assessment and, especially, assuming the strategic projects in Information and Communications Technologies (ICTs) led by the Catalan Health Ministry, such as the Shared Medical Record of Catalonia, the Personal Health Folder, Electronic Prescription, Telemedicine, and the Plan for Digital Medical Imaging.

Although in few experiences the involvement of HTA agencies and/or rigorous evaluations has been identified, this barrier has not stopped decision-makers to mainstream in some of the settings studied. The factors enhancing this decision are of different nature.

In Italy, the MyDoctor@Home experience is currently mainstreaming to 5,000 patients within the Piedmont region. This process was facilitated by the success during the pilot from an operational and organisational perspective. In addition, a "preliminary" DRG for this treatment has been created. However, some challenges related to operationalising the payment through this DRG still remain. The VCO initiative is also slowly rolling-out to other settings within the Piedmont region. According to VCO stakeholders what differentiates this project from other initiatives and is making it a sustainable reality are the organisational and governance aspects.

In Lombardy, the continuation of the deployment of Telemaco services through NRS ensures the continuity of care in remote areas. From an operational point of view the transition from Telemaco to NRS has not impacted the daily activity of project players. However, when analyzing funding mechanisms, one can note that NRS has introduced an important innovation given tariffs based reimbursement models for telemonitoring services are part of the NRS exploration. In addition, the launch of CReG (Chronic Related Groups), which can be defined as a DRG for chronic disease management in primary care, aims at providing a framework to involve primary care as case managers.

Finally, the eCare network in Bologna already reached a 19% penetration of the target population within Emilia Romagna. Mainstreaming has been facilitated by the strong support received from the regional government and the Bologna district in early stages. The integration of different domains such as healthcare and social service is the real added value of the service which has facilitated roll-out. This is also reflected at governance level. eCare network reveals an integrated governance structure where stakeholders involved have a share in the decision making process. Moreover, the project is working towards standardization and integration of the records with the regional EHR.

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[16] In November 2009, NICE launched the Medical Technologies Evaluation Programme (MTEP) focusing specifically on the selection and evaluation of new or innovative medical technologies (including devices and diagnostics) and particular products that give advantages to patients.

Similarly to Italy, Denmark shows no deployment at national level whilst some experiences are being mainstreamed. The Patient Briefcase is no longer a pilot or demonstration project, but actually a successfully implemented project running in daily operation and currently expanding the service delivery into other conditions such as diabetes. This has been driven by the clinical champion pushing this initiative and reaching the policy level. In addition, the partnership developed with the technology provider and the procurement agreement reached with them has also facilitated the process. According to stakeholders involved lack of leadership is the only factor hindering national implementation.

With regard to mainstreaming, as of spring 2012, the TeleKAT project will be the basis of a new large-scale IPHS deployment in the North Denmark Region involving 2,000 patients. This process is being facilitated by close cooperation with the industry which has developed a cloud-computing model for all data to be available on-line to patients and healthcare professionals. Data can also be sent to and from hospitals on demand from specialists.

The diabetic foot ulcer project is a demonstration project funded by the PWT Foundation in Denmark. The project has become such an important project policy-wise that even though it has not yet been able to show a positive business case or attract nearly enough patients for its pilot trials, it is at this stage still planned to go national by the spring of 2012. Stakeholders have expressed great concern with the extensive use of business cases, often solely focusing on aspects related to costs and benefits of IPHS instead of also encompassing and stressing more qualitative aspects such as quality of care, quality of work for professionals, and the higher level of flexibility that such new eHealth activities give way to.

For the anticoagulant (AC) treatment project with the new DRG reimbursement rates for web-based anticoagulant treatment, there is now a basis to mainstream. In addition, the experience has proved increased productivity allowing the same number of staff to treat 85 patients instead of 30.

Finally, the Clinically Integrated Home Monitoring Project (ICHM) has been launched to test the use of IPHS, share data and communicate across traditional sector boundaries, while developing common electronic communication standards for chronic patients. Thus, ICHM is testing deployment at scale promoting data sharing.

In the UK, Scotland is mainstreaming through the DALLAS funding. Policy-makers involved expressed that the initial TDP funding during 2006-2011 was very effective in producing the organisational change required to coordinate health and social care services as well as the cultural change required in stakeholders involved. Taking advantage of this change and the momentum generated, mainstreaming implies consolidating this change and the DALLAS co-funding became very instrumental. In addition, the remoteness of some of the areas in Scotland may also represent a driver for policy-makers. Here, due to geographical and weather conditions, helicoptering patients to hospital for required emergencies is not rare practice.

In England, as pointed, the evidence on impact has shifted the policy making process and the decision to mainstream and the associated challenges to this need to be tackled. To add to the complexity of the challenge ahead, the government has embarked on a series of NHS reforms which, over the next two years, will significantly change the commissioner and provider landscape. These reforms have started to have an impact on WSDAN sites – for instance, the clustering and ultimate removal of the primary care trust (PCT) tier and the transfer of funding over time to clinical commissioning groups are affecting the availability of resources for IPHS. There are also concerns about the increasing loss of site champions and leaders, as well as implementation expertise, as services are re-organised and staff are displaced or, as has happened in some cases, staff are no longer being employed by their organisations. Waiting for the evidence to be released has resulted in loss of momentum and it is not clear how this barrier will be overcome.

To sum up, factors beyond rigorous quantitative impact assessment (i.e.: cost-effectiveness studies) results can also influence the decision to mainstream IPHS. These factors can be of different nature. Sometimes other types of evidence such as practice-based evidence or the development of

efficiencies represent enough evidence to mainstream. In addition, a success in the organisational change also represents a factor to capitalise upon. Other aspects associated to human factors such as the competences and the clinical champions are also on the push side. The presence of reimbursement mechanisms has also been identified as a catalyser. Access, remoteness and geographical constraints such as those identified in Scotland and also in some Italian regions (Piedmont or Lombardy) also represent a driver for policy-makers to push for IPHS. Finally, policy-wise, IPHS in Denmark has been facilitated by an integrated governance approach, funding available and in some cases, the development of purchasing mechanisms (i.e.: DRG for IPHS deployment). Geographical issues also play a relevant role here and the demand side pressures on ICT applications also set the right scene for these applications to widespread.

This is relevant for a variety of reasons. One of them is cultural. The impact assessment culture based on quantitative approaches is strong in countries like England and the Netherlands whilst in others, this tradition is somehow weaker. For instance, in Scotland an evaluation of the National Telecare Development Programme (TDP) carried out by the York health Economics consortium concluded that "the absence of a strong data collection, reporting and evaluation culture within most Partnerships may have contributed to the fact that many of them found some of the outcome and efficiency measures difficult to assess"[61].

As seen, these differences also exist between health and social care traditions. Scotland for instance seems to build on a stronger tradition in social care and thus seemed to place higher emphasis on *practice-based evidence* and the organisational change.

Moreover, the WSD results provide evidence on the impact of IPHS on a redesigned service delivery system. Thus, it could be argued that the evidence is not enough. At the end of the day, even when the most robust of the evidences exists, HTA agencies always make a value judgement that involves additional criteria beyond the impact assessment when recommending a healthcare intervention. Their involvement within IPHS may be limited to some experiences but the same value judgement applies to IPHS. The differences identified in these experiences lie in the weight decision-makers place on quantitative impact assessments and their robustness versus other relevant factors and benefits associated to IPHS.

**Box 15 - Key lessons learnt – from impact to decision making**

- While HTA agencies seem not to get involved in assessment of IPHS unlike for other health interventions like drugs or other ICT for health, decisions to mainstream do get taken.

- Beyond the mere evidence, mainstreaming decisions are often backed by one or more of the following elements: support from local or regional governments, positive outcomes of pilots e.g. on care organisation or increased productivity, governance aspects, introduction of reimbursement, good cooperation with industry and political momentum.

## 3.3 Summary of findings on IPHS experiences

### 3.3.1 Integrated care and IPHS deployment

All the different countries studied under WP3 included a section on ICT for health with a specific focus on the developments of EHR systems. This was relevant as it helped identify the strategies, developments and the level of data sharing between healthcare providers and across tiers of care. It assisted in identifying trends and potential future scenarios. It was also relevant because the benefits reaped from IPHS services are likely to be higher when these systems are integrated with EHR systems as opposite to IPHS as stand-alone services.

Section 2.4.1 of this report, introduced the term integrated care based on the work carried out by Suter et al [19]. According to the authors, integrated care from a clinical perspective (or clinical integration) involves organising functions and activities around patient care and services. The focus is on continuity and coordination of care, disease management, good communication among caregivers, smooth transfer of information, and the elimination of duplicate testing and procedures;

the SIMPHS2 research placed emphasis on the aspects of integrated care related to coordination of care, good communication among care givers and smooth transfer of information given that serious gaps were identified in these areas across European healthcare systems. Integrated care requires a system of patient records accessible to all caregivers and a service delivery coordinating all tiers of care. Thus, it is unlikely to deliver truly integrated care without the support of ICT applications, a good coordination or integration between and across health and social care and appropriate incentives and governance in place. In particular, when it comes to ICT applications, an EHR system shared among caregivers represents a key pillar.

In the light of the ageing population and the need to contain healthcare expenditure, delivering integrated care at patients' homes is of paramount relevance. IPHS enable this process, hence, the interest in them. Indeed, IPHS services play a key role in delivering integrated care at patients' homes.

Moreover, self-care and care provided by families and friends are further considerations for integrating services that meet the needs of patients. As argued by Rogers et al "A truly integrated model of healthcare needs to respond to the actual types of self-care undertaken by people prior to and in addition to contacting services; and to the reasons for and ways in which people actually access formal healthcare".[62] Thus, in integrated care models, patients become both the object of care and part of the care team. IPHS represent patient-empowering applications and services providing patients the support they need to actively self-manage their condition.

Based on the above, the fact that experiences delivering truly integrated care across Europe are difficult to find may sound discouraging. Input from stakeholders during the Brussels validation workshop in late January 2012[17] revealed that South Karelia (Finland) was delivering truly integrated care: involving all tiers of care, ICT supported and deploying IPHS.

In contrast, it is encouraging to see that SIMPHS2 identified efforts in the settings studied promoting integrated care aiming at national scale. Prominent examples are those found in Denmark and the UK.

In Denmark, the final goal of promoting interoperability in general and Personal Health Systems (PHS) in particular, is to contribute to integrated care. Under the auspices of the Ministry of Interior and Health, the National Board of E-Health or NSI (National Sundheds-it). has been established with two main tasks:

- Managing the national administration of IT in the healthcare sector, including the collaboration with regions and municipalities,
- Managing operation and development of the Ministry's health-related IT systems in agreement with the individual boards, etc.

Through the involvement of four main players, one solution is to be delivered for patients and care professionals to access patient information. These four main players are: (i) the Danish regions, as these are responsible for healthcare delivery; (ii) sundhed.dk, the joint public healthcare portal; (iii) Digital Health, a joint public organisation responsible for the framework for digitisation of the Danish health service in collaboration with the regions, municipalities, stakeholder organisations and other relevant parties; and (iv) MedCom, a joint public organisation and key contractor in Danish eHealth establishing public-private partnerships.

In parallel, framework agreements defining cooperation between social and health care services are in place. Examples of this cooperation in the field of ICT are for instance the Diabetic Foot Ulcer initiative. The initiative is a large-scale collaboration in the use of telemedicine with regard to diabetic foot ulcers between the local authority home care sector a1ff11nd ulcer experts at the hospitals. The patient briefcase represents another case where IPHS services are being delivered as a routine service as part of the daily operations while similar applications for other conditions are

[17] Details available at: http://is.jrc.ec.europa.eu/pages/TFS/SIMPHS2.html

being explored. Finally, the Integrated Clinical Home Monitoring Project (ICHM) project is an IPHS initiative aiming to test the use of home monitoring on various chronic illnesses, share data and communicate across traditional sector boundaries, while developing common electronic communication standards. ICHM is a cross-sectorial, technical, and organisational project focusing on implementation. ICHM perfectly falls within the definition of integrated care established throughout this report. Thus, it can be concluded that ICHM is testing the delivery of integrated care at scale through IPHS deployment. Hence, placing Denmark amongst European frontrunners when it comes to integrated care.

In the UK, policies promoting integrated care have also been identified however approaches in England and Scotland differ. Scotland first triggered the reorganisation of services promoting cooperation between tiers of care at local level. Once the change had successfully taken place in different settings across the country, an institutional reorganisation at government level took place mirroring the structures developed at local level and aiming to support the delivery of integrated care and tele-healthcare services. In England, first deployment at scale was tested and evaluated through the WSD. Once evidence was obtained the English government committed to mainstream IPHS services targeting three million people over a five-year period whilst the re-organisation of services to support this process is still work-in-progress.

In parallel, progress towards interoperability and exchange of patient information has been made in both settings. In addition, the NHS was made responsible for delivering health and adult care services. Hence, both England and Scotland show common approaches towards integrated care in terms of mainstreaming whilst the decision-making process and the operationalisation of IPHS services portray remarkable differences. In the light of the developments in these two home countries, the UK is also considered a frontrunner on IPHS and integrated care.

Given the devolution of health competences to the regions in Italy and Spain, both countries portray a tension between national and regional policies and developments when it comes to integrated care. In both cases, a gap has often been identified when national policies are to be translated and operationalised at regional and local level. For instance, in Spain a reform took place transferring social care competences to the new Ministry of Health, Social Services and Equality. However, this change has not yet taken place across Spanish regions. This gap also works the other way around in terms of some regions showing remarkable developments towards integrated care which makes them frontrunners compared to other regions or to national objectives. These regions also offer interesting insights at European level.

Piedmont, Lombardy and Emilia Romagna present good examples of progress towards integrated care in Italy. The regional health plan in Piedmont emphasises the role of ICT in integrating tiers of care and reorganising services around patients' needs, especially in non-urban and mountainous areas which represent 43% of the total territory. In line with this, My Doctor@Home was developed. It is an RMT service for CVD and COPD conditions targeting patients aged 75+. Aiming to mainstream the service, a DRG for this intervention has been created although additional refinement is required to make this reimbursement operational. In addition, efforts under the VCO experience were developed against a background of integrated care models and the initiative is discretely being rolled-out.

Lombardy emphasised the role of self-management by patients as part of their integrated care strategy through the Telemaco/NRS experience. Mainstreaming the service has been facilitated by the development at regional level of a specific DRG for this service through the fondo regionale per la non autosufficienza (DGR 509 / April 2007). ). Indeed, the project involves different stakeholders (i.e.: from non-profit organisations to GP) and coordinates patients throughout different tiers of care (i.e.: from carers assisting in daily activities such as shopping to organising appointments with health professionals).

Emilia Romagna developed a model of integration of health and social care services through the eCare/CUP 2000 experience where each user-report is truly multidisciplinary and it is created by physicians, nurses and social workers. eCare/CUP 2000 is not focusing on a particular disease but

on the multi-faceted concept of "fragility" (users are classified as fragile not only from a medical perspective but also from a social one). A series of complimentary "social services" around the eCare/CUP 2000 platform that further personalise the offering for users was developed as a result. Relevant here is the high maturity that the initiative has achieved considering it was launched in 2003.

In Spain, the most relevant efforts identified on integrated care are portrayed in the Basque country and in Catalonia. The Basque country offered an initiative lead by the Evidence Based Clinical Unit at hospital Donostia targeting 1,338 patients in geriatric centres and also involving home care visiting units at primary care level. Along the same lines, the NEXES initiative in Catalonia is transiting from pilot stages to extensive deployment of health and social services supported by ICT and deploying IPHS. Hence, portraying interesting progress towards integrated care to over 3,000 patients.

Developments on integrated care in the Netherlands and Germany are somewhat paradoxical. Policy-wise the two settings reflect relevant activities on integrated care. Germany was a front-runner at European level when it came to disease management programmes whilst integrated care represents the basis to purchase healthcare services from providers in the Netherlands. Moreover, the level of ICT deployment in healthcare is high in these two countries. In contrast, progress towards national electronic health record and data sharing seems slow, and IPHS activities seem limited. Thus, hampering the delivery of truly integrated care. The reasons behind this are not clear.

One aspect which may help explain this situation is the role and power that sickness funds and insurers hold in these two countries. Insurers may face contradictory incentives when it comes to integrated care. On the one hand, preventing or reducing exacerbations and keeping patients at home represent cost-saving strategies. Hence, from this perspective promoting integrated care would be an attractive option. On the other hand, an EHR system would potentially facilitate patients shifting sickness funds given that they could just jump from one insurer to another in possession of their own record. This easiness for customers to shift insurance provider would have a detrimental impact on the income statement of insurers and sickness funds. Further, truly operational ICT systems are likely to develop efficiencies resulting in faster payments to healthcare providers. Again, this issue is detrimental to the income statement and to their cash-flow. These financial interests in the short-run may explain why as much as integrated care policies are being promoted, ICT developments and patient data sharing supporting it seem to go at a different pace. Potentially, Germany and the Netherlands may be facing a market failure in need of “positive externalities" through more tenacious and energetic government intervention.

Furthermore, because of different bodies being responsible for the purchase and delivery of health and social care, coordination between these tiers of care also seems to be hampered both in the Netherlands and in Germany. Thus, it is very likely that additional government intervention related to this is required to advance on integrated care delivery.

In contrast with the Netherlands and Germany, the French authorities have strongly pushed independent living starting at social care level. These initiatives are expanding and promote the involvement of healthcare players. Involving a set of strategic stakeholders, starting from the industry, which are often the ones that develop innovative services, the Ministry of Economics, Finance & Industry and national independent or government bodies like DSSIS, ASIP Santé and ARS at regional level (Regional Health Agencies) (which contribute through funding, by providing information platforms, networking facilities and other supporting measures), have taken steps to foster new ICT based business models in social care and promote eHealth initiatives such as RMT & telecare.

The existence of a good EHR system in place has been portrayed as a necessary condition supporting the delivery of integrated care. However, having a good EHR system is not enough to deliver integrated care. A good example of this is Estonia. It is the only country in Europe presenting a country-wide secure health data exchange platform called the Estonian Health Information System (EHIS) which all healthcare providers must send standardized summary information. In

2011, approximately 55% (732,500 individuals) of Estonian population had their personal digital patient record, the system contained over 5 million medical documents and was actively used by more than 450 healthcare establishments in Estonia. In addition, STAR - the information system for Estonian social services – was being mainstreamed at the time of writing. The development of EHIS and STAR find its origins in attempts to develop efficiencies through the use of ICT. Nevertheless, integrated care is not part of the Estonian policy agenda which may explain the limited IPHS experiences identified in this country. Once integrated care becomes a policy priority, capitalising on their existing EHIS and STAR systems is likely to facilitate the process.

To sum up, the type and level of developments on integrated care are varied across the experiences explored and IPHS deployment is often very much in line with them. Hence, leanings from these experiences can be extracted as well as factors acting as drivers and barriers.

### 3.3.2 Key barriers and drivers

Throughout Section 3.2 of this report, an attempt to consolidate and analyse the evidence gathered under WP3 has been made. Whilst Section 3.3.1 provided a summary on progress towards integrated care and IPHS deployment in the settings researched, this section aims to extract and analyse drivers and barriers for IPHS deployment identified.

**Patients' difficulties** in using these technologies have been identified as a barrier. These are related to finding the **technology** to be **intrusive**, feeling **uncomfortable** using these technologies or fears that the technology will **replace the contact with care professionals**. Strategies to overcome these barriers can be of different nature.

First, patients' attitudes are highly **influenced** by advice and prescription from their **relatives** and **carers**. Also, the role that **healthcare professionals**, in particular GPs, play in patients' intention to adopt is sound. Second, the role of the **industry** developing solutions which are user-friendly, intuitive and provide the flexibility required by the user has also been identified as a driver. Experiences when patients have been involved in the technology design have proven to be successful. Third, appropriate **dissemination** and **communication** strategies increasing awareness, ensuring patients' expectations from the service are set, clarifying that IPHS are complementary to face-to-face contacts (as opposed to replace) have also been helpful. Associated with this, adequate **training** and **education** on how to use the technologies are required to enhance adoption. Fourth, in combination with technology trainings and communication strategies, providing **rehabilitation programmes** to patients also supports the process. These programmes are meant for patients to learn about their condition and how to take action upon symptoms appearing. IPHS are the means to support patients self-managing their condition. Hence, they are more likely to adopt these technologies when understanding more about their condition. In addition, it is relevant to emphasize that IPHS are meant to empower patients and to promote independent living not to make them dependent on the technologies. Again here, the role of communication strategies setting and managing expectations is very relevant. Retrieving the technology from the patient after an appropriate period of time can be an interesting approach to manage over-reliance on them. Such a strategy will also result in a reduction of costs. Nevertheless, it is not clear yet how effective this strategy is.

Finally, in the experiences where **satisfaction** of **patients** and **their carers** has been evaluated, the vast majority of them revealed being satisfied with the service, feeling better cared for whilst a reduction in anxiety was observed. In the light of these satisfactory results, some settings considered promoting IPHS through the use of patient champions however these activities never took place due to ethical issues, mainly related to anonymity. Input from patient associations' representatives reveal that if properly managed, this barrier could be overcome. Thus, this is a strategy that deserves further exploration.

An additional issue is the **digital divide** associated with the elderly, who are the main candidates to use these technologies. Initiatives aiming at digital inclusion are very welcome. As seen, the

Danish society is characterised by the absence of this divide which has enhanced adoption of IPHS. Hence, the above strategies aiming to promote patients adoption would need to be tougher in settings were this divide is remarkable.

From the **care manager's perspective**, similarly to patients, difficulties to use the technologies are often related to **flexibility** of the systems. Sometimes systems are too rigid and establish targets that are unrealistic to the patient specific condition. Systems that allow care managers to shape and adapt these targets are much more embraced in this regard. Here, the role of the industry involving stakeholders and providing systems that provide room for flexibility sand adaption has proven to add value.

**False alarms** and **data granularity,** also resulting in **data overload**, are additional issues that hamper widespread adoption from care managers. The presence of false alarms is very common and the need to refine thresholds result in unnecessary extra work and burden. To ensure these are not triggered without overseeing cases which require intervention, it is very likely that these thresholds need to be adapted for each patient condition. This can take place through the provision of systems allowing for adaption (as opposite to off-the-shelf solutions). On the other hand, these false alarms can also be the result of the protocols of action developed. Here, successful experiences have shown that a period of protocol fine-tuning iterative process assists in the smooth running of services in the long-run.

Data granularity and data overload have proven more difficult to overcome. It seems that a relevant issue here is the kind of data that each care professional would require and how data is portrayed to meet their information needs. The care manager responsible for the daily IPHS readings and running the service would require more detailed data than the GP, specialist or hospital service. As described in an earlier section, a project in the UK is exploring this area. Through this initiative, input of different care professionals is used to develop and test software which portrays the data in different formats and at different levels of granularity. The results are expected to assist in overcoming this barrier. In general, consensus on clinical criteria to be applied when designing these systems represents a relevant contribution to overcome these barriers.

Additional barriers for IPHS adoption find its roots in the lack of **standards**. IPHS standards need to comply with those of the service provider (i.e.: NHS). In some cases this represented a challenge and only when the IT team at the end of the care service provider and the IPHS technology provider cooperated together, these were overcome. The process would be facilitated when this cooperation takes place at an early stage to prevent disappointments at advanced stages.

Receiving a great deal of policy attention are issues around **interoperability** of eHealth applications. Interoperability seriously hampers the delivery of integrated care. Lack of interoperability translates into patient data not being available at the right time for the care manager to take decisions. It not only hampers integrated care but it also results in frustration from IPHS users including patients and care managers. Patients are frustrated when the care manager only relies on information provided by the IPHS system and is not aware of new visits to the GP which resulted for instance in treatment modifications. Also when they attend the GP and IPHS readings are not available to them. Care managers also get disappointed due to lack of available patient data from other sources. Frustration and disappointment represent barriers to IPHS diffusion. Transitory solutions have managed to make this data available to care managers through the consultation of different sources. However, having this data integrated would facilitate the process and result in unnecessary work load.

**Work overload** is an issue that most health professionals involved in IPHS deployment have raised. This is due to a variety of factors of different nature. During the first stages of use, there will always be a work overload until the learning curve has been developed. Even when receiving training to learn how to use these technologies, this represents extra time which needs to be absorbed expecting the benefits from its use to pay-off. This is valid not only for IPHS but in general for any new application, methodology or technology to be adopted beyond ICT. Often

initiatives are launched by clinical champions who are also coping with their daily activities and IPHS services are on top of them. Here, the role of project managers is relevant as they take off responsibilities from champions. Setting time aside from care professionals' routine activities to be dedicated to IPHS has also proven to assist. Other cases covered under this research found how IPHS was the responsibility of staff dedicated exclusively to this. The latter represent no extra workload and is likely to be the form of IPHS service delivery when they become a routine service and the volume of patients is substantial enough.

Because IPHS are often associated with the **re-organisation of health services**, coordinating with other tiers of care to deliver integrated care can also result in higher workload. Hence, although the extra workload is attributed to IPHS, it is often the new form of care delivery what causes this overload until new work routines in cooperation with other tiers of care are developed.

Finally as seen, lack of interoperability and the presence of false alarms also represent sources of work overload.

It has been detailed how the delivery of integrated care requires coordination and communication among care givers. IPHS implementations are likely to be smoother in reorganised services providing integrated care. Actually, it has been identified that often ICT and IPHS are used as means to drive this change in service delivery. Nevertheless, few settings show the appropriate policies stimulating cooperation amongst tiers of care, let alone the integration of their ICT systems and data sharing.

Not only services would need to be re-organised but **incentives** aligning motivations and interests would also facilitate the growth in IPHS. At hospital level, it has been identified how the development of specific DRG to reimburse for some IPHS services have contributed to mainstreaming these applications in hospital and specialised care. Similarly, in primary care a form of DRG for chronic related groups (i.e.: CReG in Lombardy, Italy) also emerged in one of the experiences to promote IPHS applications at this level. It has also been identified how outcome based incentives are likely to be effective in spreading ICT in general and IPHS applications in particular.

Notwithstanding these developments and the fact that these incentive systems promote IPHS deployment their impact on integrated care in the long-run is not clear. When a DRG is created, it actually represents an incentive for hospitals and specialists to deliver the service and keep the patient in the community. However, this payment system does not necessarily represent an incentive to coordinate with primary and social care services which actually represent the main point of contact for patients within the community. Similarly, when primary care incentives are based on health outcomes additional initiatives improving coordination with other tiers of care would also be required. In sum, although progress incentivising IPHS deployment exists, these new incentives do not necessarily stimulate integrated care.

It has been identified as a pillar the **role of nurses** in delivering IPHS services and in pushing integrated care by coordinating with other care professionals. This is true for all initiatives regardless on whether these are led at hospital or at primary care. In contrast, recognition of this major contribution has been weak. If integrated care and IPHS services are to become routine form of care delivery, defining, recognising and incentivising the role played by nurses is likely to enhance widespread adoption.

Often IPHS services are perceived as hampering the sacred **doctor-patient relationship**. Resistance from healthcare professionals to adopt these technologies take place as a result. Different approaches as a means to overcome this barrier have been identified.

The first one is related to the incentive system. Fee-for-service payments incentivise face-to-face interaction hence are likely to hamper IPHS deployment. Outcomes based incentives are likely to be more appropriate.

The second one is related to dissemination and communication strategies engaging with healthcare professionals, setting the right expectations whilst clarifying that IPHS are complementary to face-to-face encounters and do not aim to replace these encounters neither they represent a replacement of healthcare professionals' labour by technology.

The third one is including the use of these applications as part of the development of their skills during training when obtaining their degree as care professionals. Hence, the involvement of educational institutions and universities would be relevant in this regard.

Finally in Denmark, pressures from the patients' side have had an impact in stimulating ICT adoption by healthcare professionals.

Additional interventions influencing healthcare professionals' attitudes to ICT would also be welcome. In particular, stakeholders input points at fears of transparency that ICT bring, hence reluctance to adopt them. This phenomenon can be named the "**big brother syndrome**". Hence, the need to develop further policies related to this.

The "big brother syndrome" is also associated with **liability** issues. Healthcare professionals' fears of being made responsible for lack of adequate care delivery represent a source of resistance. Within the experiences explored, although progress towards a **legal framework** for healthcare professionals to feel comfortable using these technologies has been identified, no definitive solution has been identified. Denmark represents an example where some progress has been made in this regard. However, it is also acknowledged by Danish stakeholder that additional policies and clarification are required in this regard.

**Patient ownership** issues can also undermine IPHS deployment. This is particularly true in settings where GPs do not hold a gate-keeping role, as portrayed in a case study in Germany. This is also related to lack of cooperation across tiers of care. Defining frameworks for cooperation including the allocation of responsibilities of parties involved is likely to enhance IPHS deployment.

Earlier in this section, it was identified how payment and reimbursement systems can incentivise the delivery of IPHS services. An additional aspect is that of **funding** to cover for *technology upfront costs and contributions to evidence and best practice*. Making this funding available has been identified as a key driver promoting IPHS deployment at scale. Nevertheless, experiences characterised by high project mortality have also been identified. The latter represents a barrier for funding institutions to keep on pledging resources towards IPHS applications. It is relevant for organisations testing IPHS deployment to have their objectives clearly defined and to develop monitoring indicators identifying deviations at an early stage. In addition, plans for deployment at scale shall be in place at an early stage in order to take the appropriate steps and engage with the appropriate stakeholders if sustainability (as opposite to project mortality) is to be secured.

The prominent role of **champions** has represented one of the main drivers to deliver IPHS services. They drive forward a culture of change, innovation and modernisation to underpin the development of new applications and facilitate improvement in clinical and/or IPHS services. Often they also promote a culture which encourages high standards of performance and delivery. Often, their role goes beyond launching and promoting IPHS initiatives and in many instances they also become responsible for liaising with stakeholders outside their organisation and developing inter-organisational networks. In sum, champions are agents that overcome existing barriers for innovations to be diffused. An interesting example is that of the WohnSelbst case study in Germany where the mayor of the city became a champion recruiting patients to be involved in this initiative in the light of resistance from healthcare professionals supporting this initiative. This proves how instrumental these agents can be, even in this unconventional example.

Champions have also proven to be relevant drivers in consolidating the evidence related to IPHS deployment. This is relevant as often the lack of **evidence** supporting the business case represents a barrier to spread IPHS.

The need for impact assessment has proven to be a controversial factor in terms of what needs to be evaluated. Developments in this area relate to the MAST evaluation framework, the GEMSA in France and the recently pre-announced results of the WSD in England. All of them seem to converge on the fact that it is not only about obtaining quantitative evidence in terms of cost-effectiveness but also about users' perspectives and organisational aspects. The latter is very much related to the fact that reorganisation of care services is required to deliver integrated care. Impact in other areas such as improved access or efficiencies developed as a result of IPHS deployment would also be interesting to look at once these services reach maturity.

Indeed, the WSD results emphasise that the benefits associated with telehealth and telecare assessed in their study are only valid for a reorganised service. In addition, some of the studies assessing quantitative impact showed limitations related to the low number of patients involved which did not allow for economies of scale for instance. In this regard, the development and refinement of risk- stratification tools have proven to be a driver in terms of supporting estimates on potential benefits when scaling initiatives as well as in identifying those patients who are more likely to benefit from IPHS. Thus, risk-stratification tools have represented a driver to disseminate these technologies, not only in the UK but also in other countries like Spain (i.e. the Basque country).

The analysis of the national and regional experiences found that having evidence both from a quantitative and a qualitative perspective represented a driver. Nevertheless, the decision to mainstream was not based exclusively on this and other issues including **access** and **contextual or cultural factors** also played a relevant role when making the final value judgement. An example of this is the case of Scotland mainstreaming IPHS capitalising on the organisational change that been fostered at community care level and later on institutionalised.

**HTA agencies** strongly influence the diffusion of innovations in healthcare and contribute to evidence consolidation. Their assessments strongly influence the decisions of healthcare service purchasers. At the same time, they represent a point of contact with the industry. While our research shows that HTA agencies are not always involved in IPHS evaluation it would be desirable to involve them in IPHS practices as this can act as a driver to diffuse these technologies and services.

The settings where deployment at scale has been identified mainly draw on Beveridge healthcare systems. Meanwhile, countries relying on multiple insurers or sickness funds purchasing for care services show lower IPHS deployment. The presence of spurious incentives from the insurer perspective in particular when it comes to progress of the EHR and data exchange was highlighted in Section 3.2.2. Nevertheless, the role that insurers play in this field shall not be disregarded. From the HeiTel case in Germany involving AOK, it is tempting to conclude that insurers tend to first collect sufficient evidence on the cost-effectiveness of these applications whilst in parallel they explore business and purchasing models to include these services within their basket of benefits. Hence, again the role of HTA agencies cooperating with them in these developments may also be beneficial. Furthermore, it wouldn't be surprising that once uncertainties have been addressed insurance and sickness funds become change agents with new telehealth services as they would both benefit from providing value for their customers and being cost-effective. As a result, monitoring initiatives and activities of **purchasers of care** would be of interest.

**Integrated governance** models represent a driver for IPHS deployment. What is meant by "integrated" is the involvement of the different stakeholders including the voice of patients (and their carers), care professionals from different tiers of care and community services, the industry, purchasers of care as well as government and their agencies. However, there are cases where the involvement of all stakeholders has resulted in no quorum and in difficulties to agree on key issues such as the case of Gematik in Germany (electronic health insurance card initiative). Thus, defining clear objectives and monitoring progress in the decision-making process is also relevant. In this regard, strategies to **engage** with all stakeholders have proven to be very positive. Indeed, top-down approaches often fail to do so which represents an area for improvement.

Finally, it is also relevant to pay attention to **other policies** running in parallel in the same field. In some cases, these other policies may develop synergies with IPHS deployment. In other cases, additional policies may lead to unintended consequences. For instance, in the light of the current economic situation across the European Union, healthcare systems are being the object of budget cuts. It would be relevant here to balance the benefits of short-term savings that may result in higher expenditure in the medium or long-run.

To conclude, the analysis of drivers and barriers for IPHS deployment show that these are often common to many other ICT applications in healthcare (e.g.: the big brother syndrome). In other instances, these may be IPHS specific (e.g.: patients' active role in self-management) and in others, they may rarely apply to IPHS. Even when they rarely apply to IPHS, these drivers and barriers may be worth considering from an integrated care perspective.

**Box 16 - Key lessons learnt – drivers and barriers and how to overcome the latter**

***Patient resistance to technology***

- Gaining healthcare's professional as well as carers' (formal and informal) support.
- Developing user friendly, intuitive and flexible solutions.
- Devising well thought through dissemination and communication strategies that clarify what IPHS does and does not.
- Using training as a means to engage patients and users.
- Updating educational programmes with IPHS related modules.
- Building on enthusiast users to convince other users, solving related ethical issues first.

***Resistance from care managers and healthcare professionals involved***

- Ensuring that systems are flexible and can be fine-tuned to the needs of the carers, and those of other stakeholders, as they might differ so that data fits the respective purposes.
- Providing systems which minimize the occurrence of false alarms, and provide data granularity without causing data overflow.
- Devising well thought through dissemination and communication strategies that clarify what IPHS does and does not, demystifying myths about "big brother" linked to ICT introduction.

***Lack of interoperability***

- Involving IPHS technology and service providers, and IT teams on the healthcare side early on in the process to ensure smooth implementation.
- Promoting interoperability so that IPHS data gets integrated in clinical systems.

***Increased workload***

- Careful planning for IPHS introduction is required so involved care professionals get freed from other tasks to handle IPHS.
- Care reorganisation itself, especially across different tiers of care, causes extra work which needs to be taken into account in planning as well.
- Rethinking of roles and creation of new roles for IPHS management may be required.

***Misalignment of incentives***

- Providing adequate incentives to align staff motivation and care objectives in a reorganised model of care.
- Reviewing existing incentives across tiers of care to make sure existing misalignment get resolved.

***Lack of legal certainty on liability***

- Clear frameworks need to be developed clarifying liabilities when using IPHS.
- "Patient ownership" issues needs to be defined in such frameworks especially when different tiers of care are involved.

***Creating the right context for IPHS deployment***

- Funding mechanisms help bring forward larger scale initiatives, government intervention being a clear driver.
- Impact assessments need to balance the need for sound evidence with pragmatic considerations, including quantitative and qualitative elements, to facilitate decision making for mainstreaming; several methods are being tested and likely to bring positive outcomes.
- Involving HTA agencies should help consolidate the IPHS evidence base.
- Monitoring action from insurers in IPHS field may help identify business models and best practice.
- Integrated governance involving all relevant stakeholders with a strong policy push element helps overcome barriers.

### 3.3.3 Lessons learnt and transferability of models

Building on the previous sections within this document, this final section aims to assess the extent to which these experiences can be replicated and transferred with policy support to other settings.

From the perspective of mainstreaming, the most prominent developments are those found in Denmark, in England (UK), in Scotland (UK), in some Italian regions (namely Lombardy and Emilia Romagna) and in some Spanish regions (namely the Basque country and Catalonia). Of relevant interest is the fact that those are associated with progress towards integrated care. In particular, the following experiences aim at delivering integrated care supported by IPHS at scale: ICHM in Denmark; eCare/CUP 2000 in Emilia Romagna (Italy); telemonitoring initiative of chronic patients in geriatric centres led by Hospital Donostia in the Basque country (Spain); and NEXES initiative at Hospital Clinic in Catalonia (Spain).

Throughout these experiences some good practices and strategies to overcome barriers to IPHS deployment have been identified.

Cooperation with the industry to develop solutions that suit users and service needs as well as promoting adoption has been identified as strength. Often, the solutions have also been shaped in line with the corresponding clinical protocol which represents an enhancer for deployment. Experiences where these have taken place have been identified in Scotland (UK) and in the Basque country (Spain). Additional partnerships developing software addressing data granularity barriers have been found in the UK, in particular in England (Newham) and Scotland. At a higher institutional level, acknowledging and promoting the role of the industry has also proven to be a satisfactory approach. In this regard, the French government has provided funding to deploy these technologies involving the industry whilst in England, a memorandum of understanding was recently signed by the industry and the Department of Health[63].

The role of the industry is also of paramount relevance to address interoperability. Here, best practices are those found in the UK and Denmark. In the UK, as already discussed, the DALLAS programme launched by the technology strategy Board uses progress towards interoperability as a determinant for funding eligibility. In Denmark, three organisations - Digital Health, MedCom and sundhed.dk - develop mutually supplementing activities in terms of the dissemination of Healthcare IT translating into the development of standards and promoting interoperability and data exchange.

It has been widely discussed that a reorganisation of services is required to support the delivery of integrated care. This reorganisation is often triggered through ICT deployment. In this regard, the best model found related to reorganisation of services is that pursued by Scotland. Relevant as well is that the structures of care delivery that have been developed at operational level are mirrored and supported at institutional level

In addition, integrated care involves coordination of social and health care services. As much as experiences promoting coordination between those two tiers of care have been identified at policy level (for instance in the UK and in Spain health and social care falling under the responsibility of

the same authority) at local level the reality is a different one. Cultural differences from these two disciplines need to be taken into account as tensions could arise as a result. An example on how to overcome this barrier is provided in the eCare/CUP 2000 experience in Emilia Romagna (Italy).

Relying on the intrinsic motivation of care professionals to cooperate may be a naïve approach. More advisable instead is to complement this intrinsic motivation through externalities by for instance developing incentives promoting cooperation between tiers of care. In this regard, Denmark has developed a cooperation framework between primary and social care promoting care delivered within the community. Along the same lines, Scotland developed the so-called community partnerships. In terms of financial incentives, Andalusia offers a contract model by which incentives at primary and hospital care levels are aligned given that both are based on outcomes for the population under their coverage.

Not only incentives and structures promoting cooperation across tiers of care are relevant but also the use of those incentives should not constrain ICT deployment. As discussed, fee-for-service payments unintentionally represent a disincentive for integrated care and for ICT deployment. Outcomes based payments such as the QOF in primary care in the UK or in Andalusia seem to be better aligned with integrated care delivery and ICT deployment.

In addition, how these services are reimbursed would strongly influence cooperation between tiers of care. Lombardy (Italy), France and Denmark have provided reimbursement frameworks through a form of DRG to reimburse for some IPHS services. However, this form of reimbursement does not necessarily promote coordination between tiers of care. Indeed, new service delivery models and new functions are created by ICT. Hence, new purchasing models for these services are likely to emerge as a result. This actually reflects the need for additional research and policy development related to incentives and reimbursement for these applications.

From a governance perspective, it has been discussed that an integrated governance model represents an advantage for IPHS deployment. Such a statement is also likely to be valid for ICT in general. An example for this is the eCare network in Italy. Here, an integrated governance structure where stakeholders involved have a voice in the decision making process is in place. The same applies at a higher institutional level in Denmark. In addition, those governance models that manage to engage with all stakeholders have proven to be successful. Further, involving practitioners and staff at operational level seems to promote widespread deployment. Complementarily to these models engaging in dissemination and communication strategies setting the right expectations have also proven to be driving forces.

The development of legal frameworks addressing liability and responsibility concerns is meant to enhance further deployment. In these regard, legal frameworks are also meant to identify issues related to data access, data ownership and data security. Under the SIMPHS2 research, Denmark seems to be the country portraying the biggest progress in this regard. However, the need for additional policy developments in this regard has also been identified as an issue to be addressed.

All experiences with no exception and regardless of the level of maturity have initially emerged with the presence of champions playing a key role in promoting and diffusing them. In addition, champions also contribute to developing and consolidating evidence. Complementarily to this, cases where HTA agencies have been involved in consolidating evidence and disseminating these applications have also been identified. The Basque country, Catalonia and Denmark represent good examples where HTA agencies recognise a role for these technologies in case management and get involved in assessing the impact of these interventions. In addition, HTA agencies traditionally liaise with the industry and the purchaser. Thus, potentially they can also enhance the role of purchasers in the process and contribute through evidence consolidation to the development of purchasing models.

From an evidence perspective, progress points towards evaluation methodologies that involve the use of both quantitative (i.e.: service utilisation and effectiveness) and qualitative parameters (i.e.: users' experience and service re-organisation). The WSD experience in England has provided the

most rigorous evaluation results to date. Nevertheless, limitations to the generalisability of the results exist given that these were assessed in a reorganised service. This begs the question of whether any IPHS experiment can be assessed in a non-reorganised service. Furthermore, when it comes to quantitative assessments recent approaches point towards assessing integrated care and fragility as opposed to carrying out evaluations per disease. The advantage of this new approach is that it allows for the inclusion of patients with co-morbidities. Also relevant is the fact that as progress towards interoperability is made, the quantitative assessment is likely to produce different results. In other words, the effectiveness of IPHS services are likely to be higher when data is integrated with the EHR than without data integration. Equally as important, IPHS services are likely to be more effective in an integrated care setting than in traditional settings. Thus, assessing integrated care becomes a better reflection of the reality as it reflects integration of ICT systems and holistic approaches to patients' conditions.

As much as the availability of evidence is a relevant driver, the decision to mainstream will always involve a value judgement based on additional criteria such as those outlined here including cultural (i.e.: practice-based versus evidence-based cultures) and contextual aspects (i.e.: budget constraints). Other aspects such as the role of IPHS in developing efficiencies or enhancing access to health services also influence the decision-making process. Such is the case of the Piedmont region (Italy), Scotland (UK) or Denmark. In contrast, access issues have not come to the surface in formal evaluations.

Even though the decision to mainstream will remain a value judgement, through these experiences some of the best practices portrayed are likely to be transferable to other settings through an adaption process.

Section 1.1 introduced four clusters (clusters A - D) that assisted in selecting the countries for in-depth study under WP3.

Cluster A included Denmark, Finland and Sweden. Denmark was the country selected for in-depth study. The research found that IPHS deployment at scale is taking place here. Mainstreaming has been driven by an integrated governance model involving all stakeholders which has translated into higher (though not fully) interoperability of ICT applications including a high deployment of the EHR and the presence of funding (mainly through the PWT) to test initiatives like IPHS. The governance model has also contributed to advancements related to the legal framework. Moreover, in some cases reimbursement schemes for these services have been developed as it is the case of the anti-coagulant web-based payment.

Also, a relevant factor is also the effect of the demand side which is quite unique compared to other clusters. Danes are very keen technology users and a society keen to self-manage. They have been given a voice when it comes to these applications. This has represented a push factor for healthcare professionals to use these technologies. In addition, the Danish HTA agency, DACEHTA has been involved in some of the evaluations and IPHS developments. Finally, cooperation frameworks have been established between primary and social care at community level enhancing cooperation between tiers of care.

Notwithstanding the above some areas for improvement also exist in Denmark especially in terms of reaching full interoperability and giving an extra push on integrated care. In this regard, the ICHM experience is meant to consolidate evidence on integrated care delivery in two of the five Danish regions involving all tiers of care and supported by IPHS whilst DACEHTA will be involved in the evaluation. Hence, progress towards fully integrated care is being made. It is also likely that factors related to access (i.e.: rural areas and access difficulties due to weather conditions and hospital rationalisation) play a key role here.

Based on the above, and as much as the Danish study only covered a few experiences in this country, it is likely that these findings also apply to other countries within Cluster A, namely Finland and Sweden. Indeed, although additional research would be required to validate such a statement, preliminary insights from South Karelia (Finland) points in this direction.

Cluster B included nine countries with varying levels of eHealth readiness and characterised by one main purchaser of care services in each of the countries. Also, across all of them GPs hold a gatekeeping role or efforts towards this role are being made. The countries selected for in-depth study within this cluster were Italy, Spain and the UK. Results are certainly varied in terms of how innovations are being diffused, how impact is measured and which governance model is in place. Nevertheless, a mainstreaming trend has also been identified within this cluster.

In the UK, the presence of funding to trigger deployment and to promote interoperability has been crucial. Worth noting here is the fact that in this healthcare system, funding institutions have established eligibility requirements that reflect the need to overcome barriers (i.e.: DALLAS programme only funding initiatives showing progress towards interoperability).

Mainstreaming in England has mainly been driven by robust quantitative evidence resulting in a strong policy commitment through a top-down approach and relevant policies related to industry involvement. In Scotland, instead, the policy commitment was driven by an organisational change at local level and the involvement of all stakeholders. Additional drivers in Scotland are likely to be related to a stronger tradition on social care relying thus on practice-based evidence and access issues similar to those found in Denmark.

The regions in Italy portraying a mainstreaming trend are often the most advanced in terms of interoperability and have also been driven by access issues. Also, remarkable efforts related to engagement strategies and to involvement of stakeholders have facilitated deployment at scale. Cases involving the cooperation across tiers of care are also found here such as the eCare/CUP 2000 initiative. Finally, in one of the regions the presence of a reimbursement scheme has also enhanced widespread deployment.

In Spain cases where mainstreaming at scale is taking place reflect the involvement of all stakeholders and tiers of care.

In all of the settings across cluster B, a trend towards convergence of health and social care services has been identified. In addition, the trend towards outcomes-based payments in particular in primary care is also significant. These two features are likely to be transferrable to other countries within this cluster. The overall transferability of these results to other countries in the cluster may vary. Indeed, this is precisely why Italy and Spain were selected given their diversity amongst regions which often represent a microcosmos of the EU 27 Member States. In addition, within this cluster the presence of informal payments has been reported in Hungary and Latvia. Hence, until this barrier is overcome in these settings, it seems unrealistic to promote integrated care supported by ICT with the associated transparency and patient empowerment features that ICT embed and the likely reluctance to adopt these technologies.

On the other hand, governance approaches within this cluster vary from middle-out (i.e.: Scotland or Catalonia) to top-down (i.e.: England or Andalusia) even within the same country. This actually results in the need of governance steering when middle-out approaches are more prominent and Scotland offers a good example of how this can take place. Related to top-down approaches, strategies to engage at operational level are required to ensure barriers to mainstream are appropriately addressed.

The miscellany of countries in Cluster C is even more remarkable than that of cluster B. For instance, in many of the countries within this cluster the presence of informal payments has also been reported. Moreover, countries like Belgium and Luxemburg portray a multiple purchaser model of care and high eHealth deployment, which are features closer to cluster D. Estonia was selected for in-depth study amongst the eleven countries in this cluster and it cannot be considered as a representative of the whole cluster. Nevertheless, it can be argued that emerging models of integrated care can appear in this cluster judging from the experience explored. Estonia is a country with a national EHR in place. In addition, STAR, their social care ICT system is currently being mainstreamed and the country is also home to many high-tech start-ups. In turn, the lack of emphasis on integrated care at policy level translates into weak IPHS deployment. If integrated care

becomes a priority and funding is made available for it, Estonia may eventually emerge as a best practice case given that some barriers such as those related to interoperability have already been overcome.

Finally, France, Germany and the Netherlands were selected for in-depth study within cluster D. It has been described how Germany and the Netherlands show some signs of market failure which would need to be addressed through government intervention. France instead already shows a strong government push for wider deployment through funding involving the industry, as well as a trend towards integrated governance and integrated care. In addition, incentives and reimbursement schemes for some of these applications have been developed. As much as other countries within this cluster could follow the French approach, it should be borne in mind that the power held by insurers is weaker in France that in Germany or the Netherlands.

On the other hand, there would be a benefit in monitoring the role of insurers. The experiences in the Netherlands and Germany seem to reveal that insurers are gathering impact evidence on IPHS applications. Their activities in the field may come across as low key and somewhat secretive. This may be due to the need to develop business models to purchase these services if these prove to offer value for money. Should these crystallise, insurers may represent a source for innovative purchasing mechanisms.

To sum up, different drivers have been identified which are transferrable to all countries. For instance, the role of champions has been present in all experiences and their role will always be relevant in any setting and in any Member State. Also, the role of HTA agencies consolidating evidence, diffusing these innovations as well as their involvement with the industry and with purchasers of care services is also a driver that is likely to be transferable to other settings. Instead, other issues such as the push from the demand side observed in Denmark may not be so easily transferrable in the short-run. Another example would be that of cooperation between health and social care which is likely to be easier to promote in countries building on Beveridgian models or with a single purchaser of health and/or social care services (i.e.: Estonia).

These concerns related to transferability also reflect the limitations related to the research approach used. Only a few countries were selected and only a few experiences were analysed in detail within each country. These allowed extracting some common features and trends but the generalisability will always be limited. This limitation was even more obvious when looking at quantitative data from these experiences. It became clear that quantitative comparisons were difficult or applying costs from one country to another one or even another setting within that country (even in the same country) may lead to a distorted picture as it will be detailed in deliverable 5 of the SIMPHS2 project.

Nevertheless, amongst the 31 initiatives studied across the 8 member studies zoomed in, it is clear that there is a need to define a common monitoring and assessment framework. Such a framework could combine some of the features identified here as drivers and means to overcome barriers in combination with tangible (cost) and intangible (care) factors to enable decision makers to assess both the state of maturity of the health and social care environment and the readiness to scale up. It would represent a basis for knowledge exchange and evidence sharing as well as enable better international comparisons of outcomes.

**Box 17 – Key lessons learnt from best practices**

Mainstreaming is happening in two countries at national level, and in two more countries in some of their regions. Other countries also provide useful elements of best practice.

These are gathered below.

***Governance***

- Joint or parallel implementation of integrated care (care reorganisation) and IPHS as enabler.
- Middle-out or top-down rather than bottom-up approaches.
- Integrated governance frameworks or structures.
- Policy focus on chronic diseases management.
- HTA involvement.
- National or regional funding mechanisms promoting sustainability of initiatives.

***Technology***

- Good cooperation with industry to ensure interoperability, alignment with clinical protocols etc., ideally interoperability already in place.
- Flexible, adaptable solutions.

***Re-organisation of care***

- Funding available for re-organisation of services.
- Creation of new roles (e.g. care manager).
- New structures of care delivery at operational level supported by corresponding changes at institutional level.
- Cooperation frameworks defining incentives for cooperation between tiers of care to align motivations and expectations.
- Adaptation of existing incentives that are counter-productive so as to allow IPHS to be on equal footing with other treatment/courses of care.
- Development of new reimbursement frameworks e.g. through DRG for IPHS or outcome based payments.
- Legal frameworks addressing liability and responsibility as well as data (privacy, ownership etc.) issues.

***Impact assessment***

- Assessment methodologies taking account of quantitative and qualitative parameters; also including cultural, societal and contextual considerations for mainstreaming decision making.

***Communication***

- Communication and dissemination strategies.
- Leveraging demand from patients in "ICT advanced" settings.

# 4. Conclusions

European healthcare systems' current overarching goals are to improve citizen's health status (in terms of length and quality of life) whilst decreasing (or containing) healthcare expenditure. However, the ageing of our societies alongside other factors related to lifestyles have resulted in an increase in chronic conditions which in turn leads to increased demand for healthcare services with the associated costs and a deterioration of patients' quality of life. A major tension is emerging as a result.

In order to manage this tension, a variety of strategies tackling chronic conditions started to be developed in the late 90s. These have evolved from disease management programmes to current trends towards integrated care. A reorientation of our healthcare systems to deliver truly integrated care is required as a result.

In the light of the above, this piece of research has aimed to analyse developments on integrated care and on IPHS deployment in thirty-one experiences across eight different Member States which were selected following a clustering exercise, following a regional approach which was considered more appropriate than a national one.

The research found a mainstreaming trend in some of the regions under study. The frontrunners in this regard are Denmark, England, Scotland and some regions in Spain and Italy whilst promising initiatives in other Member States are also taking place (France, Germany and the Netherlands).

Adapting a framework developed by Greenhalgh et al[33], these experiences were analysed from three perspectives: Diffusion of Innovations (or simply Innovation), Governance and Impact. Based on this analysis, a set of drivers and barriers for widespread deployment were identified and discussed.

In terms of innovation, beyond the technical innovation, the reorganisation of services promoting cooperation between tiers of care or even the integration between health and social care represents one of the main innovations and a driver for successful integrated care delivery. Further the research identified how IPHS deployment is associated with changes in traditional roles and the development of new roles as part of this reorganisation.

An integrated patient record is another of the pillars for the delivery of integrated care given that it supports good communication among caregivers, smooth transfer of information, and the elimination of duplicate testing and procedures. Both, progress towards high eHealth deployment and towards interoperability, are key building-blocks to develop a patient record integrating clinical and social care information.

Ideally integrated care has to become standardised and delivered by multi-disciplinary teams to ensure continuity of the care process and adequate incentives have to be provided to meet performance and efficiency standards. In line with it, the role of incentives has been identified as a driver for IPHS deployment and integrated care delivery. In this regard, outcomes-based incentives seem to be effective whilst fee-for-service payments seem to be a barrier. In addition, the presence of reimbursement mechanisms as an incentive has also proven to be a driver for IPHS deployment. Nevertheless, the role of incentives aligning motivations across tiers of care is an area that deserves further research.

Sound governance is another key feature to deliver integrated care. From a governance perspective, committed and integrated governance models that involve and engage with stakeholders have also proven to be an important driver. Such governance models have also facilitated progress towards defining legal frameworks addressing liability issues that integrated care and IPHS embed, although further work is still needed. Also, these governance models provide a role and a voice to patients. In integrated care models, patients become both the object of care and part of the care team. IPHS represent patient-empowering applications and services providing patients the support they need to actively self-manage their condition. Hence, their involvement in the decision-making process is also

relevant. Indeed, a key lesson learnt is the role that patients can play in spreading IPHS if properly managed.

Finally, the development and consolidation of evidence and best practice represents the third pillar of integrated care. Drivers to achieve best practice are the availability of funding to test and develop best practice evidence and protocols as well as the involvement of HTA agencies in consolidating this evidence and providing guidance on the best quality health and social care interventions. In this regard, the analysis of IPHS from an impact perspective proved to be challenging. Most common challenges associated with rigorous impact assessments relate to low number of patients under study. Having overcome this initial barrier, multifaceted approaches also involving a higher number of patients proved to be more conclusive. These approaches assessed impact of IPHS interventions using a combination of quantitative (cost-effectiveness) and qualitative (assessment of users experience and organisational impact) methods. Nevertheless, as progress towards integrated care is made, (the need for) new evidence is likely to emerge as well as new approaches to measure this evidence. This relates in particular to measuring the impact of integrated care looking at the patient from a holistic perspective which would allow for the inclusion of co-morbidities or social care aspects, for instance. The lack of evidence on issues related to economies of scale IPHS may embed when delivered as a routine service or their impact on access to care services also represents a relevant finding. Additional research in this area will assist in consolidating evidence and developing best practice.

To sum up, this analysis concludes that IPHS deployment goes very much in pace with progress towards integrated care and momentum is peaking. Even though the decision to mainstream will remain a value judgement, the analysis of the best practices found in these experiences has allowed us to identify factors which could enable decision makers to assess both the state of maturity of the health and social care environment and the readiness to scale up.

Finally, the issues identified throughout this analysis represent a starting point for the development of indicators to precisely assess preparedness to support the decision-making process. Relevant as well is the fact that the barriers identified if addressed and managed properly can be turned into drivers. This reversibility gives hope that the reorientation that European care services require to meet the challenges of our ageing societies is feasible.

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# Annex I – Statistical facts and data

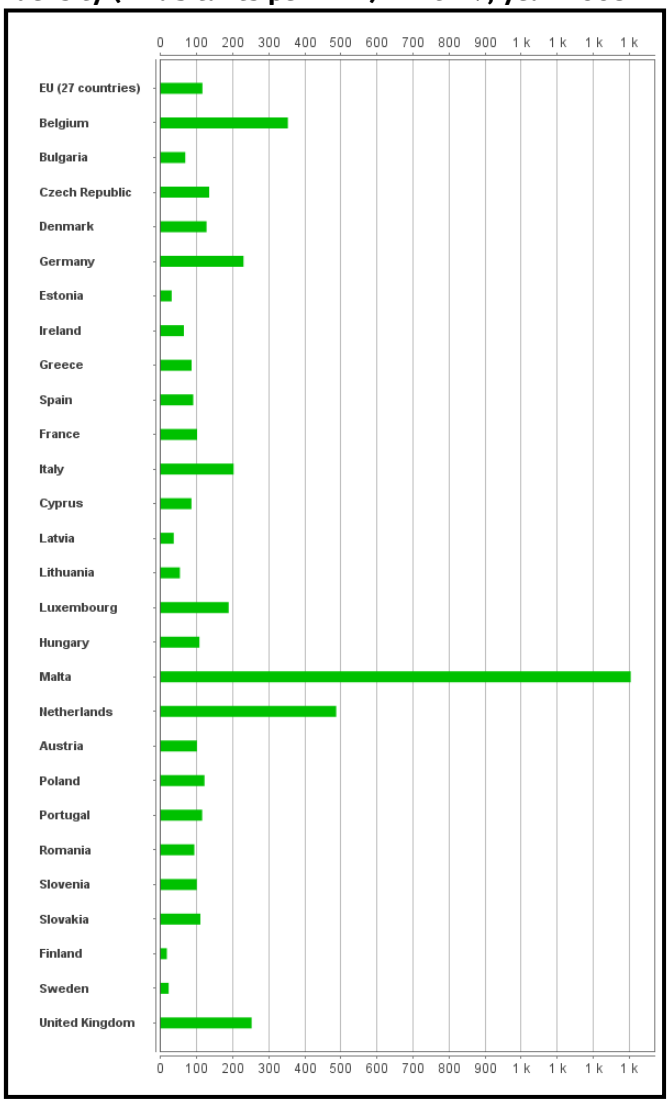
## Socio-demographic facts and data

**Table 6 – Population (in number of persons) of EU Member States at 1st of January for selected years (2000, 2010 and 2011)**

| | 2000 | 2010 | 2011 | % variation 2000-2011 |
|---|---|---|---|---|
| EU (27 countries) | 482,767,512 | 501,125,880 | 502,519,978 | 4.09% |
| Belgium | 10,239,085 | 10,839,905 | 10,951,665 | 6.96% |
| Bulgaria | 8,190,876 | 7,563,710 | 7,504,868 | -8.38% |
| Czech Republic | 10,278,098 | 10,506,813 | 10,532,770 | 2.48% |
| Denmark | 5,330,020 | 5,534,738 | 5,560,628 | 4.33% |
| Germany | 82,163,475 | 81,802,257 | 81,751,602 | -0.50% |
| Estonia | 1,372,071 | 1,340,127 | 1,340,194 | -2.32% |
| Ireland | 3,777,565 | 4,467,854 | 4,480,858 | 18.62% |
| Greece | 10,903,757 | 11,305,118 | 11,325,897 | 3.87% |
| Spain | 40,049,708 | 45,989,016 | 46,152,926 | 15.24% |
| France | 60,545,022 | 64,716,213 | 65,075,373 | 7.48% |
| Italy | 56,923,524 | 60,340,328 | 60,626,442 | 6.51% |
| Cyprus | 690,497 | 803,147 | 804,435 | 16.50% |
| Latvia | 2,381,715 | 2,248,374 | 2,229,641 | -6.39% |
| Lithuania | 3,512,074 | 3,329,039 | 3,244,601 | -7.62% |
| Luxembourg | 433,600 | 502,066 | 511,840 | 18.04% |
| Hungary | 10,221,644 | 10,014,324 | 9,985,722 | -2.31% |
| Malta | 380,201 | 414,372 | 417,617 | 9.84% |
| Netherlands | 15,863,950 | 16,574,989 | 16,655,799 | 4.99% |
| Austria | 8,002,186 | 8,375,290 | 8,404,252 | 5.02% |
| Poland | 38,653,559 | 38,167,329 | 38,200,037 | -1.17% |
| Portugal | 10,195,014 | 10,637,713 | 10,636,979 | 4.34% |
| Romania | 22,455,485 | 21,462,186 | 21,413,815 | -4.64% |
| Slovenia | 1,987,755 | 2,046,976 | 2,050,189 | 3.14% |
| Slovakia | 5,398,657 | 5,424,925 | 5,435,273 | 0.68% |
| Finland | 5,171,302 | 5,351,427 | 5,375,276 | 3.94% |
| Sweden | 8,861,426 | 9,340,682 | 9,415,570 | 6.25% |
| United Kingdom | 58,785,246 | 62,026,962 | 62,435,709 | 6.21% |

Source: Eurostat, 2011[2]. *Note that for year 2000, some of the Member States had not joined the EU, thus, although illustrative, the data is somewhat virtual.

**Figure 15 – Population density (inhabitants per km2) in EU 27, year 2008**




Source: Eurostat, 2011[2]

**Table 7 – Education attainment levels for the population aged 15-24 (%) in EU 27 Member States for selected years (2004 and 2008)**

| | Levels 0-2 (ISCED 1997)* | | Levels 3-4 (ISCED 1997)* | | Levels 5-6 (ISCED 1997)* | |
|---|---|---|---|---|---|---|
| | 2004 | 2008 | 2004 | 2008 | 2004 | 2008 |
| EU 27 MS | 34.9 | 48.6 | 42.6 | 44.1 | 6.3 | 7.3 |
| BE | 36.8 | 47.5 | 40.4 | 41.3 | 10.8 | 11.2 |
| BG | 32.0 | 52.9 | 39.0 | 44.4 | 3.0 | 2.7 |
| CZ | 17.0 | 46.3 | 50.4 | 50.7 | 2.0 | 3.0 |
| DK | 33.5 | 60.5 | 37.0 | 36.5 | 2.4 | 3.0 |
| DE | 23.1 | 58.6 | 37.3 | 39.2 | 2.2 | 2.2 |
| EE | 21.9 | 52.5 | 40.0 | 41.4 | 7.2 | 6.2 |
| IE | 35.7 | 41.6 | 43.4 | 44.1 | 13.1 | 14.3 |
| EL | 44.9 | 45.4 | 52.0 | 49.5 | 4.4 | 5.0 |
| ES | 53.7 | 55.3 | 32.9 | 32.0 | 12.7 | 12.7 |
| FR | 36.1 | 43.3 | 36.3 | 41.7 | 13.4 | 15.0 |
| IT | 52.3 | 54.1 | 43.7 | 42.4 | 1.4 | 3.5 |
| CY | 34.2 | 46.6 | 35.8 | 38.5 | 9.9 | 14.9 |
| LV | 24.4 | 51.6 | 39.2 | 41.8 | 5.1 | 6.6 |
| LT | 22.5 | 48.4 | 40.9 | 43.1 | 7.6 | 8.5 |
| LU | 38.4 | 59.8 | 35.7 | 35.6 | 6.4 | 4.6 |
| HU | 30.4 | 50.6 | 46.5 | 45.9 | 3.5 | 3.5 |
| MT | 73.4 | 67.4 | 27.7 | 25.8 | 6.9 | 6.8 |
| NL | 33.3 | 52.4 | 38.3 | 39.6 | 7.2 | 8.1 |
| AT | 26.3 | 49.5 | 49.4 | 48.6 | 3.6 | 1.9 |
| PL | 22.3 | 45.8 | 50.0 | 49.3 | 3.3 | 4.9 |
| PT | 73.3 | 64.9 | 27.9 | 30.2 | 3.7 | 4.9 |
| RO | 34.6 | 51.0 | 41.3 | 46.5 | 2.1 | 2.5 |
| SI | 24.1 | 39.7 | 53.7 | 58.1 | 1.5 | 2.1 |
| SK | 19.5 | 45.2 | 50.3 | 51.4 | 2.4 | 3.4 |
| FI | 28.7 | 53.2 | 46.2 | 45.3 | 2.2 | 1.6 |
| SE | 27.1 | 47.1 | 48.5 | 47.5 | 6.3 | 5.4 |
| UK | 28.2 | 28.4 | 55.3 | 58.0 | 11.5 | 13.6 |

Source: Eurostat, 2011[2].

*Note: Levels 0-2 (ISCED 1997) = Pre-primary, primary and lower secondary education; Levels 3-4 (ISCED 1997) = Upper secondary and post-secondary non-tertiary education; Levels 5-6 (ISCED 1997) = Tertiary education.

**Table 8 - Proportion of population aged 65 and over as a % of the total population. 27 EU Member States. 2000-2010**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EU (27 MS) | 15.6 | 15.8 | 16 | 16.2 | 16.4 | 16.6 | 16.8 | 16.9 | 17.1 | 17.2 | 17.4 |
| Belgium | 16.8 | 16.9 | 16.9 | 17 | 17.1 | 17.2 | 17.2 | 17.1 | 17.1 | 17.1 | 17.2 |
| Bulgaria | 16.2 | 16.3 | 16.9 | 17 | 17.1 | 17.1 | 17.2 | 17.3 | 17.3 | 17.4 | 17.5 |
| Czech Republic | 13.8 | 13.9 | 13.9 | 13.9 | 13.9 | 14 | 14.2 | 14.4 | 14.6 | 14.9 | 15.2 |
| Denmark | 14.8 | 14.8 | 14.8 | 14.8 | 14.9 | 15 | 15.2 | 15.3 | 15.6 | 15.9 | 16.3 |
| Germany | 16.2 | 16.6 | 17.1 | 17.5 | 18 | 18.6 | 19.3 | 19.8 | 20.1 | 20.4 | 20.7 |
| Estonia | 15 | 15.2 | 15.5 | 15.9 | 16.2 | 16.5 | 16.7 | 17.1 | 17.2 | 17.1 | 17.1 |
| Ireland | 11.2 | 11.2 | 11.1 | 11.1 | 11.1 | 11.1 | 11 | 10.9 | 10.9 | 11 | 11.3 |
| Greece | 16.5 | 16.8 | 17.2 | 17.5 | 17.8 | 18.1 | 18.5 | 18.6 | 18.6 | 18.7 | 18.9 |
| Spain | 16.7 | 16.9 | 17 | 16.9 | 16.9 | 16.8 | 16.7 | 16.7 | 16.6 | 16.6 | 16.8 |
| France | 15.8 | 15.9 | 16 | 16.1 | 16.2 | 16.3 | 16.4 | 16.3 | 16.4 | 16.5 | 16.6 |
| Italy | 18.1 | 18.4 | 18.7 | 19 | 19.2 | 19.5 | 19.7 | 19.9 | 20 | 20.1 | 20.2 |
| Cyprus | 11.2 | 11.3 | 11.7 | 11.8 | 11.9 | 11.9 | 12 | 12.3 | 12.5 | 12.7 | 13.1 |
| Latvia | 14.8 | 15.2 | 15.5 | 15.9 | 16.2 | 16.5 | 16.8 | 17.1 | 17.2 | 17.3 | 17.4 |
| Lithuania | 13.7 | 14.1 | 14.4 | 14.7 | 15 | 15.1 | 15.3 | 15.6 | 15.8 | 16 | 16.1 |
| Luxembourg | 14.3 | 13.9 | 13.9 | 14 | 14 | 14.1 | 14.1 | 14 | 14 | 14 | 14 |
| Hungary | 15 | 15.1 | 15.3 | 15.4 | 15.5 | 15.6 | 15.8 | 15.9 | 16.2 | 16.4 | 16.6 |
| Malta | 12.1 | 12.3 | 12.6 | 12.8 | 13 | 13.3 | 13.7 | 13.8 | 13.8 | 14.1 | 14.8 |
| Netherlands | 13.6 | 13.6 | 13.7 | 13.7 | 13.8 | 14 | 14.3 | 14.5 | 14.7 | 15 | 15.3 |
| Austria | 15.4 | 15.4 | 15.5 | 15.4 | 15.5 | 15.9 | 16.4 | 16.9 | 17.1 | 17.4 | 17.6 |
| Poland | 12.1 | 12.4 | 12.6 | 12.8 | 13 | 13.1 | 13.3 | 13.4 | 13.5 | 13.5 | 13.5 |
| Portugal | 16 | 16.4 | 16.5 | 16.7 | 16.8 | 17 | 17.1 | 17.3 | 17.4 | 17.6 | 17.9 |
| Romania | 13.2 | 13.5 | 13.9 | 14.2 | 14.4 | 14.7 | 14.8 | 14.9 | 14.9 | 14.9 | 14.9 |
| Slovenia | 13.9 | 14.1 | 14.5 | 14.8 | 15 | 15.3 | 15.6 | 15.9 | 16.3 | 16.4 | 16.5 |
| Slovakia | 11.4 | 11.4 | 11.4 | 11.5 | 11.5 | 11.6 | 11.7 | 11.9 | 12 | 12.1 | 12.3 |
| Finland | 14.8 | 15 | 15.2 | 15.3 | 15.6 | 15.9 | 16 | 16.5 | 16.5 | 16.7 | 17 |
| Sweden | 17.3 | 17.2 | 17.2 | 17.2 | 17.2 | 17.2 | 17.3 | 17.4 | 17.5 | 17.8 | 18.1 |
| United Kingdom | 15.8 | 15.8 | 15.9 | 15.9 | 16 | 16 | 16 | 16 | 16.1 | 16.3 | 16.5 |

Source: Eurostat, 2011[2].

**Table 9 - Old-age-dependency ratio (%), EU 27 Member States 1990and 2000-2010**

| | 1990 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EU (27 countries) | 20.6 | 23.2 | 23.5 | 23.8 | 24.1 | 24.3 | 24.7 | 24.9 | 25.2 | 25.4 | 25.6 | 25.9 |
| Belgium | 22.1 | 25.5 | 25.7 | 25.8 | 26 | 26.1 | 26.3 | 26.2 | 25.9 | 25.8 | 25.9 | 26 |
| Bulgaria | 19.5 | 23.8 | 24 | 24.9 | 24.9 | 24.9 | 24.8 | 24.9 | 24.9 | 25 | 25.2 | 25.4 |
| Czech Republic | 19 | 19.8 | 19.8 | 19.7 | 19.7 | 19.7 | 19.8 | 20 | 20.2 | 20.5 | 20.9 | 21.6 |
| Denmark | 23.2 | 22.2 | 22.2 | 22.3 | 22.3 | 22.5 | 22.7 | 22.9 | 23.2 | 23.6 | 24.1 | 24.9 |
| Germany | 22 | 23.9 | 24.5 | 25.2 | 25.9 | 26.8 | 27.8 | 28.9 | 29.9 | 30.4 | 30.9 | 31.4 |
| Estonia | 17.5 | 22.4 | 22.7 | 23 | 23.5 | 23.9 | 24.3 | 24.5 | 25.1 | 25.3 | 25.2 | 25.2 |
| Ireland | 18.6 | 16.8 | 16.6 | 16.5 | 16.4 | 16.3 | 16.3 | 16 | 15.8 | 15.9 | 16.2 | 16.8 |
| Greece | 20.4 | 24.2 | 24.7 | 25.3 | 25.8 | 26.4 | 26.8 | 27.6 | 27.6 | 27.8 | 27.9 | 28.4 |
| Spain | 20.2 | 24.5 | 24.7 | 24.8 | 24.7 | 24.6 | 24.4 | 24.3 | 24.2 | 24.1 | 24.3 | 24.7 |
| France | : | 24.3 | 24.5 | 24.7 | 24.8 | 24.9 | 25.1 | 25.1 | 25.1 | 25.2 | 25.4 | 25.6* |
| Italy | 21.5 | 26.8 | 27.4 | 27.9 | 28.5 | 28.9 | 29.3 | 29.8 | 30.2 | 30.4 | 30.6 | 30.8 |
| Cyprus | 17.2 | 17 | 17 | 17.4 | 17.6 | 17.5 | 17.3 | 17.3 | 17.6 | 17.8 | 18.2 | 18.6 |
| Latvia | 17.7 | 22.1 | 22.6 | 22.9 | 23.3 | 23.6 | 24.1 | 24.4 | 24.8 | 24.9 | 25.1 | 25.2 |
| Lithuania | 16.2 | 20.8 | 21.3 | 21.7 | 22 | 22.3 | 22.3 | 22.5 | 22.7 | 23 | 23.2 | 23.3 |
| Luxembourg | 19.3 | 21.4 | 20.7 | 20.8 | 20.9 | 20.8 | 20.9 | 20.8 | 20.7 | 20.6 | 20.5 | 20.4 |
| Hungary | 20 | 22 | 22.2 | 22.3 | 22.4 | 22.6 | 22.7 | 22.9 | 23.2 | 23.5 | 23.8 | 24.2 |
| Malta | 15.7 | 17.9 | 18.1 | 18.5 | 18.7 | 19 | 19.3 | 19.8 | 19.8 | 19.8 | 20.1 | 21.2 |
| Netherlands | 18.6 | 20 | 20.1 | 20.2 | 20.3 | 20.5 | 20.8 | 21.1 | 21.5 | 21.8 | 22.3 | 22.8 |
| Austria | 22.1 | 22.9 | 22.8 | 22.8 | 22.7 | 22.7 | 23.5 | 24.3 | 25 | 25.4 | 25.7 | 26.1 |
| Poland | 15.4 | 17.6 | 18 | 18.2 | 18.4 | 18.6 | 18.7 | 18.9 | 19 | 18.9 | 18.9 | 19 |
| Portugal | 20 | 23.7 | 24.2 | 24.5 | 24.7 | 24.9 | 25.2 | 25.4 | 25.6 | 25.9 | 26.3 | 26.7 |
| Romania | 15.6 | 19.3 | 19.6 | 20.4 | 20.6 | 20.9 | 21.1 | 21.2 | 21.3 | 21.3 | 21.3 | 21.4 |
| Slovenia | 15.5 | 19.8 | 20.2 | 20.6 | 21 | 21.4 | 21.8 | 22.2 | 22.7 | 23.3 | 23.6 | 23.8 |
| Slovakia | 16 | 16.6 | 16.5 | 16.3 | 16.3 | 16.3 | 16.3 | 16.4 | 16.5 | 16.6 | 16.7 | 16.9 |
| Finland | 19.8 | 22.2 | 22.4 | 22.7 | 22.9 | 23.3 | 23.8 | 24 | 24.8 | 24.8 | 25.2 | 25.6 |
| Sweden | 27.7 | 26.9 | 26.8 | 26.6 | 26.5 | 26.4 | 26.5 | 26.4 | 26.4 | 26.7 | 27.1 | 27.7 |
| United Kingdom | 24.1 | 24.3 | 24.3 | 24.3 | 24.3 | 24.3 | 24.3 | 24.2 | 24.1 | 24.3 | 24.6 | 24.9* |

Source: Eurostat, 2011 [2]. Note:* = provisional

**Table 10 – Forecast Old-age-dependency ratio (%), EU 27 Member States 2010-2060**

| | 2010* | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 | 2055 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EU (27 countries) | 25.92 | 28.48 | 31.37 | 34.57 | 38.33 | 42.31 | 45.52 | 48 | 50.16 | 51.82 | 52.55 |
| Belgium | 26.03 | 27.99 | 30.25 | 33.23 | 36.68 | 39.3 | 40.95 | 41.69 | 42.48 | 43.07 | 43.83 |
| Bulgaria | 25.44 | 28.86 | 32.46 | 35.8 | 38.69 | 41.63 | 45.96 | 51.55 | 56.06 | 60.11 | 60.32 |
| Czech Republic | 21.57 | 26.02 | 30.37 | 32.78 | 34.32 | 35.91 | 40.07 | 46.4 | 50.14 | 53.29 | 55 |
| Denmark | 24.87 | 28.83 | 31.42 | 33.85 | 37 | 40.13 | 41.91 | 42.45 | 41.79 | 42.04 | 43.52 |
| Germany | 31.26 | 32.52 | 35.78 | 40.22 | 47.21 | 54.2 | 56.44 | 56.92 | 58.11 | 59.57 | 59.89 |
| Estonia | 25.18 | 27.21 | 30.07 | 33.12 | 35.83 | 37.61 | 40.48 | 43.59 | 48.33 | 54.28 | 55.54 |
| Ireland | 16.82 | 19.98 | 22.79 | 25.09 | 27.59 | 30.04 | 33.07 | 36.3 | 39.66 | 38.62 | 36.65 |
| Greece | 28.41 | 30.6 | 32.57 | 34.91 | 37.74 | 42.45 | 47.83 | 53.35 | 57.45 | 57.65 | 56.65 |
| Spain | 24.69 | 27.04 | 28.94 | 31.57 | 35.52 | 40.6 | 46.7 | 53.26 | 56.91 | 57.25 | 56.37 |
| France | 25.66 | 29.22 | 32.71 | 35.81 | 39.06 | 41.95 | 44.37 | 44.77 | 45.48 | 46.34 | 46.58 |
| Italy | 30.78 | 33.13 | 34.76 | 37.02 | 41.14 | 46.5 | 51.73 | 55.13 | 56.34 | 56.58 | 56.65 |
| Cyprus | 18.64 | 21.59 | 24.88 | 28.22 | 30.79 | 31.99 | 33.32 | 35.52 | 39.82 | 43.76 | 47.57 |
| Latvia | 25.19 | 26.63 | 28.84 | 32.24 | 36.17 | 39.17 | 43.27 | 47.56 | 54.25 | 63.34 | 67.99 |
| Lithuania | 23.28 | 24.41 | 26.58 | 30.42 | 35.2 | 38.76 | 41.79 | 43.74 | 47.25 | 52.73 | 56.65 |
| Luxembourg | 20.43 | 21.31 | 23.12 | 26.04 | 29.98 | 34.07 | 37.08 | 39.57 | 41.94 | 43.58 | 45.05 |
| Hungary | 24.2 | 26.15 | 29.98 | 32.79 | 33.57 | 35.69 | 39.52 | 46 | 50.18 | 54.16 | 57.81 |
| Malta | 21.26 | 27.03 | 31.75 | 36.28 | 39.22 | 39.35 | 40.2 | 42.93 | 46.47 | 51.05 | 55.56 |
| Netherlands | 22.82 | 27.11 | 30.79 | 35.15 | 40.25 | 44.84 | 47.29 | 46.91 | 46.5 | 46.69 | 47.47 |
| Austria | 26.1 | 27.82 | 29.78 | 33.34 | 38.83 | 44.22 | 46.83 | 47.39 | 48.56 | 49.27 | 50.73 |
| Poland | 18.96 | 21.75 | 26.94 | 32.42 | 35.24 | 36.86 | 39.89 | 45.25 | 53 | 60.01 | 64.59 |
| Portugal | 26.7 | 28.98 | 31.32 | 34.04 | 37.85 | 41.79 | 46.72 | 52.04 | 55.62 | 56.66 | 57.2 |
| Romania | 21.37 | 22.59 | 25.68 | 29.04 | 30.23 | 35.28 | 40.65 | 47.61 | 53.81 | 62.31 | 64.77 |
| Slovenia | 23.8 | 25.83 | 30.41 | 34.82 | 38.84 | 42.73 | 46.14 | 50.81 | 55.05 | 57.81 | 57.61 |
| Slovakia | 16.93 | 19.14 | 23.59 | 27.98 | 31.36 | 33.88 | 37.99 | 44.63 | 51.38 | 57.58 | 61.8 |
| Finland | 25.63 | 31.41 | 36.18 | 39.82 | 42.74 | 44.25 | 43.46 | 43.79 | 44.86 | 45.74 | 47.43 |
| Sweden | 27.72 | 31.28 | 33.47 | 35.3 | 37.21 | 39.27 | 40.45 | 40.85 | 41.7 | 43.71 | 46.21 |
| United Kingdom | 24.86 | 27.76 | 29.63 | 31.74 | 34.83 | 37.7 | 38.86 | 38.58 | 39.41 | 40.9 | 42.07 |

Source: Eurostat, 2011[2].
Note:* = data for 2010 is actual (or provisional) data

**Table 11 – Life expectancy at birth, HALE and healthcare expenditure for selected years. EU Member States and other countries**

| Country | Life expectancy at birth | | Healthy life expectancy (HALE) at birth[a] (years) | | | Health expenditure ratios[a] | | Per capita health expenditures[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Male | Female | Both Sexes | Total expenditure on health as % of gross domestic product | | Per capita total expenditure on health at average exchange rate (US$) | | Per capita total expenditure on health[a] (PPP int. $) | | Per capita government expenditure on health at average exchange rate (US$) | | Per capita government expenditure on health[a] (PPP int. $) | |
| | 2000 | 2008 | 2007 | 2007 | 2007 | 2000 | 2007 | 2000 | 2007 | 2000 | 2007 | 2000 | 2007 | 2000 | 2007 |
| **EU Member States** | 76 | 78 | 68 | 73 | 70 | 7 | 8 | 1186 | 2742 | 1645 | 2577 | 897 | 2123 | 1220 | 1953 |
| Romania | 71 | 73 | 63 | 68 | 65 | 5.2 | 4.7 | 87 | 369 | 298 | 592 | 59 | 296 | 202 | 475 |
| Bulgaria | 72 | 73 | 63 | 69 | 66 | 6.1 | 7.3 | 95 | 384 | 372 | 835 | 56 | 220 | 222 | 477 |
| Poland | 74 | 76 | 64 | 70 | 67 | 5.5 | 6.4 | 247 | 716 | 583 | 1035 | 173 | 507 | 408 | 733 |
| Lithuania | 72 | 72 | 58 | 68 | 63 | 6.5 | 6.2 | 212 | 717 | 559 | 1109 | 148 | 523 | 390 | 809 |
| Latvia | 71 | 71 | 59 | 68 | 64 | 6 | 6.2 | 197 | 784 | 479 | 1071 | 107 | 454 | 260 | 620 |
| Estonia | 71 | 74 | 61 | 71 | 66 | 5.3 | 5.4 | 219 | 837 | 521 | 1094 | 169 | 640 | 404 | 836 |
| Hungary | 72 | 74 | 62 | 69 | 66 | 7.0 | 7.4 | 326 | 1019 | 852 | 1388 | 231 | 720 | 602 | 980 |
| Slovakia | 73 | 75 | 64 | 70 | 67 | 7 | 8 | 248 | 1077 | 720 | 1555 | 211 | 720 | 612 | 1040 |
| Czech Republic | 75 | 77 | 68 | 72 | 70 | 6.5 | 6.8 | 361 | 1141 | 980 | 1626 | 326 | 972 | 885 | 1385 |
| Malta | 78 | 80 | 71 | 74 | 72 | 6.8 | 7.5 | 637 | 1362 | 2903 | 4053 | 462 | 1056 | 2104 | 3140 |
| Cyprus | 77 | 80 | 69 | 71 | 70 | 5.7 | 6.6 | 744 | 1778 | 1889 | 3034 | 310 | 811 | 787 | 1383 |
| Slovenia | 76 | 79 | 69 | 74 | 71 | 8.3 | 7.8 | 707 | 1836 | 1447 | 2099 | 523 | 1313 | 1070 | 1501 |
| Portugal | 77 | 79 | 69 | 73 | 71 | 8.8 | 10.0 | 970 | 2108 | 1509 | 2284 | 704 | 1489 | 1095 | 1613 |
| Greece | 78 | 80 | 71 | 74 | 72 | 8 | 10 | 919 | 2679 | 1449 | 2727 | 552 | 1617 | 870 | 1646 |
| Spain | 79 | 81 | 71 | 76 | 74 | 7 | 9 | 1036 | 2712 | 1536 | 2671 | 742 | 1947 | 1100 | 1917 |
| Italy | 79 | 82 | 73 | 76 | 74 | 8.1 | 8.7 | 1541 | 3136 | 2052 | 2686 | 1117 | 2400 | 1488 | 2056 |
| Finland | 78 | 80 | 70 | 75 | 72 | 7.2 | 8.2 | 1693 | 3809 | 1853 | 2840 | 1203 | 2843 | 1317 | 2120 |
| United Kingdom | 78 | 80 | 71 | 73 | 72 | 7.0 | 8.4 | 1769 | 3867 | 1833 | 2992 | 1403 | 3161 | 1454 | 2446 |
| Belgium | 78 | 80 | 70 | 74 | 72 | 9.1 | 9.4 | 2061 | 4056 | 2518 | 3323 | 1479 | 3005 | 1807 | 2461 |
| Germany | 78 | 80 | 71 | 75 | 73 | 10.3 | 10.4 | 2372 | 4209 | 2671 | 3588 | 1890 | 3236 | 2128 | 2758 |
| Netherlands | 78 | 80 | 72 | 74 | 73 | 8.0 | 8.9 | 1916 | 4243 | 2337 | 3509 | 1209 | 3481 | 1474 | 2878 |
| Sweden | 80 | 81 | 72 | 75 | 74 | 8.2 | 9.1 | 2280 | 4495 | 2283 | 3323 | 1936 | 3673 | 1938 | 2716 |
| Austria | 78 | 80 | 70 | 74 | 72 | 9.9 | 10.1 | 2335 | 4523 | 2824 | 3763 | 1794 | 3456 | 2169 | 2875 |
| Ireland | 76 | 80 | 71 | 74 | 73 | 6.3 | 7.6 | 1595 | 4556 | 1805 | 3424 | 1172 | 3676 | 1326 | 2762 |
| France | 79 | 81 | 71 | 76 | 73 | 10 | 11 | 2256 | 4627 | 2615 | 3709 | 1791 | 3655 | 2076 | 2930 |
| Denmark | 77 | 79 | 70 | 73 | 72 | 8 | 10 | 2478 | 5551 | 2378 | 3513.0 | 2043.0 | 4690 | 1960 | 2968 |
| Luxembourg | 78 | 80 | 71 | 75 | 73 | 5.8 | 7.1 | 2708 | 7439 | 3137 | 5734 | 2418 | 6763 | 2800 | 5212 |
| **Other countries** | | | | | | | | | | | | | | | |
| Australia | 80 | 82 | 72 | 75 | 74 | 8.3 | 8.9 | 1728 | 3986 | 2263 | 3357 | 1155 | 2691 | 1512 | 2266 |
| Canada | 79 | 81 | 71 | 75 | 73 | 8.8 | 10.1 | 2082 | 4409 | 2516 | 3900 | 1465 | 3086 | 1770 | 2730 |
| Japan | 81 | 83 | 73 | 78 | 76 | 7.7 | 8.0 | 2827 | 2751 | 1967 | 2696 | 2298 | 2237 | 1598 | 2193 |
| New Zealand | 79 | 81 | 72 | 74 | 73 | 7.7 | 9.0 | 1055 | 2790 | 1623 | 2497 | 823 | 2202 | 1266 | 1971 |
| United States of America | 77 | 78 | 68 | 72 | 70 | 13.4 | 15.7 | 4703 | 7285 | 4703 | 7285 | 2032 | 3317 | 2032 | 3317 |

Source: WHO, 2011[3]

**Table 12 - Hospital discharges, in-patients, per 100,000 inhabitants. EU 27, period 2000-2009***

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | n/a | n/a | n/a | 16,092.4 | 16,067.3 | 17,241.5 | 15,967.3 | 15,866.0 | 16,395.5 | n/a |
| Bulgaria | 14,456.2 | 14,786.5 | 15,969.5 | 17,047.2 | 18,938.4 | 20,857.0 | 21,473.7 | 22,655.3 | 23,893.1 | 25,825.5 |
| Czech Republic | n/a | n/a | 22,809.8 | 23,679.7 | 23,810.9 | 22,311.7 | 21,588.5 | 21,467.8 | 21,037.8 | 20,813.4 |
| Denmark | 17,297.7 | 17,309.4 | 17,082.0 | 16,872.9 | 17,343.3 | 17,367.5 | 9,018.5 | 17,398.6 | n/a | n/a |
| Germany | n/a | n/a | n/a | n/a | n/a | n/a | 22,040.9 | 22,710.2 | 23,241.7 | n/a |
| Estonia | 19,946.6 | 19,319.2 | 18,720.1 | 18,678.3 | 18,841.1 | 17,923.2 | 18,306.7 | 18,420.7 | 18,406.6 | 17,566.8 |
| Ireland | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Spain | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| France | 19,554.5 | 19,088.6 | 18,645.2 | 17,734.7 | 17,582.9 | 17,487.0 | 17,418.9 | 17,155.8 | 17,069.1 | 17,026.6 |
| Italy | n/a | n/a | n/a | 15,924.8 | 15,650.6 | 15,308.8 | 15,152.2 | 14,628.6 | 14,280.5 | 13,975.2 |
| Cyprus | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Lithuania | n/a | 23,386.6 | 22,767.1 | 22,536.9 | 22,679.6 | 22,531.1 | 21,725.1 | 22,026.0 | 22,178.7 | 22,392.1 |
| Luxembourg | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Hungary | n/a | n/a | n/a | n/a | 23,882.5 | 24,327.6 | 23,884.8 | 20,575.1 | 20,252.7 | 20,141.0 |
| Malta | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 11,794.0 |
| Netherlands | n/a | n/a | 9,388.3 | 9,706.4 | 10,169.1 | 10,414.1 | 10,688.7 | 10,931.0 | 11,253.6 | 11,583.8 |
| Austria | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 27,363.8 | n/a | 27,839.7 |
| Poland | n/a | n/a | n/a | 17,401.7 | 17,776.4 | 14,309.7 | 14,935.4 | 14,593.2 | 14,785.5 | 16,234.9 |
| Portugal | n/a | n/a | n/a | n/a | n/a | 9,972.8 | 10,379.6 | 15,170.2 | 17,577.8 | 18,282.9 |
| Romania | 21,747.8 | 23,354.9 | 24,680.5 | 22,853.1 | 22,724.4 | 20,305.0 | 22,953.8 | 21,513.3 | 22,758.4 | 24,902.0 |
| Slovenia | n/a | n/a | n/a | n/a | n/a | n/a | 16,674.0 | 16,836.5 | 16,901.2 | 17,365.4 |
| Slovakia | 20,580.7 | 21,150.3 | 20,244.4 | 19,600.9 | 19,740.5 | 19,805.2 | 19,940.9 | n/a | 18,840.9 | 18,739.7 |
| Finland | 21,382.5 | 20,827.9 | 20,483.0 | 20,283.1 | 19,975.1 | 19,641.4 | 19,121.1 | 18,568.2 | 18,299.8 | 17,893.7 |
| Sweden | 16,114.0 | 15,894.4 | 15,712.3 | 15,736.3 | 15,776.0 | 15,851.1 | 16,024.3 | 16,173.5 | 16,184.1 | 16,243.2 |
| United Kingdom | n/a | n/a | 13,273.3 | 13,660.1 | n/a | 13,541.1 | 12,375.1 | 12,869.8 | n/a | 13,513.6 |

Source: Eurostat, 2011[2].

Note: all causes of diseases (A00-Z99) excluding V00-Y98 based on ICD10 codes

**Table 13 – Hospital beds per 100,000 inhabitants EU 27, years 2001-2009**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| European Union (27 countries) | 629.8 | 617.2 | 601.7 | 590.8 | 582.3 | 572.0 | 562.7 | 557.3 | 550.9 |
| Belgium | 767.4 | 759.2 | 752.3 | 749.1 | 744.8 | 672.7 | 665.7 | 660.1 | 653.4 |
| Bulgaria | 722.1 | 650.4 | 630.3 | 614.7 | 642.9 | 621.4 | 638.1 | 650.8 | 661.6 |
| Czech Republic | 777.5 | 776.0 | 771.9 | 763.2 | 754.2 | 741.2 | 727.3 | 715.8 | 710.1 |
| Denmark | 422.6 | 429.2 | 413.9 | 397.6 | 386.3 | 379.8 | 370.1 | 358.2 | 350.1 |
| Germany | 901.9 | 887.8 | 874.4 | 857.6 | 846.4 | 829.1 | 823.4 | 820.3 | 822.9 |
| Estonia | 672.9 | 608.2 | 593.4 | 582.6 | 548.4 | 565.3 | 557.3 | 571.5 | 543.9 |
| Ireland | 591.2 | 582.9 | 571.8 | 569.9 | 552.4 | 534.0 | 519.9 | 495.1 | n/a |
| Greece | 478.2 | 472.1 | 470.3 | 469.8 | 473.8 | 482.7 | 482.4 | 478.4 | 485.8 |
| Spain | 361.6 | 356.7 | 347.8 | 344.5 | 338.9 | 334.2 | 330.2 | 324.5 | 319.3 |
| France | 779.9 | 764.2 | 747.6 | 732.0 | 715.7 | 704.7 | 700.0 | 684.6 | 660.5 |
| Italy | 461.5 | 444.6 | 417.9 | 400.6 | 400.9 | 395.2 | 386.1 | 374.1 | 364.3 |
| Cyprus | 439.8 | 438.2 | 431.1 | 421.0 | 380.0 | 373.7 | 374.5 | 377.2 | n/a |
| Latvia | 817.1 | 773.4 | 779.3 | 771.4 | 766.4 | 758.6 | 755.4 | 744.5 | 638.3 |
| Lithuania | 832.2 | 805.5 | 778.4 | 745.9 | 711.1 | 690.7 | 690.2 | 685.3 | 682.4 |
| Luxembourg | n/a | n/a | n/a | 643.8 | 583.4 | 569.4 | 571.4 | 562.4 | 551.4 |
| Hungary | 786.8 | 786.3 | 784.5 | 783.5 | 786.2 | 792.1 | 719.3 | 711.0 | 715.0 |
| Malta | 753.6 | 745.8 | 740.5 | 743.0 | 742.5 | 752.3 | 778.0 | 731.4 | 482.6 |
| Netherlands | 466.8 | 458.3 | 450.9 | 447.8 | 445.8 | 478.4 | 474.9 | 471.0 | 466.9 |
| Austria | 782.7 | 778.9 | 771.3 | 770.7 | 766.2 | 764.9 | 773.1 | 766.2 | 765.0 |
| Poland | n/a | n/a | 668.1 | 667.0 | 652.2 | 647.5 | 642.5 | 661.8 | 665.0 |
| Portugal | 374.9 | 365.1 | 366.2 | 365.1 | 354.5 | 345.9 | 341.3 | 336.8 | 334.9 |
| Romania | 794.1 | 767.5 | 675.3 | 674.5 | 678.1 | 674.8 | 654.4 | 657.4 | 662.6 |
| Slovenia | 516.9 | 508.9 | 496.0 | 480.1 | 483.9 | 477.5 | 468.3 | 476.9 | 462.0 |
| Slovakia | 766.9 | 756.9 | 723.7 | 689.5 | 676.7 | 670.9 | 674.9 | 655.0 | 649.7 |
| Finland | 747.2 | 735.9 | 725.3 | 710.9 | 706.5 | 699.9 | 674.5 | 653.8 | 623.1 |
| Sweden | 326.9 | 313.4 | 305.7 | 301.8 | 293.8 | 289.8 | 287.4 | 281.6 | 277.1 |
| United Kingdom | 404.5 | 398.9 | 396.2 | 387.6 | 374.6 | 356.8 | 341.9 | 336.6 | 330.2 |

Source: Eurostat, 2011[2]

**Table 14 – Long-term beds in nursing and residential facilities per 100,000 inhabitants EU 27, years 2001-2009**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | 1,201.2 | 1,200.2 | 1,199.6 | 1,197.5 | 1,198.7 | 1,199.8 | 1,211.5 | 1,210.5 | 1,217.1 |
| Bulgaria | 59.8 | 53.6 | 54.5 | 56.0 | 56.1 | 56.9 | 56.0 | 56.3 | 59.4 |
| Czech Republic | n/a | n/a | n/a | n/a | 672.0 | 675.7 | 673.1 | 657.4 | 650.3 |
| Denmark | 866.0 | 858.1 | 818.0 | 820.3 | 818.3 | 829.3 | 848.6 | 840.7 | 843.3 |
| Germany | 817.9 | n/a | 864.1 | n/a | 918.5 | n/a | 971.9 | n/a | 1,033.0 |
| Estonia | 444.2 | 458.3 | 463.8 | 477.7 | 503.4 | 527.3 | 550.2 | 580.9 | 607.9 |
| Ireland | 440.8 | 452.0 | 474.5 | 478.7 | 474.7 | 509.5 | 522.5 | 522.4 | n/a |
| Greece | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Spain | n/a | 151.8 | 169.1 | 326.7 | 319.8 | 358.7 | 434.9 | 440.1 | 491.8 |
| France | 301.2* | 237.9 | 359.6 | 490.6 | 605.5 | 659.1 | 716.5 | 831.2 | 838.6 |
| Italy | 235.4 | 258.5 | 269.7 | 276.6 | 290.5 | 307.4 | 318.7 | 321.1 | 332.5 |
| Cyprus | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Latvia | 219.9 | 225.6 | 244.7 | 241.3 | 231.7 | 241.6 | 234.0 | 213.9 | 243.3 |
| Lithuania | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Luxembourg | 581.8 | 610.1 | 656.5 | 671.0 | 687.1 | 659.4 | 689.6 | n/a | n/a |
| Hungary | 665.8 | 689.0 | 709.0 | 728.2 | 753.1 | 761.5 | 799.9 | 806.5 | 821.2 |
| Malta | n/a | 800.4 | 775.5 | 794.5 | 510.6 | 531.1 | 536.2 | 633.0 | 1,007.3 |
| Netherlands | 1,060.2 | 1,048.3 | 1,049.0 | 1,050.4 | 1,045.5 | 1,041.2 | 1,035.6 | 1,031.9 | 1,034.8 |
| Austria | n/a | n/a | n/a | 648.5 | n/a | n/a | 670.5 | n/a | 676.8 |
| Poland | n/a | n/a | 225.2 | 228.5 | 232.6 | 231.9 | 231.7 | 231.4 | 231.3 |
| Portugal | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Romania | 93.3 | 92.5 | 99.4 | 102.2 | 93.8 | 94.1 | 97.9 | 98.2 | 94.3 |
| Slovakia | n/a | n/a | n/a | 548.7 | 543.9 | 559.6 | 566.0 | 564.4 | 585.8 |
| Slovenia | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Finland | 697.5 | 737.6 | 753.0 | 781.6 | 818.9 | 921.8 | 975.7 | 1,016.6 | 1,050.7 |
| Sweden | 1,708.0 | 1,677.7 | 1,628.1 | 1,566.1 | 1,518.3 | 1,489.0 | 1,465.8 | 1,480.8 | 1,435.1 |
| United Kingdom | n/a | n/a | 870.2* | 896.5* | 885.0 | 877.2 | 868.0 | 861.3 | 866.5 |

Source: Eurostat, 2011[2]

**Table 15 – In-patient average length of stay (in days). EU 27, period 2001-2009.**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | n/a | n/a | 7.8 | 7.7 | 7.4 | 7.4 | 7.4 | 7.6 | n/a |
| Bulgaria | 10.9 | 9.9 | 9.3 | 8.7 | 8.2 | 7.5 | 7.2 | 6.8 | 6.5 |
| Czech Republic | n/a | 10.2 | 10.1 | 10.1 | 10.7 | 10.5 | 10.4 | 10.2 | 10.2 |
| Denmark | 6.0 | 5.9 | 5.7 | n/a | n/a | 5.3 | 5.2 | n/a | n/a |
| Germany | n/a | n/a | n/a | n/a | n/a | 10.1 | 10.1 | 9.8 | n/a |
| Estonia | 8.5 | 7.9 | 7.7 | 7.5 | 7.7 | 7.7 | 8.0 | 7.9 | 7.7 |
| Ireland | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Spain | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| France | 6.0 | 6.0 | 5.9 | 5.9 | 5.8 | 5.7 | 5.7 | 0.5 | 0.5 |
| Italy | n/a | n/a | 7.4 | 7.4 | 7.4 | 7.5 | 7.5 | n/a | 7.6 |
| Cyprus | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Lithuania | 9.9 | 9.6 | 9.3 | 9.1 | 9.0 | 8.9 | 8.6 | 8.4 | 8.1 |
| Luxembourg | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Hungary | n/a | n/a | n/a | 8.0 | 7.9 | 7.8 | 7.8 | 7.9 | 6.4 |
| Malta | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 6.6 |
| Netherlands | n/a | 7.8 | 7.5 | 7.0 | 6.8 | 6.6 | 6.3 | 6.1 | 5.8 |
| Austria | n/a | n/a | n/a | n/a | n/a | n/a | 9.0 | 8.9 | 8.8 |
| Poland | n/a | n/a | 7.1 | 6.7 | 8.2 | 8.0 | 7.8 | 7.9 | 7.7 |
| Portugal | n/a | n/a | n/a | n/a | 6.4 | 6.2 | 4.2 | 3.7 | 3.5 |
| Romania | 9.0 | 8.9 | 8.4 | 8.3 | 8.0 | 7.9 | 7.7 | 7.7 | 7.6 |
| Slovenia | n/a | n/a | n/a | n/a | n/a | 7.5 | 7.5 | 7.5 | 7.3 |
| Slovakia | 9.4 | 8.9 | 8.7 | 8.6 | 8.3 | 8.2 | n/a | 7.8 | 7.7 |
| Finland | 12.4 | 12.7 | 12.4 | 12.3 | 12.3 | 12.4 | 12.7 | 12.1 | 12.2 |
| Sweden | 7.0 | 6.9 | 6.8 | 6.7 | 6.6 | 6.6 | 6.5 | 6.5 | 6.3 |
| United Kingdom | 10.2 | 9.7 | 9.0 | n/a | n/a | 8.7 | 7.9 | n/a | 7.4 |

Source: Eurostat, 2011[2]. Note: all causes of diseases (A00-Z99) excluding V00-Y98 based on ICD10 codes

**Table 16 – Practising physicians or doctors per 100,000 inhabitants. EU27. Period 2001–2009**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | 284.2 | 285.2 | 285.2 | 286.2 | 286.2 | 287.6 | 289.4 | 290.9 | 291.3 |
| Bulgaria | 344.5 | 352.9 | 360.6 | 353.3 | 365.3 | 366.1 | 365.3 | 361.3 | 370.0 |
| Czech Republic | 345.1 | 350.4 | 352.2 | 351.3 | 354.9 | 355.7 | 354.6 | 352.7 | 355.5 |
| Denmark | 292.8 | 303.1 | 307.7 | 321.6 | 330.4 | 337.9 | 339.3 | 341.6 | n/a |
| Germany | 330.3 | 333.4 | 336.7 | 339.1 | 341.2 | 345.5 | 350.5 | 356.2 | 364.1 |
| Estonia | 318.0 | 314.7 | 316.6 | 321.7 | 316.9 | 319.3 | 325.9 | 333.4 | 326.7 |
| Ireland | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Greece | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Spain | 311.0 | 305.1 | 328.3 | 340.1 | 379.9 | 365.4 | 368.3 | 352.2 | 354.8 |
| France | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Italy | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 336.2 |
| Cyprus | 260.7 | 260.6 | 257.3 | 262.3 | 257.8 | 250.4 | 271.5 | 285.6 | n/a |
| Latvia | 267.8 | 276.3 | 279.3 | 286.3 | 288.9 | 294.5 | 304.5 | 311.3 | 300.4 |
| Lithuania | 362.6 | 368.2 | 363.6 | 357.5 | 363.2 | 366.2 | 372.8 | 370.6 | 366.2 |
| Luxembourg | 219.8 | 224.6 | 236.1 | 240.7 | 253.7 | 255.8 | 267.3 | 269.7 | 268.9 |
| Hungary | 289.4 | 320.0 | 325.1 | 334.0 | 278.4 | 303.7 | 280.6 | 309.3 | 302.3 |
| Malta | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 304.4 |
| Netherlands | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Austria | 395.1 | 402.1 | 410.3 | 418.6 | 430.3 | 444.2 | 452.5 | 458.5 | 467.1 |
| Poland | 226.7 | 230.4 | 243.5 | 229.1 | 213.9 | 218.0 | 219.1 | 216.1 | 217.0 |
| Portugal | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Romania | 199.6 | 196.0 | 199.6 | 208.1 | 217.4 | 215.8 | 212.3 | 221.5 | 225.9 |
| Slovenia | 216.9 | 222.6 | 224.7 | 229.7 | 234.2 | 235.8 | 239.5 | 238.8 | 240.1 |
| Slovakia | 322.4 | 320.0 | 314.6 | 314.6 | n/a | n/a | 300.0 | n/a | n/a |
| Finland | 250.3 | 253.0 | 256.7 | 259.5 | 263.9 | 268.7 | 269.5 | 272.7 | n/a |
| Sweden | 318.1 | 327.8 | 335.0 | 342.7 | 349.6 | 358.2 | 364.7 | 371.5 | n/a |
| United Kingdom | 200.4 | 208.0 | 217.2 | 230.6 | 238.6 | 244.1 | 247.8 | 255.9 | 265.9 |

Source: Eurostat, 2011[2]

**Table 17 - Nursing and caring professionals per 100,000 inhabitants. EU27. Period 2001-2009**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Bulgaria | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Czech Republic | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 1,150.4 |
| Denmark | 2,386.6 | 2,422.1 | 2,422.3 | 2,457.1 | 2,510.8 | 2,501.0 | 2,477.9 | 2,522.2 | n/a |
| Germany | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Estonia | 659.6 | 673.9 | 696.6 | 701.3 | 835.7 | 836.0 | 846.2 | 902.5 | 898.9 |
| Ireland* | n/a | n/a | n/a | 1,718.5 | 1,707.9 | 1,867.1 | 1,956.4 | 1,926.4 | 1,871.8 |
| Greece | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Spain | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| France | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Italy | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Cyprus | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Latvia | 522.7 | 535.1 | 564.4 | 597.2 | 602.9 | 660.5 | 647.8 | 650.3 | 570.9 |
| Lithuania | 977.0 | 945.4 | 914.0 | 900.5 | 914.5 | 920.3 | 915.2 | 933.0 | 914.1 |
| Luxembourg | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Hungary | 817.4 | 835.5 | 840.7 | 839.7 | 870.6 | 891.3 | 878.6 | 885.8 | 887.3 |
| Malta | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Netherlands | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Austria | 784.7 | 781.6 | 788.3 | 775.9 | 779.9 | 797.1 | 801.1 | 813.7 | 825.9 |
| Poland | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Portugal | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Romania | 813.6 | 845.6 | 824.3 | 831.9 | 844.9 | 861.0 | 829.4 | 834.3 | 860.8 |
| Slovenia | n/a | n/a | 856.8 | 862.9 | 869.8 | 883.2 | 933.8 | 927.0 | 960.3 |
| Slovakia | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Finland | n/a | n/a | n/a | 2,706.4 | 2,775.1 | 2,876.5 | 2,968.1 | 3,074.3 | n/a |
| Sweden | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| United Kingdom | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

Source: Eurostat, 2011[2]. *Note: data for Ireland for 2005 to 2009 are estimates.

**Table 18 - Standardised death rate (per 100,000 inhabitants), period 2001-2009. EU 27**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| EU (27 MS) | 706.2 | 723.0 | 705.0 | 673.1 | 666.4 | 636.2 | 640.6 | 628.2 | 600.6 |
| Belgium | n/a | n/a | n/a | 639.2 | 635.3 | n/a | n/a | n/a | n/a |
| Bulgaria | 1,104.4 | 1,102.9 | 1,089.2 | 1,056.3 | 1,065.5 | 1,046.3 | 1,028.5 | 995.7 | 965.1 |
| Czech Republic | 877.5 | 880.9 | 899.3 | 851.7 | 837.8 | 789.3 | 767.1 | 747.1 | 744.6 |
| Denmark | 749.5 | 752.8 | 734.5 | 707.1 | 684.5 | 682.6 | 673.9 | 652.4 | 643.8 |
| Germany | 657.1 | 660.5 | 664.7 | 628.2 | 620.1 | 596.2 | 585.0 | 582.4 | 575.6 |
| Estonia | 1,116.6 | 1,090.9 | 1,066.6 | 1,028.5 | 994.2 | 975.9 | 959.6 | 893.8 | 839.8 |
| Ireland | 746.2 | 717.0 | 685.9 | 658.3 | 651.9 | 644.2 | 602.7 | 588.8 | 587.4 |
| Greece | 679.4 | 674.8 | 673.6 | 663.7 | 638.3 | 617.0 | 623.1 | 595.7 | 577.4 |
| Spain | 596.2 | 593.0 | 600.3 | 565.5 | 568.7 | 532.3 | 534.2 | 520.1 | 504.3 |
| France | 609.8 | 607.1 | 616.6 | 564.0 | 566.4 | 538.8 | 521.8 | 517.5 | n/a |
| Italy | 585.0 | 571.5 | 586.6 | n/a | n/a | 516.7 | 511.6 | 502.9 | n/a |
| Cyprus | 633.8 | 664.3 | 645.0 | 620.5 | 640.1 | 580.2 | 583.2 | 549.5 | 531.6 |
| Latvia | 1,148.3 | 1,127.0 | 1,114.3 | 1,091.1 | 1,108.7 | 1,113.1 | 1,095.3 | 1,006.9 | 951.3 |
| Lithuania | 1,037.9 | 1,021.9 | 1,007.3 | 1,017.2 | 1,081.4 | 1,091.0 | 1,095.8 | 1,033.8 | 964.0 |
| Luxembourg | 670.7 | 664.7 | 706.1 | 614.8 | 611.4 | 614.9 | 603.0 | 529.6 | 544.8 |
| Hungary | 1,035.4 | 1,034.4 | 1,047.7 | 1,009.5 | 1,015.3 | 969.0 | 962.6 | 926.1 | 914.7 |
| Malta | 668.7 | 671.4 | 682.5 | 627.9 | 629.5 | 627.4 | 589.6 | n/a | 572.0 |
| Netherlands | 680.5 | 678.3 | 666.1 | 630.4 | 615.5 | 595.9 | 571.9 | 566.0 | 549.1 |
| Austria | 632.4 | 649.3 | 650.9 | 617.7 | 607.4 | 581.3 | 562.1 | 557.2 | 562.7 |
| Poland | 911.7 | 890.4 | 892.4 | 870.7 | 860.8 | 841.3 | 836.3 | 819.0 | 809.2 |
| Portugal | 736.1 | 729.1 | 730.8 | 674.1 | 689.9 | 638.5 | 633.6 | 623.8 | 611.6 |
| Romania | 1,110.5 | 1,143.3 | 1,121.3 | 1,072.9 | 1,064.1 | 1,025.8 | 979.1 | 963.9 | 959.4 |
| Slovenia | 784.1 | 777.3 | 793.5 | 735.6 | 727.5 | 678.9 | 669.5 | 633.5 | 625.5 |
| Slovakia | 990.6 | 971.7 | 974.1 | 945.6 | 956.4 | 930.4 | 917.0 | 887.8 | 864.9 |
| Finland | 677.5 | 675.8 | 660.0 | 636.9 | 620.9 | 605.1 | 602.4 | 586.8 | 580.0 |
| Sweden | 599.5 | 598.6 | 582.2 | 568.6 | 560.5 | 547.3 | 541.3 | 533.2 | 520.4 |
| UK | 683.4 | 679.3 | 676.4 | 648.5 | 636.1 | 608.3 | 598.7 | 591.2 | 563.0 |

Source: Eurostat, 2011[2].

Note1: All causes of death (A00-Y89) excluding S00-T98 based on ICD10.

Note 2: The (age-) standardised death rate is a weighted average of age-specific mortality rates. The weighting factor is the age distribution of a standard reference population. The standard reference population used is the European standard population (see the link at the bottom of the page 21.4 Annex) as defined by the World Health Organisation (WHO). As method for standardisation, the direct method is applied. Standardised death rates are calculated for the age group 0-64 ('premature death') and for the total of ages. As most causes of death vary significantly with people's age and sex, the use of standardised death rates improves comparability over time and between countries.

**Table 19 – Death rate due to chronic disease (per 100,000 inhabitants), selected years. EU 27**

| | 1995 | 2000 | 2005 | 2008 |
|---|---|---|---|---|
| EU (27 MS) | n/a | 142.3 | 128.2 | 120.6 |
| Belgium | 140.1 | n/a | 112.3 | n/a |
| Bulgaria | 238.5 | 205.7 | 207.7 | 192.1 |
| Czech Republic | 221.2 | 187.7 | 159.9 | 147.8 |
| Denmark | 169.3 | 144.7 | 121.6 | 111.9 |
| Germany | 152.9 | 128.6 | 114.1 | 106.6 |
| Estonia | 293.9 | 241.4 | 201.3 | 178.5 |
| Ireland | 159.4 | 135.5 | 106 | 103.1 |
| Greece | 118.8 | 112.7 | 107.8 | 104.2 |
| Spain | 125.9 | 112.1 | 101.3 | 95.3 |
| France | 127.2 | 119.5 | 108.1 | 100.9 |
| Italy | 124.9 | 107.4 | n/a | 87 |
| Cyprus | n/a | n/a | 80 | 83.1 |
| Latvia | n/a | 243.2 | 241.7 | 227.1 |
| Lithuania | 277.7 | 209.1 | 234.5 | 238.7 |
| Luxembourg | 147.3 | 116.2 | 104.3 | 87.2 |
| Hungary | 353 | 310.1 | 276.1 | 261.4 |
| Malta | 126.3 | 115.8 | 102.8 | n/a |
| Netherlands | 131 | 119.5 | 104.9 | 97.9 |
| Austria | 151.7 | 129.5 | 115.2 | 105.1 |
| Poland | 207.5 | 195.1 | 173.1 | 165.3 |
| Portugal | 142.9 | 125 | 111.2 | 103.1 |
| Romania | n/a | 255.3 | 239.8 | 225.9 |
| Slovenia | 191.4 | 161.5 | 134.3 | 135.8 |
| Slovakia | n/a | 212.3 | 185.5 | 188.1 |
| Finland | 136.4 | 122.2 | 114.7 | 107 |
| Sweden | 112.7 | 100.5 | 88.7 | 82.5 |
| United Kingdom | 147.7 | 131.6 | 117.4 | 110.1 |

Source: Eurostat, 2011[2].

**Table 20 – Population Self-perceived health status (%) in 2009**

| | All age ranges | | | | |
|---|---|---|---|---|---|
| | very good | good | fair | bad | very bad |
| Belgium | 24.9 | 52.3 | 18.9 | 3.4 | 0.4 |
| Bulgaria | 10.9 | 44.2 | 31.2 | 11.0 | 2.7 |
| Czech Republic | 18.7 | 44.1 | 28.2 | 7.8 | 1.2 |
| Denmark | 35.3 | 42.6 | 16.0 | 4.5 | 1.6 |
| Germany | 20.3 | 61.8 | 16.1 | 1.9 | n/a |
| Estonia | 8.4 | 33.5 | 47.4 | 9.4 | 1.4 |
| Ireland | 54.5 | 32.6 | 11.0 | 1.9 | n/a |
| Greece | 45.7 | 27.1 | 17.9 | 7.2 | 2.1 |
| Spain | 11.2 | 56.8 | 23.2 | 6.7 | 2.2 |
| France | 23.8 | 45.8 | 14.1 | 13.7 | 2.5 |
| Italy | 18.9 | 42.1 | 31.7 | 6.0 | 1.3 |
| Cyprus | 44.8 | 36.0 | 14.0 | 3.6 | 1.6 |
| Latvia | 3.9 | 32.8 | 49.1 | 11.3 | 2.8 |
| Lithuania | 23.5 | 22.6 | 45.1 | 5.2 | 3.6 |
| Hungary | 10.1 | 35.0 | 36.8 | 14.6 | 3.5 |
| Malta | 17.1 | 52.0 | 27.3 | 2.8 | 0.7 |
| Netherlands | 21.7 | 56.0 | 17.9 | 3.9 | 0.5 |
| Austria | 34.3 | 39.2 | 20.4 | 4.9 | 1.2 |
| Poland | 8.5 | 35.4 | 34.4 | 17.7 | 4.1 |
| Portugal | 2.4 | 25.8 | 43.3 | 22.5 | 6.0 |
| Romania | 26.5 | 40.6 | 22.5 | 8.0 | 2.4 |
| Slovenia | 8.2 | 18.4 | 60.6 | 11.1 | 1.6 |
| Slovakia | 35.0 | 32.7 | 21.6 | 7.0 | 3.8 |
| Finland | 26.3 | 32.6 | 30.1 | 9.1 | 2.0 |
| Sweden | 37.8 | 36.4 | 19.1 | 5.0 | 1.8 |
| UK | 36.5 | 39.7 | 17.3 | 5.0 | 1.4 |

Source: Eurostat, 2011[2]

**Table 21 - Population Self-perceived health status, age range 15-24 years old (%) in 2009**

| | From 15 to 24 years | | | | |
|---|---|---|---|---|---|
| | very good | good | fair | bad | very bad |
| Belgium | 42.1 | 50.0 | 7.5 | 0.3 | 0.1 |
| Bulgaria | 28.9 | 55.7 | 12.4 | 2.5 | 0.4 |
| Czech Republic | 45.1 | 45.6 | 8.1 | 1.1 | n/a |
| Denmark | 46.9 | 42.5 | 9.3 | 1.3 | 0.1 |
| Germany | 41.0 | 53.7 | 5.3 | n/a | n/a |
| Estonia | 20.2 | 55.4 | 23.1 | 1.3 | n/a |
| Ireland | 63.7 | 29.6 | 6.0 | 0.7 | n/a |
| Greece | 88.9 | 9.6 | 0.9 | 0.3 | 0.3 |
| Spain | 18.7 | 67.9 | 11.8 | 1.2 | 0.4 |
| France | 45.2 | 44.3 | 7.1 | 2.7 | 0.7 |
| Italy | 41.4 | 48.7 | 9.0 | 0.5 | 0.3 |
| Cyprus | 72.9 | 22.2 | 2.0 | 0.7 | 2.2 |
| Latvia | 8.5 | 58.1 | 30.2 | 2.8 | 0.3 |
| Lithuania | 35.5 | 33.1 | 28.4 | 3.0 | n/a |
| Hungary | 23.8 | 56.5 | 15.7 | 2.9 | 1.1 |
| Malta | 37.2 | 52.7 | 9.0 | 0.9 | 0.2 |
| Netherlands | 27.2 | 62.3 | 9.5 | 0.9 | 0.0 |
| Austria | 56.7 | 32.3 | 8.7 | 1.8 | 0.4 |
| Poland | 25.3 | 58.5 | 14.3 | 1.7 | 0.2 |
| Portugal | 8.4 | 64.0 | 25.8 | 1.4 | 0.4 |
| Romania | 61.1 | 33.6 | 4.3 | 0.8 | 0.3 |
| Slovenia | 17.2 | 36.2 | 44.2 | 2.5 | n/a |
| Slovakia | 56.4 | 28.7 | 10.4 | 2.6 | 2.0 |
| Finland | 45.1 | 33.1 | 18.4 | 3.1 | 0.3 |
| Sweden | 55.4 | 33.9 | 9.2 | 0.9 | 0.5 |
| UK | 35.6 | 49.7 | 12.8 | 1.6 | 0.3 |

Source: Eurostat, 2011[2]

**Table 22 - Population Self-perceived health status, age range 25-34 years old (%) in 2009**

| | From 25 to 34 years | | | | |
|---|---|---|---|---|---|
| | very good | good | fair | bad | very bad |
| Belgium | 37.9 | 52.2 | 8.8 | 0.8 | 0.3 |
| Bulgaria | 19.3 | 60.9 | 16.1 | 2.5 | 1.3 |
| Czech Republic | 27.6 | 57.4 | 13.0 | 2.0 | n/a |
| Denmark | 44.5 | 43.4 | 9.8 | 1.8 | 0.5 |
| Germany | 32.5 | 60.8 | 6.5 | 0.3 | n/a |
| Estonia | 12.5 | 48.2 | 36.9 | 2.1 | 0.3 |
| Ireland | 66.4 | 28.1 | 5.2 | 0.3 | n/a |
| Greece | 79.7 | 16.5 | 2.2 | 0.8 | 0.9 |
| Spain | 15.7 | 68.3 | 13.1 | 2.4 | 0.6 |
| France | 32.6 | 51.2 | 10.1 | 5.2 | 0.9 |
| Italy | 33.1 | 50.8 | 14.7 | 1.1 | 0.3 |
| Cyprus | 66.9 | 25.1 | 4.4 | 1.2 | 2.3 |
| Latvia | 6.8 | 47.3 | 41.2 | 4.0 | 0.7 |
| Lithuania | 34.9 | 32.0 | 30.0 | 2.7 | 0.5 |
| Hungary | 20.1 | 50.9 | 24.1 | 4.3 | 0.5 |
| Malta | 28.7 | 55.7 | 13.9 | 0.8 | 0.9 |
| Netherlands | 30.8 | 57.3 | 10.3 | 1.4 | 0.1 |
| Austria | 48.7 | 38.3 | 10.7 | 1.8 | 0.5 |
| Poland | 12.0 | 58.8 | 25.2 | 3.4 | 0.7 |
| Portugal | 5.7 | 54.0 | 35.6 | 4.1 | 0.6 |
| Romania | 40.5 | 46.9 | 9.5 | 2.4 | 0.7 |
| Slovenia | 16.7 | 28.9 | 51.1 | 2.2 | 1.1 |
| Slovakia | 46.1 | 34.1 | 14.6 | 3.7 | 1.5 |
| Finland | 41.3 | 34.6 | 20.9 | 3.0 | 0.2 |
| Sweden | 48.0 | 37.7 | 11.9 | 1.9 | 0.5 |
| UK | 39.3 | 44.4 | 13.8 | 2.0 | 0.4 |

Source: Eurostat, 2011[2]

**Table 23 - Population Self-perceived health status, age range 35-44 years old (%) in 2009**

| | From 35 to 44 years | | | | |
|---|---|---|---|---|---|
| | very good | good | fair | bad | very bad |
| Belgium | 28.5 | 56.7 | 12.5 | 2.1 | 0.2 |
| Bulgaria | 9.1 | 59.3 | 24.7 | 5.9 | 1.0 |
| Czech Republic | 18.1 | 52.7 | 26.0 | 2.8 | 0.5 |
| Denmark | 38.1 | 45.1 | 12.8 | 3.0 | 1.1 |
| Germany | 23.7 | 64.3 | 10.8 | 1.2 | n/a |
| Estonia | 6.9 | 37.8 | 50.5 | 4.5 | 0.3 |
| Ireland | 63.8 | 29.5 | 5.5 | 1.1 | n/a |
| Greece | 63.7 | 28.5 | 5.8 | 1.3 | 0.6 |
| Spain | 12.6 | 64.7 | 17.9 | 3.6 | 1.2 |
| France | 26.7 | 50.7 | 12.4 | 8.5 | 1.7 |
| Italy | 21.7 | 53.0 | 23.0 | 1.9 | 0.4 |
| Cyprus | 52.5 | 37.7 | 6.9 | 1.4 | 1.4 |
| Latvia | 2.3 | 32.7 | 56.3 | 7.1 | 1.5 |
| Lithuania | 25.1 | 28.0 | 42.9 | 3.1 | 1.0 |
| Hungary | 11.9 | 45.8 | 32.5 | 8.3 | 1.5 |
| Malta | 17.7 | 61.5 | 19.4 | 1.4 | n/a |
| Netherlands | 23.6 | 59.5 | 13.0 | 3.3 | 0.6 |
| Austria | 40.0 | 43.1 | 13.8 | 2.7 | 0.4 |
| Poland | 5.5 | 42.5 | 40.9 | 9.8 | 1.3 |
| Portugal | 3.5 | 40.3 | 47.1 | 7.7 | 1.5 |
| Romania | 23.7 | 52.5 | 18.2 | 4.6 | 1.0 |
| Slovenia | 6.2 | 16.4 | 70.6 | 6.2 | 0.6 |
| Slovakia | 32.5 | 37.3 | 22.1 | 4.5 | 3.6 |
| Finland | 34.6 | 30.6 | 25.0 | 7.9 | 1.9 |
| Sweden | 44.7 | 37.6 | 13.0 | 4.0 | 0.8 |
| UK | 39.7 | 43.1 | 13.1 | 3.3 | 0.9 |

Source: Eurostat, 2011[2]

**Table 24 - Population Self-perceived health status, age range 45-54 years old (%) in 2009**

| | From 45 to 54 years | | | | |
|---|---|---|---|---|---|
| | very good | good | fair | bad | very bad |
| Belgium | 21.3 | 55.1 | 20.1 | 3.2 | 0.3 |
| Bulgaria | 4.6 | 42.5 | 40.4 | 10.0 | 2.5 |
| Czech Republic | 10.6 | 42.5 | 35.6 | 10.4 | 0.9 |
| Denmark | 33.9 | 42.8 | 16.7 | 4.9 | 1.8 |
| Germany | 17.1 | 63.9 | 16.1 | 2.9 | n/a |
| Estonia | 4.5 | 26.7 | 57.3 | 10.6 | 0.8 |
| Ireland | 53.1 | 36.1 | 8.6 | 2.1 | n/a |
| Greece | 43.1 | 40.3 | 12.7 | 3.0 | 0.9 |
| Spain | 10.1 | 59.2 | 22.3 | 6.7 | 1.7 |
| France | 15.8 | 49.7 | 16.5 | 15.3 | 2.7 |
| Italy | 12.6 | 48.0 | 35.8 | 3.1 | 0.5 |
| Cyprus | 37.1 | 45.9 | 12.7 | 3.3 | 1.0 |
| Latvia | 1.8 | 21.7 | 60.3 | 13.5 | 2.6 |
| Lithuania | 16.1 | 16.9 | 53.9 | 7.2 | 5.8 |
| Hungary | 3.3 | 28.5 | 44.6 | 19.4 | 4.1 |
| Malta | 10.8 | 56.1 | 29.3 | 3.3 | 0.5 |
| Netherlands | 19.7 | 56.4 | 17.7 | 5.5 | 0.7 |
| Austria | 27.1 | 44.0 | 23.1 | 5.0 | 0.8 |
| Poland | 2.7 | 23.6 | 47.0 | 23.2 | 3.6 |
| Portugal | 2.1 | 27.9 | 49.0 | 17.0 | 4.1 |
| Romania | 11.9 | 50.4 | 27.9 | 7.9 | 2.0 |
| Slovenia | 5.0 | 14.5 | 65.0 | 13.0 | 2.5 |
| Slovakia | 22.5 | 31.4 | 30.2 | 10.8 | 5.2 |
| Finland | 32.7 | 32.2 | 26.3 | 7.5 | 1.4 |
| Sweden | 38.1 | 37.5 | 18.1 | 4.8 | 1.5 |
| UK | 32.0 | 41.5 | 18.7 | 6.2 | 1.6 |

Source: Eurostat, 2011[2]

**Table 25 - Population Self-perceived health status, age range 55-64 years old (%) in 2009**

| | From 55 to 64 years | | | | |
|---|---|---|---|---|---|
| | very good | good | fair | bad | very bad |
| Belgium | 13.4 | 56.5 | 26.0 | 3.5 | 0.7 |
| Bulgaria | 2.7 | 29.3 | 48.6 | 16.8 | 2.6 |
| Czech Republic | 4.0 | 39.6 | 41.7 | 13.1 | 1.6 |
| Denmark | 30.9 | 41.5 | 19.0 | 5.9 | 2.7 |
| Germany | 7.8 | 64.0 | 25.8 | 2.4 | n/a |
| Estonia | 3.8 | 17.7 | 62.2 | 14.6 | 1.7 |
| Ireland | 40.4 | 38.7 | 18.5 | 2.4 | n/a |
| Greece | 21.5 | 39.3 | 28.3 | 8.4 | 2.4 |
| Spain | 6.5 | 45.6 | 34.0 | 9.8 | 4.1 |
| France | 10.2 | 41.4 | 21.7 | 22.9 | 3.8 |
| Italy | 7.5 | 38.1 | 45.5 | 7.6 | 1.3 |
| Cyprus | 22.7 | 49.4 | 23.6 | 3.3 | 1.1 |
| Latvia | 1.4 | 14.6 | 60.4 | 18.9 | 4.6 |
| Lithuania | 12.5 | 7.3 | 61.8 | 9.2 | 9.2 |
| Hungary | 2.8 | 21.7 | 48.8 | 21.4 | 5.2 |
| Malta | 7.0 | 47.2 | 41.4 | 4.1 | 0.3 |
| Netherlands | 15.2 | 52.8 | 25.8 | 5.7 | 0.6 |
| Austria | 19.4 | 42.5 | 30.6 | 6.0 | 1.5 |
| Poland | 2.0 | 12.3 | 42.9 | 35.4 | 7.5 |
| Portugal | 1.2 | 16.1 | 46.5 | 29.0 | 7.2 |
| Romania | 4.2 | 40.2 | 38.3 | 13.9 | 3.5 |
| Slovenia | 4.6 | 10.4 | 75.1 | 8.1 | 1.7 |
| Slovakia | 12.4 | 31.1 | 33.8 | 14.7 | 8.0 |
| Finland | 21.0 | 31.4 | 33.4 | 11.4 | 2.9 |
| Sweden | 29.9 | 35.1 | 24.5 | 7.7 | 2.9 |
| UK | 30.4 | 40.3 | 20.2 | 6.7 | 2.3 |

Source: Eurostat, 2011[2]

**Table 26 - Population Self-perceived health status, age range 65-74 years old (%) in 2009**

| | From 65 to 74 years | | | | |
|---|---|---|---|---|---|
| | very good | good | fair | bad | very bad |
| Belgium | 9.9 | 48.2 | 33.4 | 7.4 | 1.0 |
| Bulgaria | 1.4 | 22.5 | 46.3 | 23.6 | 6.2 |
| Czech Republic | 2.0 | 29.8 | 53.5 | 12.2 | 2.4 |
| Denmark | 22.9 | 42.5 | 23.9 | 7.8 | 2.9 |
| Germany | 6.6 | 60.5 | 29.8 | 3.1 | n/a |
| Estonia | 1.6 | 12.7 | 56.9 | 23.7 | 5.1 |
| Ireland | 32.3 | 39.6 | 23.0 | 5.2 | n/a |
| Greece | 6.4 | 33.1 | 40.4 | 15.4 | 4.7 |
| Spain | 4.0 | 37.5 | 40.8 | 13.7 | 3.9 |
| France | 7.6 | 35.6 | 20.8 | 31.3 | 4.7 |
| Italy | 4.1 | 23.5 | 56.3 | 13.5 | 2.5 |
| Cyprus | 10.2 | 44.1 | 33.7 | 10.8 | 1.3 |
| Latvia | 1.1 | 9.9 | 50.4 | 28.7 | 9.9 |
| Lithuania | n/a | n/a | n/a | n/a | n/a |
| Hungary | 2.3 | 12.9 | 49.4 | 26.9 | 8.5 |
| Malta | 5.2 | 40.9 | 48.1 | 4.2 | 1.5 |
| Netherlands | 13.6 | 48.5 | 31.2 | 5.6 | 1.1 |
| Austria | 13.9 | 38.1 | 36.6 | 9.2 | 2.2 |
| Poland | 1.6 | 7.6 | 38.5 | 39.9 | 12.5 |
| Portugal | 0.8 | 10.5 | 43.7 | 35.7 | 9.4 |
| Romania | 2.1 | 25.9 | 46.9 | 19.2 | 5.9 |
| Slovenia | 2.3 | 9.9 | 58.0 | 28.2 | 1.5 |
| Slovakia | 25.0 | 37.5 | 12.5 | 12.5 | 12.5 |
| Finland | 15.3 | 36.0 | 36.9 | 9.7 | 2.2 |
| Sweden | 25.0 | 40.4 | 27.0 | 5.9 | 1.7 |
| UK | 21.9 | 40.9 | 24.9 | 9.3 | 3.0 |

Source: Eurostat, 2011[2]

**Table 27 - Population Self-perceived health status, age range 75-84 years old (%) in 2009**

| | From 75 to 84 years | | | | |
|---|---|---|---|---|---|
| | very good | good | fair | bad | very bad |
| Belgium | 6.4 | 40.2 | 42.5 | 10.5 | 0.6 |
| Bulgaria | 1.0 | 17.8 | 42.6 | 28.9 | 9.7 |
| Czech Republic | 0.8 | 20.3 | 43.6 | 27.8 | 7.5 |
| Denmark | 17.5 | 36.2 | 31.4 | 11.6 | 3.4 |
| Germany | 6.1 | 58.1 | 29.0 | 6.9 | n/a |
| Estonia | 1.5 | 10.4 | 52.4 | 27.1 | 8.6 |
| Ireland | 25.6 | 36.8 | 31.5 | 6.1 | n/a |
| Greece | 2.5 | 18.9 | 45.4 | 27.7 | 5.6 |
| Spain | 2.6 | 31.3 | 41.8 | 17.9 | 6.4 |
| France | 5.5 | 31.3 | 19.4 | 35.5 | 8.2 |
| Italy | 1.9 | 15.3 | 54.4 | 23.5 | 5.0 |
| Cyprus | 2.4 | 27.4 | 49.7 | 18.5 | 2.0 |
| Latvia | n/a | n/a | n/a | n/a | n/a |
| Lithuania | n/a | n/a | n/a | n/a | n/a |
| Hungary | 1.0 | 9.2 | 51.0 | 30.6 | 8.2 |
| Malta | 3.1 | 27.7 | 57.4 | 10.3 | 1.5 |
| Netherlands | 8.1 | 42.6 | 38.5 | 9.2 | 1.6 |
| Austria | 10.2 | 33.0 | 38.2 | 14.8 | 3.8 |
| Poland | 2.0 | 7.6 | 33.0 | 42.2 | 15.2 |
| Portugal | 0.7 | 9.2 | 41.6 | 36.7 | 11.8 |
| Romania | 1.1 | 11.5 | 49.0 | 28.5 | 10.0 |
| Slovenia | n/a | n/a | 54.4 | 36.8 | 8.8 |
| Slovakia | n/a | n/a | n/a | n/a | n/a |
| Finland | 6.4 | 28.8 | 42.0 | 18.6 | 4.3 |
| Sweden | 15.7 | 33.5 | 35.4 | 10.6 | 4.8 |
| UK | 17.5 | 31.4 | 35.3 | 12.3 | 3.4 |

Source: Eurostat, 2011[2]

**Table 28 - Population Self-perceived health status, age range 85+ (%) in 2009**

| | 85 years or over | | | | |
|---|---|---|---|---|---|
| | very good | good | fair | bad | very bad |
| Belgium | 6.3 | 37.5 | 37.5 | 17.9 | 0.7 |
| Bulgaria | n/a | 11.4 | 40.8 | 36.3 | 11.6 |
| Czech Republic | 2.9 | 11.8 | 44.1 | 32.4 | 8.8 |
| Denmark | 14.0 | 41.5 | 31.0 | 9.0 | 4.5 |
| Germany | n/a | n/a | n/a | n/a | n/a |
| Estonia | n/a | n/a | n/a | n/a | n/a |
| Ireland | 24.1 | 29.8 | 38.8 | 7.3 | n/a |
| Greece | 2.7 | 14.4 | 42.0 | 31.4 | 9.6 |
| Spain | 4.1 | 27.7 | 36.9 | 22.3 | 9.0 |
| France | 3.4 | 28.2 | 13.8 | 42.1 | 12.5 |
| Italy | 1.2 | 11.5 | 49.7 | 28.4 | 9.2 |
| Cyprus | 6.2 | 28.0 | 55.4 | 10.5 | n/a |
| Latvia | n/a | n/a | n/a | n/a | n/a |
| Lithuania | n/a | n/a | n/a | n/a | n/a |
| Hungary | n/a | 12.3 | 58.2 | 25.4 | 4.0 |
| Malta | 7.0 | 23.3 | 51.2 | 9.3 | 9.3 |
| Netherlands | 5.9 | 45.0 | 42.2 | 6.2 | 0.7 |
| Austria | 12.5 | 25.5 | 34.1 | 18.4 | 9.5 |
| Poland | 1.7 | 7.1 | 33.6 | 40.2 | 17.4 |
| Portugal | 0.9 | 6.0 | 41.3 | 38.8 | 13.0 |
| Romania | 0.7 | 5.4 | 43.3 | 30.3 | 20.4 |
| Slovenia | n/a | 9.1 | 54.5 | 36.4 | n/a |
| Slovakia | n/a | n/a | n/a | n/a | n/a |
| Finland | n/a | n/a | n/a | n/a | n/a |
| Sweden | 11.3 | 27.3 | 39.5 | 14.0 | 7.9 |
| UK | n/a | n/a | n/a | n/a | n/a |

Source: Eurostat, 2011[2]

**Table 29 – Doctor consultations per capita in 18 EU Member States**

| | 2005 | 1995 | | 2005 | 1995 |
|---|---|---|---|---|---|
| Austria | 6.7 | 6.3 | Italy | 7 | |
| Belgium | 7.5 | 8 | Luxembourg | 6.1 | |
| Czech Republic | 13.2 | 12.5 | Netherlands | 5.4 | 5.7 |
| Denmark | | 5.7 | Poland | 6.3 | 5.4 |
| Finland | 4.3 | 4.1 | Portugal | 3.9 | 3.2 |
| France | 6.6 | 6.4 | Slovak Republic | 11.3 | |
| Germany | 7.5 | 6.4 | Spain | | 7.8 |
| Greece | | 2.8 | Sweden | 2.8 | 3 |
| Hungary | 12.9 | 10.4 | United Kingdom | 5 | 6.1 |

*Source: OECD Health data 2009* [64]

**Table 30 – Hospital discharges with COPD diagnosis, in-patients, per 100,000 inhabitants**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | 270.3 | 258.1 | 265.4 | 268.6 | 250.4 | 264.3 | 231.8 | 251.1 | 262.0 | n/a |
| Bulgaria | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Czech Republic | n/a | n/a | 236.4 | 247.8 | 224.5 | 221.2 | 186.4 | 190.9 | 172.9 | 180.3 |
| Denmark | 404.0 | 408.3 | 367.8 | 341.9 | 320.0 | 313.9 | 154.1 | 292.6 | n/a | n/a |
| Germany | 181.8 | 174.2 | 184.0 | 231.3 | 221.9 | 240.8 | 227.3 | 254.3 | 261.7 | n/a |
| Estonia | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Ireland | 225.8 | 210.7 | 215.2 | 214.6 | 214.4 | 246.6 | 256.8 | 267.0 | 269.0 | 263.5 |
| Spain | 244.9 | 223.1 | 231.5 | 241.8 | 217.2 | 237.8 | 181.0 | 189.4 | 186.8 | 184.7 |
| France | 88.1 | 77.8 | 81.6 | 77.8 | 73.1 | 81.6 | 79.0 | 83.8 | 87.6 | 93.7 |
| Italy | n/a | n/a | n/a | 225.4 | 205.1 | 207.7 | 178.4 | 167.6 | 157.2 | 148.9 |
| Cyprus | 29.1 | 24.8 | 17.6 | 15.6 | 47.4 | 47.6 | 46.6 | 61.9 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | n/a | 201.3 | n/a | n/a | 180.4 | n/a |
| Lithuania | n/a | 383.5 | 372.8 | 395.7 | 373.2 | 325.5 | 258.9 | 281.7 | 252.2 | 249.9 |
| Luxembourg | 227.8 | 210.4 | 208.9 | 194.6 | 176.6 | 158.2 | 143.2 | 161.9 | 146.9 | 154.1 |
| Hungary | n/a | n/a | n/a | n/a | 365.8 | 395.1 | 374.7 | 317.1 | 324.9 | 341.4 |
| Malta | n/a | n/a | n/a | n/a | 62.3 | n/a | 61.7 | 53.5 | 93.3 | 146.9 |
| Netherlands | n/a | n/a | 112.1 | 114.9 | 115.6 | 127.0 | 122.3 | 129.8 | 133.6 | 134.2 |
| Austria | n/a | n/a | n/a | 336.2 | 334.6 | 339.5 | 320.3 | 340.9 | 352.0 | 353.9 |
| Poland | n/a | n/a | n/a | 307.0 | 294.6 | 244.9 | 236.7 | 235.5 | 205.5 | 193.8 |
| Portugal | n/a | n/a | n/a | n/a | n/a | 98.8 | 88.0 | 98.5 | 98.2 | 96.4 |
| Romania | 457.8 | 491.3 | 550.1 | 502.4 | 496.7 | 438.3 | 436.1 | 411.3 | 486.6 | 548.2 |
| Slovenia | n/a | n/a | n/a | n/a | 146.9 | 140.2 | 127.3 | 129.6 | 120.5 | 121.5 |
| Slovakia | 225.1 | 228.0 | 215.9 | 201.3 | 200.8 | 205.1 | 196.0 | n/a | 168.3 | 169.3 |
| Finland | 260.2 | 250.3 | 229.7 | 216.2 | 201.6 | 194.1 | 182.0 | 170.3 | 162.8 | 153.9 |
| Sweden | 212.3 | 197.1 | 198.6 | 192.8 | 190.7 | 197.0 | 188.9 | 189.6 | 198.0 | 191.5 |
| UK | n/a | n/a | 224.3 | 254.8 | n/a | 248.9 | 228.5 | 226.1 | n/a | 230.6 |

Source: Eurostat, 2011[2]

**Table 31 – Standardised death rate by 100 000 inhabitants, Death due to ischaemic heart diseases (EU 27)**

| | 2000 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|
| EU (27 countries) | 114.8 | 97.6 | 91 | 89.7 | 85.1 |
| Belgium | n/a | 67.5 | n/a | n/a | n/a |
| Bulgaria | 194.7 | 163.1 | 147.9 | 135.4 | 126 |
| Czech Republic | 187.4 | 177.5 | 168.8 | 185.5 | 176.2 |
| Denmark | 111.2 | 77.6 | 71.6 | 66.8 | 62.2 |
| Germany | 126.8 | 104.2 | 97.9 | 92.6 | 86.4 |
| Estonia | 336.1 | 264.2 | 253.3 | 236.3 | 224.4 |
| Ireland | 165.1 | 118.5 | 112.5 | 114.1 | 106.3 |
| Greece | 87.5 | 77.8 | 76.3 | 73.3 | 67.3 |
| Spain | 65.4 | 56.3 | 51.9 | 50.4 | 47.4 |
| France (metropolitan) | 49.4 | 40.5 | 37.3 | 35.4 | 33.8 |
| Italy | 74.5 | n/a | 64.1 | 62 | 60.3 |
| Cyprus | n/a | 84.1 | 79.6 | 85.8 | 73.8 |
| Latvia | 319.7 | 287 | 279.4 | 298.6 | 263.5 |
| Lithuania | 299 | 355 | 347.2 | 338.2 | 321.3 |
| Luxembourg | 83 | 67.1 | 77 | 63.8 | 57.5 |
| Hungary | 232 | 261.3 | 240.7 | 226.6 | 216.9 |
| Malta | 171.8 | 149.5 | 142.2 | 119.9 | n/a |
| Netherlands | 85.6 | 59.5 | 54.3 | 50.2 | 46.8 |
| Austria | 132 | 111.6 | 107.7 | 103.3 | 97.4 |
| Poland | 140.8 | 114.2 | 111.2 | 104.2 | 102.2 |
| Portugal | 62.6 | 53.4 | 46.2 | 47.2 | 44.4 |
| Romania | 232.5 | 217.9 | 213.2 | 200.9 | 194.1 |
| Slovenia | 105 | 79.9 | 68 | 67.2 | 67.4 |
| Slovakia | 296.3 | 272.3 | 248.4 | 268.6 | 280.5 |
| Finland | 176.5 | 142 | 136.7 | 134.2 | 128.8 |
| Sweden | 123.8 | 101.1 | 98.4 | 93 | 90 |
| United Kingdom | 135.5 | 107.3 | 97.9 | 93 | 87.7 |

Source: Eurostat, 2011[2]

**Table 32 – In-patients hospital discharges by diagnosis heart failure, per 100,000 inhabitants**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | 176.9 | 182.1 | 184.9 | 188.9 | 189.7 | 200.1 | 200.1 | 203.4 | 212.0 | n/a |
| Bulgaria | n/a | n/a | n/a | n/a | n/a | 700.9 | 844.6 | 853.4 | 923.0 | 982.6 |
| Czech Republic | n/a | n/a | 227.9 | 226.9 | 269.0 | 257.2 | 255.5 | 251.6 | 280.3 | 306.3 |
| Denmark | 194.1 | 178.6 | 176.0 | 168.8 | 161.1 | 154.8 | 78.3 | 152.4 | n/a | n/a |
| Germany | 292.3 | 313.1 | 319.4 | 326.2 | 314.1 | 369.4 | 383.1 | 405.5 | 424.4 | n/a |
| Estonia | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Ireland | 139.5 | 156.1 | 157.5 | 149.0 | 141.0 | 133.8 | 132.7 | 129.2 | 122.6 | 127.6 |
| Spain | 182.0 | 180.6 | 188.5 | 190.4 | 196.8 | 204.9 | 202.4 | 215.7 | 218.0 | 221.0 |
| France | 267.3 | 268.2 | 272.9 | 259.5 | 265.5 | 280.1 | 283.8 | 290.1 | 296.7 | 300.1 |
| Italy | n/a | n/a | n/a | 324.5 | 334.2 | 337.0 | 345.5 | 337.4 | 337.3 | 336.4 |
| Cyprus | 79.1 | 98.8 | 87.8 | 117.9 | 78.5 | 66.9 | 68.1 | 82.0 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | n/a | 12.9 | n/a | n/a | 27.1 | n/a |
| Lithuania | n/a | 171.8 | 226.8 | 372.6 | 556.9 | 599.6 | 602.2 | 524.5 | 546.1 | 529.2 |
| Luxembourg | 248.7 | 245.3 | 253.0 | 256.0 | 268.9 | 277.3 | 281.4 | 274.0 | 253.6 | 222.4 |
| Hungary | n/a | n/a | n/a | n/a | 485.5 | 454.0 | 439.4 | 368.2 | 344.3 | 333.9 |
| Malta | n/a | n/a | n/a | n/a | 110.9 | n/a | 126.4 | 117.1 | 204.7 | 269.3 |
| Netherlands | n/a | n/a | 142.2 | 145.6 | 150.2 | 155.8 | 160.1 | 167.8 | 169.0 | 177.7 |
| Austria | n/a | n/a | n/a | 308.3 | 313.7 | 309.2 | 321.1 | 321.8 | 318.9 | 303.3 |
| Poland | n/a | n/a | n/a | 220.1 | 320.9 | 271.5 | 319.4 | 333.8 | 378.4 | 435.4 |
| Portugal | n/a | n/a | n/a | n/a | n/a | 124.1 | 128.0 | 140.5 | 141.7 | 143.6 |
| Romania | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 781.4 | 846.1 | 924.3 |
| Slovenia | n/a | n/a | n/a | n/a | 188.9 | 208.9 | 216.2 | 225.9 | 223.2 | 228.3 |
| Slovakia | 68.2 | 81.1 | 95.4 | 124.5 | 150.4 | 168.2 | 199.5 | n/a | 190.0 | 210.5 |
| Finland | 271.1 | 273.2 | 266.8 | 279.6 | 304.2 | 304.3 | 326.8 | 332.5 | 336.0 | 340.4 |
| Sweden | 356.6 | 332.5 | 318.0 | 320.8 | 324.0 | 330.3 | 330.8 | 331.8 | 341.8 | 335.6 |
| United Kingdom | n/a | n/a | 151.3 | 146.1 | n/a | 136.9 | 121.5 | 121.5 | n/a | 123.4 |

Source: Eurostat, 2011[2]

**Table 33 – In-patients hospital discharges by diagnosis hypertensive disease, per 100,000 inhabitants**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | 67.2 | 67.5 | 66.8 | 72.6 | 81.4 | 81.3 | 82.6 | 80.5 | 75.5 | n/a |
| Bulgaria | 385.2 | 355.8 | 309.3 | 236.8 | 312.2 | 331.6 | 65.6 | 61.6 | 52.3 | 55.7 |
| Czech Republic | n/a | n/a | 209.4 | 219.0 | 239.6 | 217.0 | 217.8 | 191.2 | 189.5 | 185.8 |
| Denmark | 85.3 | 83.6 | 82.7 | 83.7 | 84.2 | 84.4 | 44.9 | 86.4 | n/a | n/a |
| Germany | 231.2 | 243.5 | 254.7 | 281.8 | 315.8 | 279.9 | 284.9 | 299.7 | 320.5 | n/a |
| Estonia | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Ireland | 59.1 | 58.5 | 62.7 | 56.4 | 55.3 | 43.5 | 44.9 | 40.5 | 37.5 | 40.6 |
| Spain | 52.2 | 57.8 | 58.2 | 59.8 | 57.1 | 59.1 | 60.0 | 60.5 | 59.7 | 62.1 |
| France | 68.8 | 63.6 | 61.3 | 53.5 | 54.0 | 53.1 | 52.6 | 50.3 | 49.0 | 51.2 |
| Italy | n/a | n/a | n/a | 137.1 | 131.6 | 128.0 | 125.4 | 111.8 | 103.6 | 95.9 |
| Cyprus | 23.6 | 33.3 | 27.2 | 20.2 | 18.7 | 15.4 | 17.2 | 18.9 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | n/a | 523.5 | n/a | n/a | 555.8 | n/a |
| Lithuania | n/a | 623.0 | 492.0 | 465.1 | 411.7 | 393.4 | 371.6 | 395.6 | 440.7 | 473.4 |
| Luxembourg | 117.8 | 111.4 | 120.4 | 131.1 | 128.8 | 116.1 | 121.9 | 130.8 | 116.9 | 110.3 |
| Hungary | n/a | n/a | n/a | n/a | 238.1 | 227.2 | 235.0 | 199.0 | 189.4 | 174.3 |
| Malta | n/a | n/a | n/a | n/a | 13.2 | n/a | 13.6 | 11.0 | 33.6 | 64.7 |
| Netherlands | n/a | n/a | 17.7 | 19.0 | 20.6 | 19.8 | 20.7 | 19.8 | 21.0 | 21.7 |
| Austria | n/a | n/a | n/a | 394.8 | 385.7 | 372.3 | 383.1 | 391.8 | 390.3 | 337.9 |
| Poland | n/a | n/a | n/a | 401.3 | 365.7 | 284.7 | 272.0 | 242.8 | 233.0 | 222.8 |
| Portugal | n/a | n/a | n/a | n/a | n/a | 47.2 | 53.9 | 55.4 | 64.9 | 62.2 |
| Romania | 719.9 | 828.5 | 870.2 | 725.6 | 638.6 | 474.1 | 463.6 | 381.3 | 454.2 | 596.4 |
| Slovenia | n/a | n/a | n/a | n/a | 134.4 | 136.6 | 135.4 | 136.9 | 146.8 | 149.8 |
| Slovakia | 278.9 | 312.4 | 291.6 | 276.3 | 305.7 | 322.1 | 333.4 | n/a | 298.2 | 301.0 |
| Finland | 120.3 | 123.2 | 118.2 | 125.9 | 139.0 | 133.3 | 134.1 | 129.9 | 122.3 | 115.2 |
| Sweden | 55.7 | 53.1 | 54.1 | 53.4 | 56.3 | 59.6 | 66.9 | 69.3 | 66.1 | 87.9 |
| United Kingdom | n/a | n/a | 26.4 | 27.3 | n/a | 27.7 | 27.3 | 28.5 | n/a | 32.3 |

Source: Eurostat, 2011[2]

**Table 34 – In-patients hospital discharges by diagnosis angina pectoris, per 100,000 inhabitants**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | 86.9 | 69.6 | 62.1 | 57.2 | 48.8 | 48.7 | 45.6 | 39.1 | 33.7 | n/a |
| Bulgaria | n/a | n/a | n/a | n/a | n/a | 368.0 | 594.3 | 695.9 | 778.8 | 1,053.5 |
| Czech Republic | n/a | n/a | 217.9 | 208.7 | 213.8 | 171.0 | 153.1 | 131.0 | 115.0 | 106.8 |
| Denmark | 355.8 | 343.5 | 347.6 | 319.4 | 306.7 | 301.9 | 145.2 | 249.3 | n/a | n/a |
| Germany | 185.2 | 234.0 | 285.6 | 315.0 | 379.9 | 376.0 | 358.4 | 339.9 | 320.6 | n/a |
| Estonia | 429.2 | 424.7 | 405.0 | 398.9 | 387.3 | 361.9 | 437.6 | 380.0 | 366.8 | 329.0 |
| Ireland | 141.1 | 140.5 | 130.1 | 116.8 | 104.3 | 135.4 | 141.3 | 135.4 | 121.7 | 111.1 |
| Spain | 71.8 | 54.6 | 46.3 | 43.7 | 40.8 | 35.5 | 32.4 | 77.5 | 69.8 | 62.8 |
| France | 216.4 | 211.7 | 210.9 | 202.5 | 205.4 | 202.5 | 201.6 | 191.9 | 186.6 | 182.1 |
| Italy | n/a | n/a | n/a | 212.6 | 214.6 | 198.1 | 193.3 | 82.7 | 172.0 | 161.0 |
| Cyprus | 38.5 | 54.3 | 66.3 | 49.5 | 92.6 | 77.6 | 77.3 | 78.6 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | n/a | 395.9 | n/a | n/a | 475.4 | n/a |
| Lithuania | n/a | 1,017.0 | 1,047.8 | 1,081.3 | 1,094.2 | 1,103.0 | 1,043.2 | 1,031.6 | 1,017.2 | 1,022.8 |
| Luxembourg | 198.5 | 230.3 | 225.0 | 209.0 | 173.3 | 169.4 | 138.8 | 151.3 | 173.9 | 155.1 |
| Hungary | n/a | n/a | n/a | n/a | 334.3 | 323.7 | 307.4 | 285.8 | 303.8 | 285.7 |
| Malta | n/a | n/a | n/a | n/a | 74.0 | n/a | 64.7 | 59.4 | 102.6 | 115.7 |
| Netherlands | n/a | n/a | 102.1 | 98.6 | 108.1 | 102.9 | 203.4 | 202.6 | 208.0 | 205.2 |
| Austria | n/a | n/a | n/a | 163.3 | 179.0 | 173.7 | 178.6 | 184.3 | 174.8 | 139.0 |
| Poland | n/a | n/a | n/a | 334.2 | 358.4 | 298.5 | 279.0 | 252.8 | 232.2 | 236.8 |
| Portugal | n/a | n/a | n/a | n/a | n/a | 20.5 | 41.6 | 54.5 | 58.5 | 45.5 |
| Romania | 132.9 | 150.2 | 162.0 | 246.2 | 239.0 | 189.0 | 197.4 | 148.0 | 143.1 | 185.9 |
| Slovenia | n/a | n/a | n/a | n/a | 139.8 | 156.0 | 181.4 | 157.6 | 154.8 | 163.7 |
| Slovakia | 146.2 | 153.8 | 157.4 | 168.7 | 185.4 | 202.8 | 224.3 | n/a | 201.3 | 195.7 |
| Finland | 433.4 | 405.7 | 361.5 | 349.5 | 333.1 | 299.2 | 271.7 | 240.2 | 217.9 | 191.2 |
| Sweden | 504.2 | 465.3 | 418.9 | 394.4 | 367.7 | 329.6 | 309.5 | 292.8 | 262.4 | 226.2 |
| United Kingdom | n/a | n/a | 200.4 | 185.5 | n/a | 158.7 | 141.5 | 135.8 | n/a | 116.5 |

Source: Eurostat, 2011[2]

**Table 35 – In-patients hospital discharges by diagnosis acute myocardial infarction including subsequent myocardial infarction, per 100,000 inhabitants**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | 154.6 | 158.5 | 163.9 | 161.2 | 158.8 | 151.6 | 150.0 | 161.3 | 171.0 | n/a |
| Bulgaria | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Czech Republic | n/a | n/a | 229.2 | 247.3 | 256.8 | 212.6 | 203.6 | 202.6 | 199.9 | 202.1 |
| Denmark | 207.9 | 237.5 | 266.8 | 270.3 | 266.4 | 253.0 | 121.8 | 245.3 | n/a | n/a |
| Germany | 199.7 | 179.3 | 191.0 | 234.1 | 257.5 | 258.6 | 262.3 | 270.7 | 268.6 | n/a |
| Estonia | 198.8 | 195.4 | 217.9 | 233.5 | 245.5 | 237.9 | 245.2 | 232.7 | 230.0 | 221.8 |
| Ireland | 131.5 | 134.8 | 134.5 | 128.5 | 131.3 | 134.0 | 138.1 | 139.7 | 138.1 | 134.2 |
| Spain | 113.4 | 125.1 | 136.9 | 137.7 | 137.5 | 132.7 | 124.9 | 122.3 | 121.7 | 118.9 |
| France | 127.0 | 132.5 | 133.3 | 126.9 | 121.6 | 115.8 | 111.7 | 109.5 | 109.0 | 110.9 |
| Italy | n/a | n/a | n/a | 204.5 | 208.2 | 210.9 | 212.2 | 210.8 | 207.3 | 201.3 |
| Cyprus | 56.1 | 80.7 | 80.8 | 88.6 | 86.2 | 73.4 | 56.2 | 64.4 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | n/a | 243.0 | n/a | n/a | 222.8 | n/a |
| Lithuania | n/a | 206.6 | 216.8 | 226.9 | 226.5 | 223.2 | 219.1 | 216.1 | 220.2 | 231.7 |
| Luxembourg | 97.4 | 89.2 | 98.2 | 91.0 | 93.4 | 78.9 | 78.5 | 89.2 | 117.5 | 97.8 |
| Hungary | n/a | n/a | n/a | n/a | 171.6 | 176.2 | 187.2 | 176.4 | 180.0 | 184.6 |
| Malta | n/a | n/a | n/a | n/a | 59.8 | n/a | 47.9 | 43.3 | 74.6 | 112.1 |
| Netherlands | n/a | n/a | 158.3 | 151.7 | 147.9 | 145.8 | 140.9 | 137.8 | 145.3 | 153.4 |
| Austria | n/a | n/a | n/a | 175.5 | 182.1 | 193.6 | 189.5 | 190.2 | 184.6 | 179.8 |
| Poland | n/a | n/a | n/a | 174.7 | 200.2 | 154.1 | 167.7 | 175.8 | 177.0 | 192.3 |
| Portugal | n/a | n/a | n/a | n/a | n/a | 111.4 | 113.2 | 116.0 | 120.1 | 116.7 |
| Romania | 81.0 | 84.7 | 80.4 | 69.2 | 70.7 | 63.8 | 79.7 | 68.8 | 73.1 | 75.8 |
| Slovenia | n/a | n/a | n/a | n/a | 173.6 | 182.8 | 174.2 | 170.7 | 156.7 | 166.2 |
| Slovakia | 142.8 | 152.5 | 142.5 | 139.0 | 146.9 | 154.2 | 162.1 | n/a | 158.2 | 162.7 |
| Finland | 282.7 | 313.0 | 322.9 | 328.3 | 303.3 | 296.8 | 280.2 | 266.7 | 248.7 | 237.9 |
| Sweden | 327.7 | 371.8 | 380.2 | 382.8 | 373.7 | 378.3 | 377.2 | 387.8 | 366.0 | 331.7 |
| United Kingdom | n/a | n/a | 184.4 | 181.7 | n/a | 178.4 | 158.4 | 155.3 | n/a | 146.1 |

Source: Eurostat, 2011[2]

**Table 36 – In-patients hospital discharges by diagnosis other ischaemic heart disease, per 100,000 inhabitants**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | 491.8 | 487.8 | 487.2 | 486.5 | 507.2 | 479.6 | 453.0 | 427.0 | 406.6 | n/a |
| Bulgaria | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Czech Republic | n/a | n/a | 691.7 | 721.4 | 641.2 | 545.9 | 506.1 | 455.6 | 407.9 | 401.6 |
| Denmark | 175.3 | 172.4 | 155.5 | 143.4 | 154.6 | 155.6 | 69.0 | 126.3 | n/a | n/a |
| Germany | 693.8 | 597.8 | 527.9 | 533.4 | 403.9 | 342.8 | 338.1 | 327.2 | 327.4 | n/a |
| Estonia | 489.4 | 474.3 | 411.8 | 405.2 | 414.0 | 398.4 | 406.8 | 389.2 | 401.9 | 344.5 |
| Ireland | 182.4 | 206.9 | 226.1 | 230.2 | 216.5 | 149.8 | 136.6 | 115.7 | 114.5 | 108.2 |
| Spain | 177.4 | 180.5 | 181.6 | 180.7 | 178.3 | 170.1 | 170.1 | 116.8 | 110.6 | 107.6 |
| France | 145.2 | 151.6 | 156.7 | 157.5 | 158.5 | 156.1 | 164.6 | 161.6 | 158.7 | 163.4 |
| Italy | n/a | n/a | n/a | 201.4 | 203.5 | 194.1 | 185.2 | 276.0 | 168.6 | 159.1 |
| Cyprus | 223.3 | 215.9 | 136.4 | 99.5 | 80.6 | 120.2 | 111.4 | 125.4 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | n/a | 730.2 | n/a | n/a | 761.5 | n/a |
| Lithuania | n/a | 150.3 | 87.5 | 71.3 | 55.4 | 49.6 | 49.2 | 56.4 | 59.8 | 57.3 |
| Luxembourg | 487.7 | 550.1 | 595.5 | 637.5 | 589.0 | 490.2 | 471.0 | 365.6 | 319.9 | 303.7 |
| Hungary | n/a | n/a | n/a | n/a | 367.5 | 352.0 | 344.3 | 300.9 | 293.2 | 269.3 |
| Malta | n/a | n/a | n/a | n/a | 146.5 | n/a | 126.4 | 85.1 | 117.0 | 122.5 |
| Netherlands | n/a | n/a | 262.4 | 273.6 | 299.3 | 292.7 | 186.8 | 188.7 | 174.3 | 171.0 |
| Austria | n/a | n/a | n/a | 592.5 | 611.4 | 598.9 | 609.8 | 600.4 | 580.6 | 559.6 |
| Poland | n/a | n/a | n/a | 448.8 | 330.2 | 267.7 | 272.8 | 257.4 | 284.8 | 318.7 |
| Portugal | n/a | n/a | n/a | n/a | n/a | 143.9 | 127.0 | 157.5 | 160.4 | 152.5 |
| Romania | 557.2 | 594.8 | 605.4 | 406.9 | 339.3 | 219.7 | 215.1 | 146.7 | 149.9 | 188.3 |
| Slovenia | n/a | n/a | n/a | n/a | 81.4 | 73.2 | 78.2 | 89.2 | 89.6 | 82.6 |
| Slovakia | 834.7 | 829.9 | 763.7 | 708.5 | 678.2 | 658.5 | 582.5 | n/a | 461.4 | 432.1 |
| Finland | 335.6 | 321.6 | 325.9 | 333.0 | 323.2 | 304.5 | 289.2 | 262.7 | 239.6 | 216.9 |
| Sweden | 58.0 | 58.1 | 59.4 | 55.3 | 54.5 | 55.9 | 59.4 | 62.1 | 59.3 | 63.0 |
| United Kingdom | n/a | n/a | 160.6 | 165.2 | n/a | 173.0 | 160.1 | 156.1 | n/a | 145.1 |

Source: Eurostat, 2011[2]

**Table 37- Prevalence estimates of diabetes mellitus (DM), 2010 – European Region**

| | Population (20-79) | Diabetes prevalence | | | | Number of people with DM (000's) in the 20-79 age-group | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country/Territory | 000's | National | Comparative* | Rural | Urban | Male | Female | 20-39 | 40-59 | 60-79 | Total |
| Austria | 6.302 | 11,2% | 8,9% | | | 375,1 | 333,3 | 72,1 | 272,8 | 363,5 | **708,4** |
| Belgium | 7.644 | 8,0% | 5,3% | | | 304,3 | 305,8 | 9,6 | 167,8 | 432,6 | **610,0** |
| Bulgaria | 5.790 | 9,0% | 6,5% | | | 289,1 | 230,4 | 22,0 | 182,8 | 314,6 | **519,5** |
| Cyprus | 634 | 10,4% | 9,1% | | | 43,9 | 22,0 | 6,9 | 30,3 | 28,7 | **65,9** |
| Czech Republic | 7.824 | 8,7% | 6,4% | | | 309,6 | 367,7 | 44,5 | 190,7 | 442,1 | **677,3** |
| Denmark | 3.907 | 7,7% | 5,6% | | | 159,4 | 142,1 | 18,9 | 113,4 | 169,2 | **301,5** |
| Estonia | 994 | 9,9% | 7,6% | | | 44,0 | 53,9 | 8,5 | 33,9 | 55,6 | **97,9** |
| Finland | 3.863 | 8,3% | 5,7% | | | 180,0 | 139,8 | 15,6 | 100,4 | 203,8 | **319,8** |
| France | 44.091 | 9,4% | 6,7% | | | 2.437,1 | 1.727,1 | 208,6 | 1.210,2 | 2.745,4 | **4.164,2** |
| Germany | 62.654 | 12,0% | 8,9% | | | 3.966,7 | 3.527,6 | 651,9 | 2.792,1 | 4.050,4 | **7.494,3** |
| Greece | 8.561 | 8,8% | 6,0% | | | 355,4 | 398,6 | 37,4 | 198,9 | 517,7 | **754,0** |
| Ireland | 3.171 | 5,7% | 5,2% | | | 93,0 | 87,3 | 34,5 | 68,0 | 77,8 | **180,3** |
| Israel | 4.496 | 7,1% | 6,5% | | | 179,9 | 138,9 | 42,1 | 127,1 | 149,5 | **318,8** |
| Italy | 44.510 | 8,8% | 5,9% | | | 2.018,9 | 1.907,3 | 121,3 | 1.223,5 | 2.581,3 | **3.926,2** |
| Latvia | 1.719 | 9,9% | 7,6% | | | 76,7 | 93,1 | 14,6 | 58,9 | 96,3 | **169,7** |
| Lithuania | 2.484 | 9,7% | 7,6% | | | 110,1 | 129,6 | 20,9 | 86,6 | 132,3 | **239,8** |
| Luxembourg | 349 | 7,0% | 5,3% | | | 12,3 | 12,0 | 0,5 | 7,5 | 16,3 | **24,3** |
| Malta | 307 | 9,8% | 6,8% | | | 12,6 | 17,3 | 0,3 | 9,0 | 20,6 | **29,9** |
| Netherlands | 11.943 | 7,7% | 5,3% | | | 473,0 | 449,4 | 15,1 | 266,8 | 640,5 | **922,4** |
| Poland | 28.618 | 9,3% | 7,6% | | | 1.321,2 | 1.353,4 | 257,6 | 1.052,6 | 1.364,4 | **2.674,6** |
| Portugal | 8.034 | 12,4% | 9,7% | | | 578,0 | 419,7 | 95,6 | 374,3 | 527,7 | **997,6** |
| Romania | 16.129 | 8,4% | 6,9% | | | 720,3 | 631,2 | 157,8 | 474,7 | 718,9 | **1.351,4** |
| Slovakia | 4.075 | 7,7% | 6,4% | | | 138,2 | 175,8 | 25,6 | 103,0 | 185,4 | **314,0** |
| Slovenia | 1.546 | 9,9% | 7,7% | | | 87,5 | 65,4 | 10,3 | 70,3 | 72,4 | **152,9** |
| Spain | 33.944 | 8,7% | 6,6% | | | 1.547,5 | 1.391,8 | 160,9 | 1.008,8 | 1.769,6 | **2.939,3** |
| Sweden | 6.619 | 7,3% | 5,2% | | | 223,6 | 260,9 | 36,6 | 136,8 | 311,0 | **484,4** |
| United Kingdom | 44.056 | 4,9% | 3,6% | | | 1.225,7 | 913,9 | 149,2 | 684,4 | 1.306,0 | **2.139,6** |
| **EUR Total** | **364.265** | **8,9%** | **6,6%** | | | **17.283** | **15.295** | **2.239** | **11.045** | **19.294** | **32.578** |

Source: Diabetes Atlas [15]

**Table 38 - Prevalence estimates of impaired glucose tolerance (IGT), 2010 - European Region**

| | Population (20-79) | IGT prevalence (%) | | Number of people with IGT (000's) in the 20-79 age-group | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Country/Territory** | **000's** | **National** | **Comparative*** | **Male** | **Female** | **20-39** | **40-59** | **60-79** | **Total** |
| Austria | 6.302 | 6,0% | 4,1% | 181,3 | 196,4 | 0,6 | 93,1 | 284,1 | **377,8** |
| Belgium | 7.644 | 6,5% | 4,8% | 246,0 | 248,5 | 51,7 | 151,6 | 291,2 | **494,5** |
| Bulgaria | 5.790 | 6,0% | 5,0% | 172,2 | 172,5 | 45,7 | 162,6 | 136,5 | **344,7** |
| Cyprus | 634 | 6,7% | 5,9% | 19,8 | 23,0 | 7,3 | 16,9 | 18,6 | **42,8** |
| Czech Republic | 7.824 | 17,4% | 15,3% | 593,4 | 767,4 | 308,2 | 510,1 | 542,6 | **1.360,9** |
| Denmark | 3.907 | 15,2% | 12,4% | 273,0 | 321,4 | 101,6 | 194,9 | 299,9 | **594,4** |
| Estonia | 994 | 17,4% | 15,3% | 67,8 | 105,4 | 38,3 | 65,0 | 69,9 | **173,2** |
| Finland | 3.863 | 8,8% | 5,9% | 187,8 | 151,4 | 9,8 | 108,6 | 220,7 | **339,2** |
| France | 44.091 | 7,6% | 6,6% | 2.318,5 | 1.021,1 | 613,4 | 1.550,3 | 1.178,0 | **3.339,6** |
| Germany | 62.654 | 6,6% | 4,1% | 2.006,6 | 2.125,9 | 4,7 | 979,6 | 3.148,2 | **4.132,6** |
| Greece | 8.561 | 7,4% | 5,9% | 292,5 | 342,0 | 93,1 | 225,6 | 315,8 | **634,5** |
| Hungary | 7.515 | 17,5% | 15,3% | 544,7 | 770,6 | 297,2 | 500,1 | 520,0 | **1.315,3** |
| Ireland | 3.171 | 1,9% | 1,7% | 30,6 | 30,7 | 1,6 | 23,4 | 36,3 | **61,3** |
| Italy | 44.510 | 6,0% | 4,7% | 1.105,2 | 1.549,5 | 423,1 | 870,3 | 1.363,2 | **2.654,7** |
| Latvia | 1.719 | 17,4% | 15,3% | 118,3 | 181,4 | 67,7 | 113,2 | 120,9 | **299,7** |
| Lithuania | 2.484 | 17,3% | 15,3% | 170,7 | 258,1 | 96,3 | 168,5 | 166,0 | **428,9** |
| Luxembourg | 349 | 5,9% | 4,8% | 10,5 | 9,9 | 2,6 | 6,9 | 10,9 | **20,4** |
| Malta | 307 | 7,7% | 6,1% | 11,6 | 12,1 | 1,6 | 10,5 | 11,6 | **23,8** |
| Netherlands | 11.943 | 6,3% | 4,8% | 381,2 | 366,8 | 81,6 | 242,4 | 426,0 | **748,0** |
| Poland | 28.618 | 16,9% | 15,3% | 2.050,3 | 2.793,0 | 1.156,4 | 1.967,7 | 1.719,2 | **4.843,3** |
| Portugal | 8.034 | 13,3% | 4,7% | 495,0 | 576,6 | 144,0 | 414,6 | 513,0 | **1.071,6** |
| Romania | 16.129 | 17,0% | 15,3% | 1.167,5 | 1.576,0 | 659,3 | 1.048,3 | 1.037,8 | **2.743,4** |
| Slovakia | 4.075 | 16,6% | 15,3% | 287,4 | 388,9 | 174,1 | 277,2 | 226,9 | **676,2** |
| Slovenia | 1.546 | 17,5% | 15,3% | 119,4 | 151,8 | 58,4 | 110,3 | 104,5 | **271,2** |
| Spain | 33.944 | 7,5% | 6,6% | 1.350,8 | 1.183,0 | 537,3 | 1.042,0 | 956,5 | **2.533,8** |
| Sweden | 6.619 | 9,0% | 7,3% | 196,2 | 401,5 | 102,9 | 166,9 | 327,8 | **597,7** |
| United Kingdom | 44.056 | 5,1% | 4,7% | 1.414,4 | 836,1 | 582,5 | 933,3 | 736,7 | **2.250,5** |
| **EUR Total** | **367.284** | **8,8%** | **7,2%** | **15.813** | **16.561** | **5.661** | **11.954** | **14.783** | **32.374** |

Source: Diabetes Atlas [15]

**Table 39 – Health expenditure for diabetes, 2010 and 2030 – European Region**

| | Health expenditure for diabetes in 2010 ('000) | | | | Mean health expenditure per person with diabetes in 2010 | | Health expenditure for diabetes in 2030 ('000) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | US Dollars (USD) | | International Dollars (ID) | | R=2 | | US Dollars (USD) | | International Dollars (ID) | |
| Country | R=2 | R=3 | R=2 | R=3 | USD | ID | R=2 | R=3 | R=2 | R=3 |
| Austria | 2.838.538 | 5.112.748 | 2.611.485 | 4.703.782 | 4.007 | 3.686 | 3.382.734 | 6.205.429 | 3.112.151 | 5.709.060 |
| Belgium | 2.295.389 | 4.385.559 | 2.042.637 | 3.902.651 | 3.763 | 3.348 | 2.810.304 | 5.434.030 | 2.500.853 | 4.835.672 |
| Bulgaria | 156.428 | 290.272 | 422.126 | 783.307 | 301 | 813 | 153.367 | 286.858 | 413.865 | 774.095 |
| Cyprus | 101.907 | 179.361 | 114.966 | 202.346 | 1.547 | 1.745 | 140.463 | 252.225 | 158.463 | 284.547 |
| Czech Republic | 663.262 | 1.227.928 | 1.104.163 | 2.044.190 | 979 | 1.630 | 768.508 | 1.455.465 | 1.279.371 | 2.422.981 |
| Denmark | 1.486.379 | 2.779.535 | 1.046.957 | 1.957.815 | 4.930 | 3.473 | 1.621.958 | 3.107.799 | 1.142.455 | 2.189.034 |
| Estonia | 57.142 | 104.244 | 93.686 | 170.912 | 584 | 957 | 58.486 | 107.319 | 95.889 | 175.953 |
| Finland | 1.009.470 | 1.904.253 | 821.803 | 1.550.240 | 3.157 | 2.570 | 1.122.455 | 2.186.940 | 913.783 | 1.780.373 |
| France | 17.242.239 | 32.081.752 | 14.962.237 | 27.839.467 | 4.141 | 3.593 | 21.361.923 | 40.479.165 | 18.537.160 | 35.126.460 |
| Germany | 28.108.815 | 51.318.714 | 25.180.168 | 45.971.836 | 3.751 | 3.360 | 30.288.414 | 56.013.228 | 27.132.675 | 50.177.230 |
| Greece | 2.067.278 | 3.941.035 | 2.367.754 | 4.513.860 | 2.742 | 3.140 | 2.403.451 | 4.577.554 | 2.752.790 | 5.242.896 |
| Hungary | 641.388 | 1.188.032 | 996.964 | 1.846.660 | 973 | 1.513 | 698.737 | 1.317.478 | 1.086.107 | 2.047.869 |
| Ireland | 907.828 | 1.709.891 | 709.802 | 1.336.910 | 5.035 | 3.937 | 1.306.723 | 2.506.982 | 1.021.685 | 1.960.129 |
| Italy | 11.022.611 | 20.883.104 | 10.129.992 | 19.191.976 | 2.807 | 2.580 | 12.613.638 | 23.933.107 | 11.592.177 | 21.994.988 |
| Latvia | 83.745 | 152.511 | 162.576 | 296.071 | 493 | 958 | 85.842 | 157.299 | 166.645 | 305.366 |
| Lithuania | 124.923 | 227.276 | 240.366 | 437.304 | 521 | 1.003 | 135.576 | 248.312 | 260.863 | 477.779 |
| Luxembourg | 176.755 | 334.774 | 154.165 | 291.988 | 7.268 | 6.339 | 252.131 | 480.324 | 219.908 | 418.937 |
| Malta | 43.022 | 77.440 | 60.371 | 108.667 | 1.437 | 2.017 | 52.139 | 96.834 | 73.163 | 135.881 |
| Netherlands | 3.793.953 | 7.159.055 | 3.396.441 | 6.408.963 | 4.113 | 3.682 | 4.816.096 | 9.307.548 | 4.311.488 | 8.332.347 |
| Poland | 1.587.531 | 2.872.480 | 2.703.613 | 4.891.920 | 594 | 1.011 | 1.868.848 | 3.485.719 | 3.182.705 | 5.936.285 |
| Portugal | 1.556.896 | 2.853.311 | 1.761.022 | 3.227.412 | 1.957 | 2.214 | 1.791.737 | 3.308.574 | 2.026.654 | 3.742.365 |
| Romania | 398.018 | 743.760 | 807.180 | 1.508.345 | 295 | 597 | 435.144 | 819.961 | 882.472 | 1.662.880 |
| Slovakia | 244.760 | 450.641 | 441.819 | 813.457 | 779 | 1.407 | 319.562 | 603.000 | 576.845 | 1.088.482 |
| Slovenia | 248.607 | 449.312 | 785.566 | 1.419.765 | 1.626 | 5.138 | 282.379 | 523.721 | 892.280 | 1.654.888 |
| Spain | 6.694.086 | 12.449.384 | 6.974.043 | 12.970.037 | 2.277 | 2.373 | 8.837.728 | 16.500.546 | 9.207.336 | 17.190.625 |
| Sweden | 1.986.899 | 3.798.437 | 1.605.726 | 3.069.732 | 4.101 | 3.315 | 2.270.267 | 4.416.821 | 1.834.732 | 3.569.484 |
| United Kingdom | 7.647.875 | 15.096.950 | 6.482.223 | 12.795.946 | 3.574 | 3.030 | 9.130.774 | 18.281.745 | 7.739.106 | 15.495.330 |
| **EUR Total** | **93.185.745** | **173.771.759** | **88.179.850** | **164.255.560** | **2.509** | **2.571** | **109.009.383** | **206.093.982** | **103.113.620** | **194.731.937** |

Source: Diabetes Atlas [15]

**Table 40 – In-patient average length of stay (in days) COPD**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | 12,9 | 12,8 | 12,6 | 12,7 | 12,5 | 12,3 | 12,1 | 11,8 | n/a |
| Bulgaria | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Czech Rep | n/a | 18,0 | 16,9 | 16,8 | 18,4 | 17,9 | 17,6 | 16,2 | 15,8 |
| Denmark | 7,1 | 6,8 | 6,5 | n/a | n/a | 5,9 | 5,8 | n/a | n/a |
| Germany | 11,9 | 11,7 | 12,6 | 12,3 | 12,0 | 11,9 | 12,3 | 11,4 | n/a |
| Estonia | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Ireland | 9,5 | 9,3 | 9,2 | 9,5 | 10,0 | 10,3 | 10,0 | 9,5 | 9,4 |
| Spain | 9,9 | 9,9 | 9,7 | 9,4 | 9,2 | 8,8 | 8,7 | 8,6 | 8,5 |
| France | 9,1 | 9,3 | 9,3 | 9,2 | 9,0 | 8,9 | 9,0 | 0,2 | 0,2 |
| Italy | n/a | n/a | 9,9 | 9,9 | 10,0 | 10,1 | 10,3 | n/a | 10,4 |
| Cyprus | 7,5 | 5,1 | 5,4 | 6,8 | 6,0 | 6,9 | 6,4 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | 9,6 | n/a | n/a | 9,4 | n/a |
| Lithuania | 10,5 | 10,0 | 9,5 | 9,6 | 9,5 | 9,3 | 9,1 | 9,0 | 8,9 |
| Luxembourg | 13,5 | 13,8 | 12,3 | 12,3 | 12,2 | 12,1 | 13,5 | 12,5 | 13,9 |
| Hungary | n/a | n/a | n/a | 10,0 | 9,7 | 9,8 | 9,8 | 10,1 | 8,0 |
| Malta | n/a | n/a | n/a | 6,8 | 7,1 | 7,6 | 6,9 | 5,6 | 5,5 |
| Netherlands | n/a | 13,0 | 12,4 | 11,9 | 11,2 | 11,1 | 10,4 | 10,1 | 9,6 |
| Austria | n/a | n/a | 11,2 | 10,8 | 10,4 | 10,5 | 10,1 | 10,1 | 10,5 |
| Poland | n/a | n/a | 11,6 | 10,8 | 10,6 | 10,3 | 10,0 | 9,6 | 9,3 |
| Portugal | n/a | n/a | n/a | n/a | 10,0 | 10,1 | 9,8 | 9,6 | 9,5 |
| Romania | 11,0 | 10,4 | 9,8 | 10,3 | 10,0 | 9,9 | 9,9 | 9,6 | 9,4 |
| Slovenia | n/a | n/a | n/a | 11,0 | 10,1 | 10,5 | 10,1 | 10,1 | 10,4 |
| Slovakia | 16,7 | 14,3 | 13,5 | 13,1 | 12,5 | 12,5 | n/a | 11,6 | 11,5 |
| Finland | 9,6 | 10,7 | 11,1 | 10,1 | 10,4 | 10,3 | 11,3 | 11,1 | 10,5 |
| Sweden | 6,7 | 6,8 | 6,6 | 6,6 | 6,5 | 6,6 | 6,5 | 6,3 | 6,3 |
| UK | 11,1 | 10,6 | 10,2 | n/a | n/a | 9,3 | 8,9 | n/a | 8,2 |

Source: Eurostat, 2011[2]

**Table 41 – In-patient average length of stay (in days) Acute myocardial infarction including subsequent myocardial infarction**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | 9,3 | 8,9 | 8,8 | 8,5 | 8,5 | 7,7 | 7,5 | 7,4 | n/a |
| Bulgaria | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Czech Republic | n/a | 8,0 | 7,5 | 7,5 | 8,0 | 7,8 | 7,5 | 7,2 | 7,0 |
| Denmark | 6,8 | 6,2 | 5,8 | n/a | n/a | 5,3 | 5,1 | n/a | n/a |
| Germany | 10,8 | 10,2 | 10,9 | 10,7 | 11,1 | 11,2 | 11,0 | 10,9 | n/a |
| Estonia | 10,0 | 9,5 | 9,1 | 9,1 | 9,6 | 9,4 | 10,3 | 10,1 | 9,9 |
| Ireland | 10,5 | 10,4 | 10,5 | 11,0 | 10,5 | 9,9 | 9,5 | 9,0 | 8,4 |
| Spain | 9,9 | 9,9 | 9,5 | 9,2 | 9,0 | 8,7 | 8,4 | 8,3 | 8,1 |
| France | 7,3 | 7,2 | 7,0 | 6,9 | 6,6 | 6,5 | 6,4 | n/a | n/a |
| Italy | n/a | n/a | 8,6 | 8,4 | 8,2 | 8,0 | 7,9 | n/a | 7,8 |
| Cyprus | 9,4 | 9,2 | 8,9 | 9,5 | 7,7 | 8,2 | 7,8 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | 10,4 | n/a | n/a | 10,0 | n/a |
| Lithuania | 12,4 | 12,5 | 12,3 | 12,3 | 11,9 | 11,4 | 11,0 | 10,8 | 10,5 |
| Luxembourg | 8,5 | 7,2 | 7,4 | 7,3 | 7,1 | 7,4 | 6,7 | 6,5 | 5,7 |
| Hungary | n/a | n/a | n/a | 10,0 | 9,2 | 8,3 | 8,0 | 8,2 | 6,9 |
| Malta | n/a | n/a | n/a | 8,2 | 7,2 | 7,2 | 6,7 | 7,6 | 7,1 |
| Netherlands | n/a | 9,5 | 9,2 | 8,6 | 8,0 | 7,6 | 7,1 | 6,7 | 6,5 |
| Austria | n/a | n/a | 12,6 | 11,6 | 10,0 | 10,0 | 9,5 | 9,4 | 9,3 |
| Poland | n/a | n/a | 9,3 | 8,4 | 8,8 | 8,2 | 7,9 | 7,4 | 6,7 |
| Portugal | n/a | n/a | n/a | n/a | 8,9 | 8,7 | 8,5 | 8,2 | 7,9 |
| Romania | 10,8 | 10,9 | 10,3 | 11,2 | 9,5 | 9,3 | 9,0 | 8,6 | 8,2 |
| Slovenia | n/a | n/a | n/a | 8,4 | 7,8 | 7,7 | 7,6 | 8,0 | 7,5 |
| Slovakia | 10,6 | 10,1 | 9,4 | 8,6 | 8,1 | 7,7 | n/a | 6,0 | 5,4 |
| Finland | 13,5 | 13,1 | 12,1 | 11,5 | 12,3 | 9,9 | 11,5 | 10,1 | 9,7 |
| Sweden | 6,4 | 6,3 | 6,2 | 5,8 | 5,5 | 5,4 | 5,0 | 5,0 | 4,8 |
| UK | 9,2 | 9,4 | 9,6 | n/a | n/a | 9,6 | 9,0 | n/a | 8,4 |

Source: Eurostat, 2011[2]

**Table 42 – In-patient average length of stay (in days) Angina pectoris**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | 4,2 | 4,2 | 3,6 | 3,7 | 3,4 | 3,3 | 3,1 | 3,0 | n/a |
| Bulgaria | n/a | n/a | n/a | n/a | 5,9 | 5,2 | 5,0 | 4,3 | 3,5 |
| Czech Republic | n/a | 6,5 | 6,1 | 5,9 | 6,3 | 6,1 | 6,0 | 5,6 | 5,1 |
| Denmark | 3,8 | 3,7 | 3,4 | n/a | n/a | 3,4 | 3,2 | n/a | n/a |
| Germany | 7,0 | 6,6 | 6,3 | 5,8 | 5,9 | 5,7 | 5,5 | 5,3 | n/a |
| Estonia | 8,3 | 8,3 | 7,5 | 7,3 | 7,1 | 7,0 | 6,6 | 6,3 | 6,1 |
| Ireland | 7,0 | 6,8 | 6,7 | 6,7 | 6,9 | 6,3 | 5,9 | 5,8 | 5,3 |
| Spain | 7,1 | 6,6 | 6,5 | 6,1 | 5,9 | 5,7 | 6,7 | 6,5 | 6,4 |
| France | 5,1 | 4,9 | 4,7 | 4,6 | 4,5 | 4,4 | 4,4 | 0,1 | 0,1 |
| Italy | n/a | n/a | 5,8 | 5,6 | 5,5 | 5,4 | 4,6 | n/a | 5,1 |
| Cyprus | 6,3 | 6,5 | 5,3 | 5,7 | 5,2 | 5,6 | 5,7 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | 7,9 | n/a | n/a | 6,7 | n/a |
| Lithuania | 9,8 | 9,6 | 9,0 | 8,9 | 8,8 | 8,8 | 8,3 | 8,1 | 7,5 |
| Luxembourg | 4,5 | 4,8 | 4,6 | 4,8 | 4,4 | 4,2 | 4,1 | 3,6 | 3,5 |
| Hungary | n/a | n/a | n/a | 5,6 | 5,3 | 4,9 | 5,0 | 5,2 | 4,5 |
| Malta | n/a | n/a | n/a | 5,0 | 4,8 | 5,0 | 4,5 | 5,3 | 5,2 |
| Netherlands | n/a | 4,8 | 4,5 | 4,5 | 4,1 | 5,5 | 5,1 | 4,7 | 4,4 |
| Austria | n/a | n/a | 7,1 | 6,5 | 6,3 | 6,1 | 5,9 | 5,7 | 5,5 |
| Poland | n/a | n/a | 6,6 | 6,2 | 6,3 | 6,0 | 5,8 | 5,5 | 5,0 |
| Portugal | n/a | n/a | n/a | n/a | 3,3 | 3,9 | 3,0 | 2,8 | 2,7 |
| Romania | 8,8 | 8,2 | 7,5 | 7,4 | 7,3 | 7,1 | 6,9 | 6,7 | 6,3 |
| Slovenia | n/a | n/a | n/a | 6,7 | 5,7 | 5,1 | 5,0 | 5,0 | 4,8 |
| Slovakia | 8,5 | 8,0 | 7,4 | 7,0 | 6,7 | 6,3 | n/a | 5,2 | 4,9 |
| Finland | 6,1 | 6,0 | 6,2 | 5,4 | 5,5 | 5,6 | 6,1 | 4,9 | 4,6 |
| Sweden | 3,9 | 4,0 | 4,0 | 3,9 | 3,7 | 3,8 | 3,6 | 3,5 | 3,5 |
| UK | 5,6 | 5,6 | 5,6 | n/a | n/a | 4,9 | 4,6 | n/a | 4,1 |

Source: Eurostat, 2011[2]

**Table 43 – In-patient average length of stay (in days) hypertension**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | 9,4 | 9,5 | 9,7 | 9,4 | 9,6 | 9,5 | 9,3 | 8,9 | n/a |
| Bulgaria | 10,8 | 9,0 | 8,1 | 7,7 | 7,0 | 8,3 | 7,6 | 3,6 | 3,8 |
| Czech Republic | n/a | 9,0 | 8,7 | 8,5 | 8,4 | 8,2 | 8,6 | 8,8 | 8,9 |
| Denmark | 5,0 | 4,6 | 4,5 | n/a | n/a | 3,8 | 3,8 | n/a | n/a |
| Germany | 8,7 | 8,4 | 9,0 | 8,3 | 7,7 | 7,3 | 7,1 | 6,7 | n/a |
| Estonia | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Ireland | 7,4 | 6,8 | 6,9 | 6,7 | 6,2 | 5,1 | 5,1 | 4,7 | 4,3 |
| Spain | 8,9 | 8,8 | 8,7 | 8,8 | 8,6 | 8,6 | 8,5 | 8,4 | 8,3 |
| France | 6,5 | 6,6 | 6,5 | 6,4 | 6,2 | 5,9 | 5,8 | 0,3 | 0,2 |
| Italy | n/a | n/a | 7,2 | 7,2 | 7,3 | 7,4 | 7,7 | n/a | 7,9 |
| Cyprus | 5,5 | 4,7 | 3,8 | 4,8 | 4,5 | 4,6 | 4,3 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | 7,8 | n/a | n/a | 7,4 | n/a |
| Lithuania | 9,4 | 9,0 | 8,5 | 8,1 | 8,0 | 7,6 | 7,2 | 7,1 | 6,7 |
| Luxembourg | 7,6 | 8,4 | 7,1 | 6,7 | 8,0 | 7,9 | 6,5 | 7,1 | 7,7 |
| Hungary | n/a | n/a | n/a | 8,6 | 8,7 | 8,7 | 8,5 | 9,0 | 7,3 |
| Malta | n/a | n/a | n/a | 5,2 | 4,1 | 3,6 | 3,0 | 4,7 | 26,5 |
| Netherlands | n/a | 7,8 | 7,2 | 6,6 | 6,2 | 5,9 | 5,6 | 5,1 | 4,8 |
| Austria | n/a | n/a | 9,9 | 8,1 | 7,8 | 7,7 | 7,5 | 7,6 | 7,9 |
| Poland | n/a | n/a | 6,9 | 6,3 | 6,3 | 6,1 | 5,8 | 5,5 | 5,1 |
| Portugal | n/a | n/a | n/a | n/a | 8,2 | 8,1 | 8,5 | 9,0 | 8,9 |
| Romania | 8,7 | 8,0 | 7,6 | 7,6 | 7,7 | 7,5 | 7,8 | 7,5 | 7,3 |
| Slovenia | n/a | n/a | n/a | 7,3 | 6,9 | 6,5 | 6,7 | 6,0 | 6,3 |
| Slovakia | 9,0 | 8,6 | 8,3 | 8,1 | 7,8 | 7,7 | n/a | 7,5 | 7,4 |
| Finland | 13,8 | 13,5 | 13,7 | 11,6 | 13,2 | 13,8 | 13,8 | 14,6 | 16,7 |
| Sweden | 4,2 | 4,3 | 4,1 | 4,0 | 4,1 | 4,2 | 4,2 | 3,9 | 4,6 |
| UK | 8,6 | 8,8 | 8,6 | n/a | n/a | 8,3 | 8,2 | n/a | 8,1 |

Source: Eurostat, 2011[2]

**Table 44 – In-patient average length of stay (in days) other ischaemic heart disease**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | 5,7 | 5,5 | 5,3 | 4,9 | 4,8 | 4,6 | 4,5 | 4,2 | n/a |
| Bulgaria | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Czech Rep | n/a | 10,4 | 10,5 | 10,6 | 11,2 | 11,0 | 11,3 | 11,0 | 10,8 |
| Denmark | 5,5 | 5,3 | 5,2 | n/a | n/a | 4,5 | 4,4 | n/a | n/a |
| Germany | 7,2 | 7,0 | 9,7 | 10,4 | 10,5 | 10,4 | 10,1 | 10,1 | n/a |
| Estonia | 11,7 | 11,1 | 11,2 | 10,5 | 12,5 | 13,6 | 14,2 | 13,6 | 12,8 |
| Ireland | 8,1 | 8,0 | 7,5 | 7,8 | 6,7 | 6,4 | 6,8 | 6,4 | 5,9 |
| Spain | 7,8 | 7,8 | 7,6 | 7,2 | 7,0 | 6,9 | 6,6 | 6,5 | 6,3 |
| France | 5,2 | 5,0 | 4,8 | 4,7 | 4,5 | 4,5 | 4,5 | 0,1 | 0,1 |
| Italy | n/a | n/a | 7,8 | 7,6 | 7,5 | 7,5 | 6,9 | n/a | 7,4 |
| Cyprus | 4,9 | 5,7 | 6,5 | 7,3 | 4,8 | 5,2 | 5,5 | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | 8,3 | n/a | n/a | 7,6 | n/a |
| Lithuania | 9,5 | 9,5 | 9,1 | 9,0 | 9,3 | 8,2 | 7,9 | 7,5 | 7,2 |
| Luxembourg | 5,9 | 5,3 | 5,2 | 5,3 | 5,4 | 5,3 | 5,8 | 6,2 | 6,0 |
| Hungary | n/a | n/a | n/a | 10,8 | 10,7 | 10,7 | 11,1 | 11,4 | 8,9 |
| Malta | n/a | n/a | n/a | 6,2 | 5,9 | 6,7 | 6,7 | 7,3 | 11,4 |
| Netherlands | n/a | 7,3 | 7,0 | 6,7 | 6,5 | 6,2 | 6,0 | 6,1 | 6,2 |
| Austria | n/a | n/a | 13,2 | 11,7 | 11,9 | 11,8 | 11,8 | 11,8 | 11,8 |
| Poland | n/a | n/a | 7,7 | 6,8 | 6,5 | 6,5 | 6,5 | 5,9 | 5,5 |
| Portugal | n/a | n/a | n/a | n/a | 5,8 | 5,3 | 3,7 | 3,5 | 3,4 |
| Romania | 9,3 | 8,6 | 8,4 | 8,4 | 8,6 | 8,7 | 9,0 | 9,2 | 8,9 |
| Slovenia | n/a | n/a | n/a | 10,4 | 10,5 | 8,9 | 8,3 | 8,4 | 8,5 |
| Slovakia | 10,5 | 10,0 | 9,6 | 9,4 | 9,2 | 9,3 | n/a | 8,9 | 8,6 |
| Finland | 17,5 | 19,4 | 16,8 | 16,0 | 17,2 | 19,5 | 20,0 | 23,9 | 20,5 |
| Sweden | 5,5 | 5,3 | 5,1 | 4,8 | 4,4 | 4,4 | 4,5 | 4,3 | 4,0 |
| UK | 7,5 | 7,4 | 7,2 | n/a | n/a | 6,7 | 6,7 | n/a | 6,6 |

Source: Eurostat, 2011[2]

**Table 45 – In-patient average length of stay (in days) other ischaemic heart disease**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | 11,0 | 10,7 | 10,2 | 9,8 | 9,8 | 9,6 | 9,4 | 9,4 | n/a | n/a |
| Bulgaria | 10,9 | 10,4 | 9,9 | 9,3 | 9,4 | 7,4 | 7,0 | 6,6 | 6,2 | n/a |
| Czech Republic | n/a | 14,7 | 14,2 | 14,4 | 14,9 | 14,9 | 14,2 | 14,2 | 14,1 | n/a |
| Denmark | 7,9 | 7,9 | 7,7 | n/a | n/a | 6,9 | 6,5 | n/a | n/a | n/a |
| Germany | 14,1 | 14,0 | 14,3 | 14,0 | 13,9 | 13,7 | 13,4 | 13,0 | n/a | n/a |
| Estonia | 10,8 | 10,0 | 10,7 | 10,3 | 10,1 | 10,1 | 10,2 | 10,2 | 10,4 | n/a |
| Ireland | 8,1 | 8,2 | 8,1 | 8,4 | 9,9 | 8,9 | 8,7 | 8,6 | 8,5 | n/a |
| Spain | 10,6 | 10,6 | 10,4 | 9,5 | 9,3 | 9,1 | 9,0 | 9,0 | 8,9 | n/a |
| France | 8,1 | 8,2 | 8,0 | 7,8 | 7,5 | 7,4 | 7,2 | 0,3 | 0,2 | n/a |
| Italy | n/a | n/a | 8,7 | 8,7 | 8,8 | 8,8 | 8,8 | n/a | 8,8 | n/a |
| Cyprus | 6,6 | 6,7 | 6,1 | 6,5 | 6,3 | 6,2 | 5,8 | n/a | n/a | n/a |
| Latvia | n/a | n/a | n/a | n/a | 9,8 | n/a | n/a | 9,1 | n/a | 7,7 |
| Lithuania | 10,6 | 10,6 | 10,2 | 10,1 | 10,1 | 9,9 | 9,8 | 9,6 | 8,8 | 8,8 |
| Luxembourg | 10,0 | 10,5 | 10,3 | 9,3 | 9,5 | 9,8 | 10,4 | 10,2 | 9,4 | n/a |
| Hungary | n/a | n/a | n/a | 7,6 | 7,3 | 7,1 | 7,2 | 7,3 | 6,1 | n/a |
| Malta | n/a | n/a | n/a | 9,6 | 11,9 | 13,3 | 10,3 | 10,1 | 13,0 | 13,1 |
| Netherlands | n/a | 12,9 | 12,8 | 11,6 | 11,3 | 10,9 | 10,0 | 9,4 | 9,2 | n/a |
| Austria | n/a | n/a | 17,0 | 12,1 | 12,0 | 12,2 | 11,8 | 12,0 | 11,8 | n/a |
| Poland | n/a | n/a | 9,8 | 9,4 | 9,6 | 9,5 | 9,1 | 8,7 | 8,5 | n/a |
| Portugal | n/a | n/a | n/a | n/a | 12,1 | 9,8 | 9,3 | 8,7 | 8,5 | n/a |
| Romania | 7,3 | 6,7 | 6,4 | 6,5 | 6,4 | 7,3 | 7,1 | 7,0 | 7,0 | n/a |
| Slovenia | n/a | n/a | n/a | 8,9 | 8,8 | 9,1 | 9,2 | 8,6 | 8,3 | n/a |
| Slovakia | 12,0 | 11,2 | 11,1 | 10,9 | 10,6 | 10,2 | n/a | 10,0 | 9,7 | n/a |
| Finland | 12,7 | 12,6 | 13,4 | 13,1 | 13,3 | 12,7 | 13,6 | 14,2 | 12,1 | n/a |
| Sweden | 7,5 | 7,5 | 7,3 | 7,2 | 7,0 | 6,9 | 7,0 | 6,8 | 6,5 | n/a |
| UK | 11,7 | 11,3 | 11,0 | n/a | n/a | 9,2 | 8,8 | n/a | 8,2 | n/a |

Source: Eurostat, 2011[2]

## Annex II – Overview of IPHS projects covered – project fiches

| **ITALY** | |
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| **My Doctor@home** | |
| Description | Launched in 2008 by hospital AO San Giovanni Battista Molinette (AOSGBM) in partnership with Telecom Italia |
| Goal of the project | Elderly patients treated in the home based hospitalization (OAD) setting or just discharged are the target. The OAD service is active every day, normally, involving 13 professional nurses, 1 nurse coordinator, 1 social worker, 3 physiotherapists and 1 counsellor. Besides routine visits, during working hours the health staff of OAD is also able to answer patient calls and be at his/her home within 20 or 30 minutes.<br>RMT services for CVD and COPD patients aged 75+ |
| Other information | Technology platform based on a cloud computing model (Platform-as-a-Service). Technology relies heavily on mobile phone transmission and on sms reminders to patients |
| Project phase | A DRG for this treatment has been created at regional level, however some barriers to make this reimbursement scheme effective remain. Rolling out for 5,000 patients currently being recruited |
| Size & geographical scope | Initially, RCT with 40 patients (20 in each group) in 2008. Currently 416 patients and aiming to mainstream to 5,000.<br>Piedmont region with about 4.5 million inhabitants it is one of the regions with the highest proportion of 65+ population. The regional health plan In the plan, the role of ICT is considered key to the reorganisation of primary care and the integration of different care/ assistance levels, especially in non-urban and mountains areas (43% of the total territory). |
| Quantitative Impact assessment | Estimated financial gains when compared to hospital stay: Financial gain estimates in line with results of a 2007 study "Healthcare costs of COPD in Italian referral centres" which estimated that the average cost of a day of stay for COPD patients in Italy is € 268.2<br>Contract with Telecom Italia : €10 million (per 5,000 patients over 5 years); €2 per day ( just Telecom Italia services) + OAD regime is reimbursed on average €160 per day<br>Preliminary studies show reduced access to specialists. Early detection of deteriorating conditions, allowing timely care and reduced acute episode recurrence rates. |
| Qualitative impact assessment | Better patient responsiveness to treatments and improvement of the mood |
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| **VCO** | |
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| Description | Against a background of integrated care models delivered to diabetic patients in primary care, an RMT service was set up. One of the main drivers was geographical. The contact centre is attended by nurses that monitor patient measurement and eventually activate ASL clinicians or contact patients through video-conferencing, send patients' clinical reports to involved GPs and specialists |
| Goal of the project | Patients with different chronic conditions: diabetes, COPD, cancer and chronic heart failure patients. However most of them are diabetic patients |
| Other information | The service is delivered through a telemedicine centre managed by the supplier. The role of ASL in the project is focused on the clinical side.<br>RMT and video-conferencing facility |
| Project phase | Slowly rolling-out |
| Size & geographical aim | March 2011 there were 128 patient involved.<br>Also Piedmont region. So far in ASL Verbano Cusio Ossola (ALS VCO), a Piedmont local health enterprise in a mountainous area. plans for ASL Biella to start treating its diabetic patients through the ASL VCO system |
| Quantitative Impact assessment | <u>Costs</u><br>Contract with Tesan and partners: €1,817,000.(contract covers 300 patients within 3 years' time framework ) On top of that +2 % of contract value covering CSI activities ( €36,400).<br>When the project will enrol 300 patients the estimated costs will be around €6-€6.50 per day per patient. Considering January 2011 results costs were between €14 and €15 per day per patient (Costs per patients are IDC estimates)<br><u>Benefits</u><br>Reduced use of: ambulatory care services (63% reduction), A&E (80% reduction), and hospitalization rates (56% reduction). Better adherence to prescriptions, reduction of average values for disease key clinical indicators. Estimates do not include ASL VCO specialists' time.<br>Clinical benefits: reduced HbA1c values in 76% of cases (from 8.5 to 7.2); reduced hypoglycemia episode rate per months from 10 to 5 for type 1 patients and from 4 to 3 in type 2 patients; Reduction of cholesterol count in 54.4% of patients; Reduction of triglycerides in 53.9% of patients |
| Qualitative impact assessment | Customer satisfaction survey concluded that the initiative is positively considered (93% of responses were positive. The remaining 7% was just somewhat negative). Patients' perception of training was positive with no negative opinions. Devices were also generally judged easy to manage (75 % had no difficulty at all, 22% had sometimes difficulties, 3% said that difficulties were not manageable). Support was effective and timely: for 81% of patients the service was always effective and timely, for 15% nearly always, and for 4% only sometimes. |

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| | Patients generally think they are better followed (48% of them think they are treated in a much better way, while none of them think that care has deteriorated in quality) and a large share of them states that the service has helped improve their lifestyle and change habits in a significant way (37%), while only 16% of them noticed no (6%) or few (10%) changes towards a healthier lifestyle. |
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| **Telemaco/ NRS** | |
| Description | The project was conducted from April 2006 to September 2010 and was aimed at supporting the accessibility to specialized healthcare for small municipalities in mountain valleys through the provision of telemedicine services:<br>• Tele-monitoring for patients with CHF or COPD after hospital discharge;<br>• tele-consultation for GPs from specialists in cardiology, dermatology, diabetes and respiratory medicine;<br>• tele-consultation on digital images (Computerized Tomography) between rural hospitals and high specialized hospitals for traumatic brain injury and stroke. |
| Goal of the project | Currently at mainstreaming phase, COPD oxygen therapy combined with RMT. The overarching goal is for patients to learn to self-manage their condition. The service involves:<br>• A specialized nurse (tutor) which will follow the patient during the service and that will play a major role for counselling and patient education activities<br>• Electronic transmission of clinical data<br>• Regular phone contacts between patients and tutor<br>• A call centre available to patients 24/7 for ad hoc requests<br>• Management of a shared database which can be accessed by GPs, Nurses and Specialists |
| Other information | Funding is directly managed by hospital. The project addresses patients with severe COPD, which according the available literature are the most expensive. |
| Project phase | Original funding (2006-2010): Ministry of Health (€1.6 million), the Ministry of Innovation and Technology (€0.45 million) and by the Lombardy regional health department (€1.4 million). Once it was completed, it now falls under the NRS umbrella which is NRS is a regional common framework for new experimental initiatives aimed at developing chronic disease management tools for chronic and post acute patients.<br>A DRG has been created for the telemaco service to be reimbursed = Mainstreaming for COPD oxygen therapy at home for all the Lombardy region |
| Size & geographical aim | In September 2010, Telemaco involved patients in the catchment area of 8 ASLs of the 15 ASLs in Lombardy. |

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| | The plan is for 1,013 patients by the end of 2011. |
| Quantitative Impact assessment | €3.45 million initial funding. When the project was moved into NRS, funding for 2010 was €216,000 (300 potential patients )<br>Tariffs: €720 (120 per month/€4 per day) for 6 months high intensity care or €480 (€80 per month, €2.7 per day) for 6 months low intensity. Costs per hospital are available in Annex III.<br>Fewer hospital admissions, fewer access to emergency service, acute episodes have been largely addressed at patient home. |
| Qualitative impact assessment | Good patients' acceptance and satisfaction rates. Increased role of patients and informal care givers in disease management. |
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| **eCare/CUP 2000 in Bologna** | |
| Description | This is the only project integrating health and social services. The project does not entail the use of medical devices.<br>eCare/CUP 2000 is a telesupport / telecompany initiative, based on an ad hoc call centre offering services for fragile elderly people. |
| Goal of the project | The service is very focused on social care prevention for fragile patients 75+ |
| Other information | The call centre is provided by CUP 2000: an in-house company owned by the regional government, the municipality of Bologna, the province (district) of Bologna, and by most of Emilia Romagna's ASLs and AOs. |
| Project phase | Rolling out – currently 19% of the target population |
| Size & geographical aim | In 2010, 3,327 patients involved.<br>Emilia Romagna an area with higher proportion of ageing population. This project targets Bologna and Ferrara. So far covering 50 councils in Bologna. |
| Quantitative Impact assessment | 2011- the total budget of the project is €800,000. Budget includes all costs (capital allowances, volunteers' reimbursements, wages etc., phone costs etc.).<br>Cost/patient: €1 per day ( but new estimates are showing also lower numbers)<br>50% reduction in attendance to A&E services. Reduction of hospitalization rates. Reduction of acute episodes recurrence. More effective integration of social and health resources. |
| Qualitative impact assessment | High acceptance and satisfaction rates. Reduction of fragility conditions. |

| **DENMARK** | |
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| **The Patient Briefcase** | |
| Description | The ICT equipment allows live transmission of images / sound as well as data measurements from medical equipment (e.g. Spiro meter and devices to measure oxygen saturation) to be quickly transferred to the hospital either via the Internet or a satellite connection. At the hospital, the doctor can evaluate and guide the patient as if the patient was present at the hospital. The data transmitted from the patient's home enables the hospital to perform a systematic monitoring and control the quality of treatment. |
| Goal of the project | Testing COPD home monitoring |
| Other information | Use of ADSL connection. In addition, the patients' equipment is a "briefcase" with an on/off switch, a button for volume and an alarm button with an SMS function where the patient can contact the tele-nurse 7 days a week during working hours (8-15). |
| Project phase | Launched in 2010, it is set to finish as a project in 2012 after one year in full operation at Odense University Hospital (OUH). The hospital has decided to mainstream the Patient Briefcase at the hospital from 2012 onwards and entered a service agreement with the producer MediSat A/S. currently the project is routine care for COPD and aiming to mainstream for diabetes and post-birth discharge at home |
| Size & geographical aim | 800 COPD patients. Regional basis |
| Quantitative Impact assessment | Funding: 161.000 EUR) EC funding for the EU pilot project Better Breathing. The estimated remaining cost of approx. 10 m DKK (1.3 m EUR) for the implementation project was funded by OUH (University Hospital of Odense) and the manufacturer, MediSat A/S.<br>Current cost agreement involves: 530-800 EUR per month, i.e. a leasing agreement for 40 briefcases (the exact amount is classified).<br>133 patients have been involved in the MAST study |
| Qualitative impact assessment | |
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| **ePatch** | |
| Description | ePatch (electronic patch) is an application based on a wireless sensor system for measurements of specific heart rate disturbances, which typically predicts a stroke. The purpose of the patch is therefore to screen people in the group of risk and thereby initiate a preventing treatment in due time. |
| Goal of the project | The aim is to develop a heart ePatch that records electro cardio signals in a quality better than or equal to the existing |

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| | technology and to demonstrate the ease-of-use-and-wear of the ePatches on heart patients in the hospital. |
| Other information | ePatch basically falls under the same category as the Holter device |
| Project phase | Testing technology feasibility in Denmark and in Germany |
| Size & geographical aim | Currently testing user feasibility at hospital level. |
| Quantitative Impact assessment | By introducing monitoring with heart ePatches and automatic analysis identifying persons who should be receiving preventive treatment for strokes, it is expected that approx 1500 strokes can be prevented. Estimates conclude taht this could amount to potential annual cost savings to the Danish healthcare system of 500-750 m DKR (67-100 m EUR).<br>Also, quality of the clinical analysis is increased and handling, maintenance and hygiene is made easier. |
| Qualitative impact assessment | Care professionals revealed that the quality is better or equal to the reference equipment in current use in the hospital wards. The nurses are pleased with how easy it is to handle the ePatches and the patients are grading use of the ePatches as either “satisfying” or “very satisfying”. |
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| **TeleKAT Project** | |
| Description | The telekat box can collect and transmit vital values wirelessly such as blood pressure, pulse, weight, oxy saturation, etc. The data is transmitted via the Internet to healthcare staff. Hereby, the health professionals are able to follow the course of disease and training efforts |
| Goal of the project | The project tries to prevent readmissions of citizens suffering from COPD by encouraging help to self-help in rehabilitation in the patient’s own home. The rehabilitation happens by offering the COPD patients tele-homecare (remote patient monitoring and treatment) technology. |
| Other information | |
| Project phase | January 2nd 2008 to June 30th 2011<br>• Phase I (January–June 2008): Design phase.<br>• Phase II (July 2008–June 2009): Clinical testing of tele-rehabilitation programme.<br>• Phase III (July 2009–June 2010): Conducting a randomised study.<br>• Phase IV (July 2010–June 2011): Testing the programme in a new context with other healthcare professionals.<br>The TeleKAT project will be the basis of a new large-scale project focused on remote patient monitoring and treatment in the North Denmark Region. This project will comprise approximately 2,000 patients and most likely start in the spring of 2012 as a day-to-day running implementation project. |
| Size & geographical aim | RCT - 132 patients with COPD participated in the study with 66 in each group |

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| | Aiming at regional scope by 2012 |
| Quantitative Impact assessment | Earlier surveys have shown that 14 per cent of these patients (severe COPD patients) are readmitted within one month and that 46 per cent is readmitted within one year. However, the project has taught the patients to handle their own illness, which is why they have far less bed days. When comparing, we can see that the preventive remote patient monitoring lowers the number of admissions with over 50 per cent.<br>Even in the cases where admission happens, the number of bed days is lowered with over five days compared to the control group |
| Qualitative impact assessment | |
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| **The Diabetic Foot Ulcer Project** | |
| Description | A visiting nurse is given the chance to have continuous collaboration and dialogue with specialist expertise through a common ulcer record with pictures and documentation. The ulcer record gives a more efficient treatment of the wound as treatment can be initiated instantly. Also ulcer specialists can gain access to the pictures and thereby support decision-making processes made at the hospital. This is done through sending the images through the GSM net (by use of SMS/MMS messaging) and use of a web browser with access to the images and medical assessments done by non-specialists. Meanwhile, health professionals can save time. |
| Goal of the project | The diabetic foot ulcer project will test an internet based ulcer record in connection with treatment of ulcers in the patients' own homes |
| Other information | |
| Project phase | pilot |
| Size & geographical aim | 23 patients for 16 months. from January 2010 to April 2011 and is now prolonged until March 2012 with national implementation in mind for that date |
| Quantitative Impact assessment | The National Board of Health's analysis department Danish Centre of Health Technology Assessment (DACEHTA) performed the health technology assessment study for this condition. It was concluded that the annual cost of treating people with diabetic foot ulcers in Denmark in 2006 was estimated to be 793 m DKK (€ 106 m in 2009 exchange rate). Costs for home help are the largest portion of this at about 44 per cent, hospitalisation 36 per cent and outpatient treatment 20 per cent.<br>If the number of patients surpasses 45,000, the company will take 0.97 DKK (0.129333 EUR) per patient. In that way, if a hospital and a number of municipalities with an accumulated patient number of 250,000 are ready to use RMT, the total cost would be 242,500 DKK ex VAT + 10,200 DKK (In total 33,693 EUR) in hosting costs. |

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| Qualitative impact assessment | |
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| **The Anti Coagulant (AC) Treatment Project** | |
| Description | The pilot project was conducted in collaboration between OUH (also involved in patient briefcase project) and the AC centre at Skejby Hospital. |
| Goal of the project | The purpose of the WEB-AC project is to investigate the possibility to develop a web-based RMT functionality to an existing system and its feasibility in practice. Issues such as dose adjustments, safety and quality of the treatment are under study. |
| Other information | |
| Project phase | The web-based interface for patients was developed in the period 2005-2006 and was available on sundhed.dk in October 2006. |
| Size & geographical aim | 300 patients<br>New DRG and DAGS Reimbursement rates for web-based anticoagulant treatment, there is now a basis for the implementation of remote AC treatment in all Danish hospitals and AC clinics, when needed. |
| Quantitative Impact assessment | the following prices apply:<br>• 400 patients: 50,000 DKK (6,700 EUR)<br>• 401-800 patients: 100,000 DKK (13,400 EUR)<br>• 801-1200 patients: 150,000 DKK (20,100 EUR)<br>• 1201-1600 patients: 200,000 DKK (26,800 EUR)<br>• 1601-2000 patients: 250,000 DKK (33,500 EUR)<br>• 2001-2500 patients: 300,000 DKK (40,300 EUR)<br>Assistance for setup, installation, etc. will on average cost 25,000-40,000 DKK (3,300-5,300 EUR) per location.<br>The annual costs for maintenance and support are divided into the costs for the central application for web-based decision support in sundhed.dk and for the software programme “AC schema” used in the clinic respectively amounting to a cost of 130,000 DKK (17,400 EUR) and 262,000 DKK (35,200 EUR) per year. These costs are independent of the number of patients. |
| Qualitative impact assessment | |

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| **Integrated Clinical Home Monitoring Project (ICHM)** | |
| Description | The ICHM project is an IPHS and RMT project that will test the use of home monitoring on various chronic illnesses, share data and communicate across traditional sector boundaries, while developing common electronic communication standards. It is a cross-sectorial, technical, and organisational project focusing on implementation from the outset, consolidated from five quite similar IPHS and RMT projects planned across Denmark, all applying for funding from the PWT Foundation. |
| Goal of the project | |
| Other information | |
| Project phase | Start in the beginning of 2012 and run for approximately one year due to political context delaying the project. |
| Size & geographical aim | Two regions involving a number of municipalities and general practices in both regions |
| Quantitative Impact assessment | The Danish PWT Foundation funds the ICHM project. With a consolidated budget of 65 m DKK (8.7 m EUR) out of which 33 m DKK (4.4 m EUR) originate from the PWT Foundation and 32 m DKK (4.3 m EUR) originate from the participating regions.<br>the role of evaluating the project and its outcomes has been chosen to be delegated to the National Board of Health's department for HTA, namely DACEHTA |
| Qualitative impact assessment | |

| **ESTONIA** | |
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| **VIRTU Project** | |
| Description | "Virtual elderly care services on the Baltic islands" (VIRTU) is a 3-year pilot deployment project of personal integrated assistance using videoconferencing solution |
| Goal of the project | The main aim of the VIRTU project at the individual level is to help elderly in the archipelago area to live at home, support their social interaction, improve their quality of life and increase their safety. part of the solution to:<br>• diminish isolation and loneliness,<br>• give an answer to long distances and diminish travelling,<br>• help elderly people to whom it is hard to travel to keep in touch with the society,<br>• socialize people who live alone,<br>• help elderly people to keep in touch with the relatives far away<br>• find new ways to communicate/connect/consult elderly people and health/social care personnel and student. |
| Other information | Telecare service can be used with a device that is based on a very easy-to-use video call technology. It works through the internet connection.<br>Current funding: the EU's Central Baltic programme and the rest from national public co-funding organised by all project partners |
| Project phase | The larger-scale aim is to create a functional social and health care service model based on the use of virtual technologies for the archipelago areas.<br>The project has two more concrete expected outcomes. It is planned to test the market with a goal to become sustainable by the end of the project (April 2013) and to be able to continue the service on a wider scale. |
| Size & geographical aim | Currently 8 users<br>The project is conducted at international level, but current case study focuses on Estonian partners and innovation development and dissemination in Estonian islands Saaremaa, Hiiumaa, Muhumaa, Ruhnu. The municipalities that are taking part in Estonia are Kuressaare, Kaarma, Kärla, Leisi, Lümanda, Orissaare and Ruhnu. |
| Quantitative Impact assessment | The expectation is that implementing the VIRTU technology will bring monetary savings on treatment/care costs. However, retrieving cost data is making the evaluation very challenging.<br>Main cost articles: average monthly cost thus € 1,471. There are no economies of scale in this project by increasing the number of users, at least not from a health/social care personnel point of view. |
| Qualitative impact | |

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| assessment | |
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| **Dreaming project** | |
| Description | The elderly-friendly alarm handling and monitoring (shortened for DREAMING) is a EU pilot project to demonstrate new services to provide economically sustainable home assistance and eInclusion services able to extend the independent living of elderly citizens in their homes and break their loneliness thus improving the quality of life of the elderly. It is multicentre RCT in 7 different European Union. |
| Goal of the project | The main aim of the DREAMING project is to keep elderly people (defined as aged 65+) in their home environment as long as their physical and mental conditions allow it, enabling them to be full members of the society for longer. |
| Other information | Three services are being delivered: Monitoring and Alarm Handling services; Elderly-friendly videoconferencing services; and Non-ICT based services providing support that enables elderly people to live independently in their homes. |
| Project phase | DREAMING is currently ongoing until spring 2012. |
| Size & geographical aim | Estonia has 30 participant in the control group and 30 in the intervention group. The service is run by ECTH hospital |
| Quantitative Impact assessment | Preliminary results show lower hospitalisations.<br>The total yearly expenditure of ETCH associated with the project is assessed to an average of 100,000 € including depreciation technology costs (120,000 € has been spent on an upfront technology investment). The total costs of ETCH therefore amount to approximately 400,000 €. |
| Qualitative impact assessment | |
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| **ELIKO project** | |
| Description | In the period 2008-2011, Eliko has developed a tele-care system prototype that is intended for different medical applications. Eliko's key activity is technology development and research and not medicine, they have involved partners in the project including the Estonian 3rd largest hospital, East-Tallinn Central Hospital. |
| Goal of the project | The main aim for the project is to create an economically feasible tele-medicine service that can be employed in practice at the provision of health-related services. The project involves a tele-care system prototype, which will be tested at East-Tallinn Central Hospital. The aim is to connect the patient, hospital, emergency care provider (if needed) by sensors for patient monitoring, thus the system integrates several institutional and information systems. |
| Other information | telehealth |
| Project phase | pilot with patients has not jet started |

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| Size & geographical aim | Local (Project partners include public and private research organisations, software companies and the Estonian 3rd largest hospital) |
| Quantitative Impact assessment | |
| Qualitative impact assessment | |

| France | |
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| **ESOPPE - Home security and Home comfort** | |
| Description | The ESOPPE programme is one of the regional Geriatrics expertise centre of the Limousin region, conducted by Legrand (Industrial company), in cooperation with the Limoges University and the Limousin ecosystem which includes: Autonom'Lab, University of Limoges, CHU Limoges, Limousin Region, and territorial administrations (Conseil régional du Limousin, Départements de la Corrèze et de la Creuse) |
| Goal of the project | The main purpose of the ESOPPE prospective study was to evaluate the efficacy of a simple home automation pack coupled to a teleassistance service for preventing falls at home among the frail elderly population losing autonomy. The second priority was to evaluate the service efficiency both in terms of reduced number of falls at home and associated admission to hospital emergency. |
| Other information | The project fits within a territorial strategy to help the elderly live safely and comfortably at home; it is also part of Legrand's long term strategy and local service organizations' strategy to deliver home automation coupled with patient care services.<br>The solution is a home automation system which helps to prevent elderly people falling especially when they get up during night, through automatic lighting devices adapted to home layout; and to control and monitor possible falls through fall captors with added-value telealarm environment (i.e. active captors). |
| Project phase | The ESOPPE R&D study is now completed but product deployment is on-going in the Limousin region, with focus on Corrèze and Creuse departments –around Guéret for the latter, the main town of the department (14,000 inhabitants). |
| Size & geographical aim | The study was initially targeted at 196 adults over 65 years old, living at home, in the Corrèze Department, Limousin Region. The overall target is to cover 3,200 homes in Corrèze, by end 2014. |
| Quantitative Impact assessment | The study was designed as a longitudinal prospective cohort study. Ninety eight people were allocated to each of the control and intervention groups. The simple home automation pack acceptability rate was 97.9% (96/98) in the intervention group. The home falls diaries were analyzed for 96 persons year in the intervention group and 98 persons year in the control group. Results showed 77 (40.5%) elderly falling at home with 29 (30.9%) in the intervention group and 48 (50.0%) in the control group. The simple pack was significantly associated with the reduction of falls at home (odd ratio = 0. 33 IC95% [0.17 – 0.65] p value = 0. 0012). To avoid one elderly falling at home, one will have to equip five. The use of the simple pack was also associated with the reduction of elderly falling at home requiring admission to emergency (odd ratio =0. 30 IC95% [0.12 – 0.74] p value = 0. 0081). |
| Qualitative impact assessment | |
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| **DOMOCARE - Systemic approach for living at home – e-care @ home** | |
| Description | DOMOCARE includes a telealarm application as a first service offering. A simple alarm signal service (alarm buttons) is enhanced with added-value applications around patient behaviour at home. Partners involved are an industry company and a service organisation. |
| Goal of the project | The aim is to deliver added-value services monitored through a 24-hours call centre reached through telealarm, based upon behaviour |

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| | signals from the elderly people at home. The final objective is “to cover 80% of safety and comfort issues raised around an elderly person staying at home”. According to the preliminary study performed by the industrial stakeholders, classical telealarm button leads to efficient results in only 25% of cases. |
| Other information | The DOMOCARE strategic answer, for phase 1 and 2, is linked to offering service packages at three levels:<br>- “classical pack” including "Basic offer" i.e. telealarm button and home relay to service platform<br>- “Active offer” which is telealarm plus movement detection (movement of the person and door opening)<br>- “Prevention offer” which is the same as the above plus a monitoring device for temperature control, medicine observance, and refrigerator access. |
| Project phase | Phase 1 (telealarm) and phase 2 (DOMOCARE added-value for active alarm and control) are presently distributed on a local basis.<br>Phase 3 (PICADO, i.e. e-health applications combined with DOMOCARE telealarm) is a 3-year regional project started in 2011. |
| Size & geographical aim | Local - Champagne-Ardenne region |
| Quantitative Impact assessment | Planned evaluation:<br>- Challenges and needs, as perceived by elderly people<br>- Service follow-up (activity parameters) and service quality (customer satisfaction)<br>- Parameters to quantify medical and service synchronisation<br>- Autonomy parameters<br>- Economic and business models<br>- “Living lab” principles. |
| Qualitative impact assessment | For phase 1 and 2, the main parameter regarding service benefit is measured through customer satisfaction - i.e. the customer or his/her family continue the service subscription, through annual renewal. A customer survey is undertaken by the industry stakeholders. |
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| **Y-DOM - Home security and service staff coordination in mobility** | |
| Description | The Y-DOM concept is developed and commercialised by the DORO/PRYLOS company – a French start-up created in 2003, dedicated to social resources coordination and management. It is based upon android smartphone usage and an ICT platform service. |
| Goal of the project | Organisations in charge of local services to help elderly people are one of the economic sectors which create local employment. However, in spite of growing needs, this sector is faced with severe financial difficulties: social budgets now represent some 50% of the Conseil Général's financial lines. On many occasions the French government pointed out the need to upgrade the management process of such organisations. Dedicated devices aimed at social service staff scheduling optimisation have been identified as a necessary cost control tool. |
| Other information | The DORO/PRYLOS Y-DOM approach offers benefits to three categories of actors: |

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| | - The service employee in first line, who is able to better organise his (her) own time and optimise time spent at homes of elderly people, generating income;<br>- The association staff, organising service duties for employees and centralising calls in case of absence of employees or of modifications request from elderly people;<br>- The administration fund providers – mainly the Conseil Général providing budget to the local associations. |
| Project phase | Y-DOM is currently being commercialised. From a decentralisation point of view, the French government is helping to coordinate mutualisation projects between the Départements. |
| Size & geographical aim | Nationwide commercialisation |
| Quantitative Impact assessment | The Y-DOM offering is mainly addressing associations' management. Key parameters are linked to service productivity:<br>- for employees, ratio between period of time corresponding to actual income, vs. time spent for the association<br>- for association staffing: control of actual schedule for each employee; productivity for management employees regarding reporting control and invoicing, including follow-up for employee salary and reimbursement by local administration.<br>Some studies performed by PRYLOS show that productivity increase should lead to a better efficiency, larger than €0.25 per hour. |
| Qualitative impact assessment | |

| **GERMANY** | |
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| **Heitel case study** | |
| Description | Partners involved: University Hospital Heidelberg (Department of Cardiology, Angiology and Pneumology) + AOK Baden-Württemberg (public insurance provider) + SHL Telemedicine (IPHS provider)+General practitioners in Baden-Wuerttemberg +Cardiologists in Baden-Wuerttemberg |
| Goal of the project | The aim of HeiTel is to monitor patients with heart failure, acute coronary syndrome and arrhythmia in the state of Baden-Wuerttemberg in their own homes in order to detect worsening of their condition at an early stage |
| Other information | Heidelberg hospital had been involved in previous research projects such as the EU-funded projects MyHeart and HeartCycle as well as the nationally funded project Somatek on CHF.<br>Patients are equipped with three devices, a 12-lead ECG, a weighing scale and a blood pressure monitor (which also reads the heart rate). Data are sent via the landline or mobile phone, and the blood pressure monitor and scale readings are sent to a modem via bluetooth and then transmitted via the landline. Data are sent to the SHL telemedicine centre in Düsseldorf, which is staffed with doctors (including cardiologists) and nurses. SHL also set the individual thresholds for each patient. |
| Project phase | AOK has criticised possible patient disempowerment as one of the negative side effects of such an approach. With being monitored closely, some of the responsibility may be being shifted away from patients because every small deviation is picked up and dealt with externally. They state that it needs to be established for which 5% of patients such a service is beneficial, and point out that it is not for everyone. |
| Size & geographical aim | The service is available to up to 100 suitable AOK patients/year in the Southern German state of Baden-Wuerttemberg. So far 300 patients have gone through the treatment |
| Quantitative Impact assessment | a maximum of 12 months enrolment is funded through the integrated care contract. Some patients deteriorate again after this time.<br>initial letter in which information from GP is reimbursed with 35€; throughout their patient's enrolment doctors receive 40€ per quarter<br>The only definite outcome is that the cost of 2.000€ per patient plus the 0.5 cardiologist position at the hospital are covered.<br>Preliminary results: While the control groups needed on average 1.9 emergency treatments per year, HeiTel patients only required 0.4. During their time on the programme, 33 (15.8%) HeiTel patients needed to be hospitalised. This compares to an average of 45.9% of patients in the control groups . When hospitalised, the number of bed days was significantly lower in HeiTel patients (13.8 compared to 23.4 on non-cardiac wards, and 1.2 compared to 3 days on cardiac wards).<br>And while one-year-mortality was 19% in the control group, in the intervention group it was only 4.8%. Changes in NYHA stage (down from 2.8 to 2.2) and the level of depression could also be observed, however, these improvements could not be |

| | |
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| | fully sustained once patients had been discharged after 12 months. These initial results are very promising and show that telemonitoring can be highly beneficial for CHF patients. |
| Qualitative impact assessment | Besides anecdotal improvements in patients' health status and quality of life, another important outcome of the project are the learning effects for the resident clinicians involved. Patients have expressed feeling safer. Additionally, they learn for example how important monitoring their weight is for the management of their condition. |
| | |
| **WohnSelbst case study** | |
| Description | Municipal Hospital HSK + Wiesbaden Residential Housing Association (GWW) + Fraunhofer ISST/ spin-off Smart Living GmbH + Beurer Diagnostics + STAR Healthcare + ATOS, formerly known as Siemens-Assignio + German Commission for Electrical, Electronic & Information Technologies of DIN and VDE (DKE) + Sanvartis + Hartmann Real Estate |
| Goal of the project | Testing whether the product Smart Living which had been developed purely for residential housing could be extended to collect healthcare information and would be ideally suited to elderly people living at home.<br>Target conditions: - obesity<br>- at risk of stroke<br>- diabetes<br>- high blood pressure<br>- CHF |
| Other information | The role of Social care is stronger here |
| Project phase | Technology being still refined aiming to use blue-tooth data transmission by Spring 2012 |
| Size & geographical aim | only 35 of the 100 planned residents were recruited in two cities: Wiesbaden and Taunusstein |
| Quantitative Impact assessment | The project, along with other funded projects, is being evaluated as part of the AAL funding stream by Technical University Berlin |
| Qualitative impact assessment | the initial health check and the services of the minder ("Kümmerer") were appreciated. Occasional problems with the technology were cited as a slight disadvantage. However, when asked, several residents expressed an interest in continuing to receive the service after the end of the project for a monthly fee. However, the amount of the monthly fee is crucial, and this fact must be taken into consideration for the development of the business case |

| **Netherlands** | |
|---|---|
| **COPDdotCOM** | |
| Description | Initiated by Roessingh Research and Development. The study is conducted at the Medical Spectrum Twente hospital. The University of Twente is also involved in the study.<br>The design, development and demonstration of a system that supports self management of the patient and communication between the patient and the care professional; |
| Goal of the project | COPD patients monitoring - The patient wears a sensor and a PDA, that measures his daily activity levels and compares it to the optimal activity level. Additionally, through a web based portal, the patient answers questions about his current condition, allowing for remotely supervised training and monitoring of the disease status. |
| Other information | |
| Project phase | Duration: 2009 - Oct 2011<br>Recruitment: 10/2010-4/2011<br>Experiment: 11/2010-5/2011<br>Analysis:5/2011-9/2011<br>A follow-up study, CoCo (condition coach) recently started aiming to mainstream at hospital level. CoCo focuses on economical effects and setting up a business case in order to come to structural financing and moving from the pilot phase to structural implementation |
| Size & geographical aim | Nr. of patients involved: 32<br>Region: Twente |
| Quantitative Impact assessment | Outcomes of the study are clinical indicators and usability aspects |
| Qualitative impact assessment | |
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| **TEHAF study - Health Buddy** | |
| Description | a study of the clinical and economical effectiveness of the Health Buddy, an American IPHS that was adjusted to the Dutch context in 4 hospitals: Heerlen (Atrium Medical Centre), Maastricht (University Medical Centre) and Sittard (Orbis Medical and Care Concern). |
| Goal of the project | RCT testing the intervention (RMT) and usual care for Chronic heart failure. Four programs, differentiated based on symptoms, level of disease specific knowledge and behaviour, were designed for the current study. |
| Other information | Health Buddy IPHS system and monitoring by care providers consisting of specialized heart failure nurse specialists, a nurse assistant and a supervising cardiologist. |
| Project phase | Duration: Sept 2007 – Dec 2010<br>Recruitment: 15 months<br>Experiment: 12 months<br>Analysis: Ongoing (from January 2010) |
| Size & geographical aim | Nr. of patients involved: 382<br>Region: Limburg |
| Quantitative Impact assessment | Outcomes of the study are clinical as well as economic indicators in terms of hospital admissions, quality of care and cost-effectiveness. Furthermore, therapy adherence, the level of disease specific knowledge and quality of life is studied. |
| Qualitative impact assessment | |
| | |
| **In Touch study – CardioConsult** | |
| Description | Ten hospitals involved: all patients were in the intervention group (nobody wanted to be in the usual care group) |
| Goal of the project | A study aimed at measuring the value of ICT guided disease management combined with telemonitoring for heart failure (HF) patients |
| Other information | Intervention group of patients received additional telemedicine devices (measuring weight, ECG, health monitor and blood pressure meter). Collected data are transferred automatically by the GPRS network into the disease management system CardioConsult. The health professional is automatically informed via SMS or email |
| Project phase | Original Duration: Sept 2009- Sept 2011<br>Now postponed as follows:<br>• Recruitment: 12/2009-9/2011 or 1/2012<br>• Experiment: 1/2010-6/2012 |

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| | • Analysis: 6/2012-12/2012 |
| Size & geographical aim | Aimed & current nr. of patients involved: 220/105<br>Region: Groningen |
| Quantitative Impact assessment | Outcomes of the study are clinical as well as economic indicators. The focus is on a composite end point (aggregated indicator which tries to capture a number of indicators in one final indicator) for death, readmission for heart failure, change in quality of life, death from any cause, treatment according to guidelines, optimal dosage of medication, number of visits to the heart failure clinic, HF knowledge and self-care behaviour and cost-benefit ratio. |
| Qualitative impact assessment | |
| | |
| **Koala Project (overview only)** | The Koala project was launched in 2006 by KPN, Menzis and Sensire/Thuiszorg Groningen. The Koala system provides patients with a 24/7 service to contact nurses in a medical service centre through their television. Koala was aimed to provide more effective care, without losing quality. The economic effects of service were compared to a situation in which the patients did not have the Koala system. For COPD patients, the effects could not be measured, since they used Koala as an extra, not as a substitute. The effects for the CHF and diabetes patients are shown in. As can be seen, the total of the societal costs and benefits of Koala is: €18800 + PM (quality of life improvement) - per patient for the project. The quality of health of the patient and the quality of healthcare with Koala were similar to the quality level experienced with conventional treatment according to the researchers. The clinical and economic effects of Koala could become positive if the Koala system would be implemented in a substantially larger group of CHF patients, because in their case Koala could prevent hospitalization. |

| **SPAIN** | |
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| **HUVR COPD RMT pilot** | |
| Description | Background of HUVR on EC funded IPHS projects and current project being funded under ISCIII framework PiTES.<br>Partners: HUVR + CM (technology and service provider) + ISCIII |
| Goal of the project | RCT, treating COPD patients under oxygen therapy with RMT technology and service support |
| Other information | |
| Project phase | Launched in February 2011 and finished end of July 2011. Evaluation completed and findings are not conclusive. |
| Size & geographical aim | 56 patients were included in the pilot: 21 in the control group and 25 in the intervention group<br>If RCT proves positive, to be rolled out to HUVR COPD and HF patients (thus covering some patients in Seville, Andalusia, Spain). Aims to carry out additional RCT for other diseases/conditions such as cephalalgia and patients suffering from chronic conditions with co-morbidities |
| Quantitative Impact assessment | clinical data to be measured:<br>Hospital utilisation during the pilot (reduction of hospital admissions and reduction of length of stay)<br>Patients' quality of life (QoL) = EuroQoL and Saint George.<br>Results were inconclusive due to the small sample of patients, recruitment spread across time and short period of evaluation which is likely to bias results given the fragility of their condition. |
| Qualitative impact assessment | A service satisfaction questionnaire was also administered |
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| **Evidence Based Medicine Clinical Unit Hospital Donostia, San Sebastian** | |
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| Description | Run by Hospital Donostia. Patients involved in the intervention were treated as follow. Firstly, vital signs related with blood pressure, cardiac frequency, respiratory frequency and level of consciousness were gathered by a nurse trough a PDA and automatically sent via WIFI to the chronic management application within the clinical station. These vital signs were automatically processed to establish the risk score of the patient and set up an alarm system. All this information was also linked to the drug module of the applications. Secondly, when patients went from stage III-IV to stage II, a health promotion and prevention programme supervised by a nurse was launched. Finally, once the patients were discharged from the hospital all the planned telephone follow-ups were launched. |
| Goal of the project | To prove that patients with heart failure may benefit from home telemonitoring of their condition plus multifaceted personalised intervention compared with multifaceted personalised intervention alone |
| Other information | |
| Project phase | RCT during 20/02/2008 and 31/12/2009 |
| Size & geographical aim | 38 patients were recruited (18 for the control group and 19 for the intervention group).<br>A new project being launched: a centre-focused randomised controlled trial with 6 centres as control group and 6 centres as intervention group with 1,338 patients in total (573 in the intervention group and 765 in the control group). All clinical data and questionnaires are being gathered with a PDA linked with a centralised dataset. In case of alarm, a SMS is sent automatically to the doctor in charge of the patient at the hospital who will react and decide in consensus with the Geriatric centre and the home care visiting unit (Primary care team) assigned to the Geriatric centre. |
| Quantitative Impact assessment | The Unit received initial funding to carry out its interventions from the hospital and the Basque Health Service (€18,890).<br>Reduction in length of hospital stay (227 days for the control group vs. 83 days for intervention group)<br>No significant differences were found in terms of visits to emergency (36 days for the control group vs. days for the 22 intervention group) and admissions to the hospital (34 for the control group vs. 14 for the intervention group).<br>A cost-effectiveness analysis of this intervention has been carried out by the Unit and the Health Technology Assessment Agency of the Basque Country[65] using direct cost of hospitalisation (including DRG), human resources and ICT costs.<br>The intervention was considered as cost-effective just in 37% of the cases. However, one should also bear in mind the fact that the control group was built on a previous experience which already showed 80% reduction of readmissions and visits to emergency, which may explain such incremental improvements. |
| Qualitative impact assessment | An assessment on perceived quality of medical attention took place using the Spanish SERVQHOS questionnaire. |

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| **TELBIL project** | |
| Description | Primary care-based telemonitoring initiative for home care patients with heart failure and chronic lung disease was launched in 2011 |
| Goal of the project | This study was designed as a randomised controlled open clinical trial to reach a number of objectives (see below) and test whether "home care patients with HF and COPD may benefit from a primary care-based telemonitoring intervention which could result in a reduction of hospital admissions, duration of the hospitalisations and mortality", as well as whether "home telemonitoring may improve the quality of life of these patients in a way that is cost-effective and acceptable to patients and health care professionals". |
| Other information | |
| Project phase | 1 year project duration |
| Size & geographical aim | 30 patients in control group and 30 patients in intervention group 70+ in bilbao area (basque country) |
| Quantitative Impact assessment | Project funded by the Basque doH<br>The cost of the Project was €2,000 per patient. This budget included institution's membership access cost (€1,500), purchase of devices (€782), users' membership cost (€80 per user), health professionals' membership (€20 per professional) and software license/utilisation (€260 per institution and €65 per device).[18]<br>the study analysed variables related to duration of hospital stay, hospital admissions due to HF or chronic lung disease (CLD), mortality rate, use of health care resources, quality of life (QoL), cost-effectiveness,<br>Preliminary results at 3 months: increase in QoL (58.8 vs 34.4)<br>Preliminary results at 6 months: lower mortality lower length of stay. Increase in QoL |
| Qualitative impact assessment | Compliance and patient and health care professional satisfaction with the new technology.<br>Perception from healthcare professionals were: (1) avoidance of hospital admissions and increase in patients' quality of life; (2) facilitating the clinical decision process; (3) increasing patients' and caregivers' satisfaction and safety; (4) patients' participation in their care (i.e. self-care) and (5) new communication channels between primary and secondary care. |
| | |
| **Hospital Clinic COPD Trials and NEXES** | |
| Description | Background of RCT on COPD in 1999 involving two hospitals: Hospital Clinic and Hospital Bellvitge with 629 patients. From here the moved to an international project where the hypothesis made was that a simple, well defined integrated care (IC) |

[18] These costs were reduced by Saludnova for 2011.

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| | intervention with the support of information and communication technologies may be effective to prevent hospitalisations for exacerbations in COPD patients. In Hospital Clinic, no primary care involved took place |
| Goal of the project | Following a second RCT, now roll-out on integrated IPHS supported is tested with four actions |
| Other information | |
| Project phase | Transition phase from existing pilot experiences to extensive deployment of health and social services supported by NEXES, supporting Healthier and Independent Living for Chronic Patients and Elderly project funded by ICT Policy Support Programme Area |
| Size & geographical aim | NEXES targets patients with one or more of the following chronic conditions: COPD, chronic heart failure and type II diabetes.<br>Wellbeing and physical training involving IPHS monitoring 200 patients (100 intervention)<br>Care for fragile patients involving primary care centres and a support call centre. Total patients 1200 (600 intervention and 700 control)<br>Promoting Home hospitalisation and early discharge 2200 (1100 intervention and 1100 control) |
| Quantitative Impact assessment | The CHRONIC project [19] was funded under the Fifth Framework Programme within Personal health systems with a total cost of €3.47 million (EU contribution: €1.88 million). The duration of the project was 30 months from January 2000 to June 2002.<br>LINKCARE Linking Health Professionals in Emerging Care Environments[20] was funded by eTen Market Validation with a total cost of €1.94m (EC Contribution: €0.76m). The duration of the project was 18 months from September 2005 to February 2007.<br>NEXES – Supporting Healthier and Independent Living for Chronic Patients and Elderly (Living Healthily at Home was funded under the ICT Policy Support Programme ICT for ageing well with a total cost of €4.76m (EU contribution: €2.38m). The duration of the project was 36 months from May 2008 to April 2011.<br>Several RCT were carried out on COPD showing positive health outcomes and effectiveness of the interventions. A cost-effectiveness analysis is planned within the NEXES project. |
| Qualitative impact assessment | |

[19] CHRONIC Project: http://cordis.europa.eu/fetch?CALLER=PROJ_ICT&ACTION=D&DOC=6&CAT=PROJ&QUERY=01323ecef593:2cab:21d00c03&RCN=53659
[20] LINKCARE http://ec.europa.eu/information_society/activities/eten/cf/opdb/cf/project/index.cfm?mode=detail&project_ref=ETEN_NM8

| **UK** | |
|---|---|
| **Bute island- Highlands** | |
| Description | Two types of technologies were piloted with funding from the TDP grant: Community Telehealth Pods and Home Telehealthcare Pods for patients with COPD |
| Goal of the project | The aim is for both A&E and hospitals to discharge patients earlier and integrate them within the community with telehealthcare support. |
| Other information | |
| Project phase | COPD patients with home Pods, comparing the periods March-November in 2008 and 2009 were completed. Mainstreaming in Highlands. Likely to be involved in DALLAS (deployment at scale) |
| Size & geographical aim | Mainstreaming (i.e.: the 5-year maintenance included in the new framework contract serves as means to guarantee continuity until new funding is obtained from NHS Highland (Scotland). HF patients are being rolled-out.<br>Aiming to "rotate" the technology for mainstreaming purposes |
| Quantitative Impact assessment | The costs of acquisition of home COPD Pods stand at £ 1,400 (or €1,632) per Pod, a lump sum which includes:<br>The same services included so far: Peripherals, Data transmission costs (paid to Vodafone), The nurse web interface data retrieval.<br>An extra five year IT maintenance (provided by the technology supplier not by the NHS Highland health board IT department), which so far was not included in the standard price<br>Prior to this agreement £200/year (equivalent to €233/year) for each COPD home Pod IT support<br>Evaluation results (2008-2009) concluded a reduction is: GP visits (from 47 down to 28), A&E attendances (from 9 to 2) and hospital admissions related to COPD, both in terms of numbers (from 11 down to 1) and days of bed occupancy (from 72 to 8). |
| Qualitative impact assessment | Findings revealed telehealth helping patients to be more responsible and more aware of their condition rather than the benefit being from the technology itself: as patients get used to the equipment they actually learn to look after themselves. Thus, rotating the technology from patient to patient seemed also a reasonable option to stakeholders involved |
| | |
| **Telescot** | |
| Description | RCT on different conditions<br>• COPD – most advanced of all trials<br>• For diabetes the plan is to carry out an RCT (sponsored by CSO) with 320 patients (160 in the control group and 160 |

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| | in the intervention group).<br>• For hypertension (sponsored by BUPA foundation), a randomised controlled trial (RCT) involving recruitment of 400 people who have high blood pressure is foreseen. 200 will continue receiving usual care while the other 200 will be given a blood pressure monitor to use at home. The monitor transmits readings via mobile phone to a secure website which can be accessed by patients and their practice nurse who can give advice to them by telephone, text or email.<br>• The study on heart failure (sponsored by the Scottish Centre for Telehealth) involves qualitative interviews to learn from patient and staff experiences with using the technology.<br>In addition, future planned research will also include IPHS for dementia and depression. |
| Goal of the project | To test new service delivery and coordination with social care for the above conditions<br>For COPD - In Spring 2011, recruitment for COPD was completed with 256 patients finally selected to take part in a randomised control trial (RCT). The trial was planned to last for 12 months during which measurement and monitoring data from the patients is being gathered. |
| Other information | |
| Project phase | Not completed. Likely to be involved in DALLAS (deployment at scale) |
| Size & geographical aim | Lothian area (Scotland) |
| Quantitative Impact assessment | The cost of the COPD technology is £2,000 (about €2,330).<br>The Telescot COPD pilot will be evaluated in terms of cost-effectiveness analysis (cost per QALY[21]). Preliminary results show that the analysis is very sensitive to the cost of the equipment.<br>Rotating the technology is also highly emphasized for mainstreaming purposes |
| Qualitative impact assessment | Patients and carers were very positive about the telecare system, even where there were operational problems. They consistently echoed a range of benefits. This study revealed that being (and feeling) monitored as well as learning to manage their condition resulted in faster and better access to a GP or an intervention when required which in addition translated into reduced anxiety for patients and carers. |
| | |
| **WSD** | |
| Description | The Whole System Demonstrator (WSD) programme was conceived as a two year research project funded by the Department of Health and originally aiming at finding out how technology can help people manage their own health while |

[21] QALY stands for Quality Adjusted Life Years.

| | |
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| | maintaining their independence. Participants in the trial were recruited at the three selected demonstrations sites. The telecare service was aimed at vulnerable people who needed the support of Social Care or Health Services to keep living on their own, for example those with physical disabilities, the frail and elderly or those suffering from dementia or epilepsy. The telehealth service was aimed at helping people manage their long-term health conditions in their own home. Conditions covered by telehealth included diabetes, CVD and/ or COPD. |
| Goal of the project | The final trial evaluation assessed the added value of telehealth and telecare over a reorganised service and not the benefits of whole systems redesign compared to conventional care. Moreover, the trial did not aim to assess the effects of individual technologies used but of telehealth and telecare supported services[35] |
| Other information | |
| Project phase | During 2008, patient recruitment took place through GP practices and data gathering started for the evaluation. |
| Size & geographical aim | 6,191 participants were recruited to participate in the trial which correspond to 5,721 service users plus 470 carers involving 238 GP practices in Cornwall, Kent and Newham (England)<br>Cornwall and Kent are mainstreaming<br>Small-scale proof-of-concept studies (typically less than 100 patients enrolled) have been coordinated alongside the WSD under the WSD Action Network (WSDAN) umbrella<br>Mainstreaming to three million people throughout a 5-year period; DALLAS to synergise with mainstreaming efforts |
| Quantitative Impact assessment | The total funding allocated to the WSD was £31 million (about €45.6 million at the time), including evaluation costs which represented 12-15% of the overall budget.<br>Preliminary results indicate that the technology only represents 10% of the solution and the remaining and most challenging 90% are about getting the organisation turned around<br>Final evaluation results were pre-announced in late 2011 as follows: "if used correctly telehealth can deliver a 15% reduction in A&E visits, a 20% reduction in emergency admissions, a 14% reduction in elective admissions, a 14% reduction in bed days and an 8% reduction in tariff costs. More strikingly they also demonstrate a 45% reduction in mortality rates". Additional details are required and about to be published. |
| Qualitative impact assessment | Not available at the time of writing. Additional details are required and about to be published |
| | |
| **HULL** | |
| Description | This hospital initiated experience draws on experience in this hospital since 1999, As of from 2008 onwards RMT activities continued with the corresponding PCT in the area and additional funding was obtained to use RMT for chronic heart failure. |

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| | Implementation of telehealth in a hospital setting differs a bit from that of community care. In the Hull hospital, care integration is done through nurses with four different nurse constituencies in the hospital: two discharge nurses, one nurse responsible for telemonitoring readings and one specialist community nurse coordinating with primary care and GP practice nurses. In addition, Hull University has a certified educational programme for all of those nurses as training is a fundamental part |
| Goal of the project | To test telehealth on patients with heart failure |
| Other information | |
| Project phase | Coordinating services with primary care services as well at district level |
| Size & geographical aim | Hull hospital and Hull PCT |
| Quantitative Impact assessment<br>Total costs & estimated cost per patient benefits | with their first RCT demonstrating a reduction in one year mortality from 45% with usual care to 29% with telehealth and savings around £1000 (around €1,471 at the time) per patient per year in avoided hospital admissions. Later on an RMT compared telephone support only with RMT. |
| Qualitative impact assessment | On the telephone support versus telehealth: telephone support applications rely on the patient himself detecting symptoms (thus, patient lead) whilst telehealth improves detection by a healthcare professional. In addition, because nurse telephone support has proven to be very expensive and being patient-lead can be unreliable at times (given that it relies in patients detecting symptoms as opposite to RMT detection for instance), telehealth represents a better alternative. |
| | |
| **North Yorkshire and York (NYY)** | Evaluation results from this experience are available at Annex IV – Evaluation results from North Yorkshire and York (NYY), England |

## Annex III – Cost per patient in different hospitals involved in the Telemaco experience, Italy

**Table 46 - Economic assessment of services. Costs per Patient. Telemaco project (Lombardy)**

| Activity | Esine hospital | Lumezzane Hospital | Voghera Hospital | Cuasso Hospital |
|---|---|---|---|---|
| Planned Phone calls | € 114.12 | € 215.62 | € 64.03 | € 98.90 |
| Unplanned Phone calls | € 54.28 | € 204.05 | € 29.67 | € 121.58 |
| Tutor visits at patient home | € 0.00 | € 0.00 | € 0.00 | € 0.00 |
| Specialists visits | € 0.00 | € 0.00 | € 0.00 | € 0.00 |
| Specialist Consultations | € 3.83 | € 31.79 | € 1.60 | € 30.40 |
| Interactions with GP | € 0.00 | € 0.00 | € 0.00 | € 0.00 |
| Therapy modifications | € 0.00 | € 7.90 | € 0.00 | € 0.00 |
| Patient Education and Training | € 22.06 | € 22.06 | € 0.00 | € 18.40 |
| Enrollment visits | € 25.72 | € 25.72 | € 14.71 | € 28.08 |
| Discharging visits | € 44.12 | € 44.12 | € 11.64 | € 28.08 |
| Organisation ( internal) | € 15.85 | € 3.05 | € 28.63 | € 21.74 |
| Blood gas analysis | € 38.00 | € 38.00 | € 38.00 | € 38.00 |
| Trend Oximetry ( with electronic transmission) | € 9.50 | € 9.50 | € 9.50 | € 9.50 |
| Spirometry | € 23.75 | € 23.75 | € 23.75 | € 23.75 |
| **Telemonitoring** | **Esine hospital** | **Lumezzane Hospital** | **Voghera Hospital** | **Cuasso Hospital** |
| Costs for 6 months (per patient) | € 351.23 | € 625.57 | € 221.53 | € 418.07 |
| Monthly costs | € 58.54 | € 104.26 | € 36.92 | € 69.68 |

Source: Adaptation from Zanaboni presentation for the seminar closing Telemaco project in November 2010. In WP3 - Italy country report[66]

## Annex IV – Evaluation results from North Yorkshire and York (NYY), England

The table below (Table 47) provides a summary of the savings in the NYY experience with 91 COPD patients during a year study with telehealth intervention

**Table 47 – Evaluation of the telehealth pilot in North Yorkshire and York (NYY)**

| Acute care events | | Before telehealth | After telehealth | difference |
|---|---|---|---|---|
| Elective admissions | activity | 21 | 11 | 10 |
| | cost | £15,750 | £11,729 | £4,001 |
| Non -elective admissions | activity | 83 | 50 | 33 |
| | cost | £119,051 | £205,493 | £86,442 |
| A&E visits | activity | 49 | 68 | 19 |
| | cost | £5,321 | £7,433 | £2,113 |
| Total cost | | £224,675 | £140,122 | £84,558 |

Source: Telehealth pilot in North Yorkshire and York, 2010 in WP3 UK Country report, 2011.[10]

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Abstract
This report is the main deliverable of the Strategic Intelligence Monitor on Personal Health Systems, Phase 2 project (Simphs 2). It is based on an analysis of developments in integrated care in thirty-one care schemes across eight different Members States: Denmark, the UK, Spain, Italy, Estonia, the Netherlands, Germany and France. It summarise the main outcomes of the research, suggest areas where policy input is needed and propose the development of a monitoring framework to enable decision makers to assess the state of maturity of the deployment efforts in a mainstreaming process.

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