JA Health Workforce Planning and Forecasting

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MINIMUM PLANNING DATA REQUIREMENTS FOR HEALTH WORKFORCE PLANNING

WP5

Deliverable

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Joint Action Health Workforce Planning and Forecasting

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IMUM DATA SET FOR HEALTH WORKFORCE PLANNING AND FORECASTING

1. Management summary

Healthcare is one of the most significant sectors in the EU economy with a growing employment potential due to an increasing demand for healthcare, particularly linked to having an ageing population that is driven by several factors such as morbidity, innovative technologies and people's expectations in the health systems, among other things[1].

However, the healthcare sector faces major challenges:

- an ageing workforce and lack of recruitment for replacing retirees;
- significant employee turnover in some sectors due to demanding working conditions and relatively low pay;
- the need for the workforce to develop new skills in order to deal both with innovative technologies and the rise in chronic conditions and comorbidities[2].

Facing these challenges requires policy makers to adopt challenging decisions based on a sound forecast of the future impact of any policy put in place. At the EU level, an action plan for EU health workforce was adopted in 2012. One of the actions prioritised in the European Commission's action plan for EU health workforce (HWF)[3] is improving health workforce planning and forecasting to develop policy interventions and make informed investment decisions to better match supply and demand and support European Countries with health workforce planning (which varies considerably)[4]. The planning process needs a good set of data in order to produce reliable results. Health workforce planning and forecasting improvement goes through the identification of a set of key indicators and a process of measurement through the collection of the proper related data.

Reporting shows that some countries still struggle to put a standard and reliable data collection in place which is the first step for any forecasting exercise. Currently, there is no agreement at the international level on minimum data requirements for health workforce planning[5].

The **Joint Action on Health Workforce Planning and Forecasting (JAEUHWF),** funded under the 2012 Health Programme, intends to create a European platform to share good practice and to develop methodologies on forecasting health workforce and needed skills[6]. The Action focuses on the five

[1]1 See Bartosz P. (2010), Astolfi R., Lorenzoni L. Oderkirk J. (2012)and De la Maisonneuve, Martins (2013) for an analysis of the economic impact of the various determinants in healthcare demand.

2 See Green paper on the European Workforce for Health, European Comission, 2008.

3 Action Plan for the EU health workforce, Commission Staff Working Document (2012) 93 final.

4 Feasibility Study: EU level collaboration on Forecasting Health Workforce Needs, Workforce Planning and Health Workforce Trends, Matrix Insight Ltd for the European Commission, May 2012

5 See note 4.

6 http://ec.europa.eu/health/workforce/policy/planning/index_en.htm

"harmonised" professions: Doctors, Nurses, Midwives, Pharmacists and Dentists[7]. One of the objectives of the Joint Action is to identify a Minimum Data Set for Health Workforce Planning.

A Minimum Data Set (MDS) for Health Workforce Planning consists of a core set of standard variables used to build indicators which are generally collected at a national level for reporting and making assessments on key aspects of health system delivery. In this paper, the focus is on the current workforce/staffing resources and future health workforce needs. This can enable the comprehensive analysis of supply, requirements and adequacy in professional-based workforce planning.[8]

This document contains the results of a shared process involving thirty-seven EU partners of the Joint Action EUHWF (European member states as well as stakeholder organisations)[9].

These results are a consensus recommendation on the key planning indicators and the related minimum set of data[10] that may be adopted by the EU Member States as a common necessary tool kit to provide basic forecasting and enable a basic planning process to take place[11].

A future release of this paper will address the recommendations for the necessary data set and indicators needed to draw future enhanced scenarios.

This document is organized into six sections. After the management summary, section 2 briefly describes the planning process and the forecasting model that the MDS engages. It constitutes a summary of the methodological background that will be expanded and thoroughly described in the next deliverable of WP5. Section 3 focuses on the minimum data set for health workforce planning. Section 4 describes the key planning indicators (KPI) and the related set of data, the lists of which are presented in section 5. Appendices are presented in section 6.

7 See Directive 2005/36/EU on the recognition of professional qualifications, recently modified by Directive 2013/55/EU of Dec. 28, 2013.

8 WHO human resources for health minimum data set – 2008.

9 See the list in Appendix n° 9.7.

10 The key planning indicators and the minimum data set presented in the next sections reflect the priorities agreed by the Workpackage 5 partners within the EUHWF Joint Action framework and the feedback from the MDS workshop held in Milan on the 19th and 20th of September 2013.

11 The Minimum Data Set is not intended to provide (or replace) a country-level workforce planning system. Suggestions for supplementary information are also given so that the MDS can be adapted or developed, if required, to support domestic workforce planning.

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2. The planning process

The HWF planning process is the set of organized activities, task lists and schedules required to achieve scope and targets defined in the health workforce planning system. It includes the making and maintenance of a plan and it combines forecasting of developments with the drawing of scenarios on how to cope with them (strategies). A planning process is necessary to offer decision-makers a technically motivated set of opinions of foreseeable situations in the future. It includes forecasting as described by the following figure.

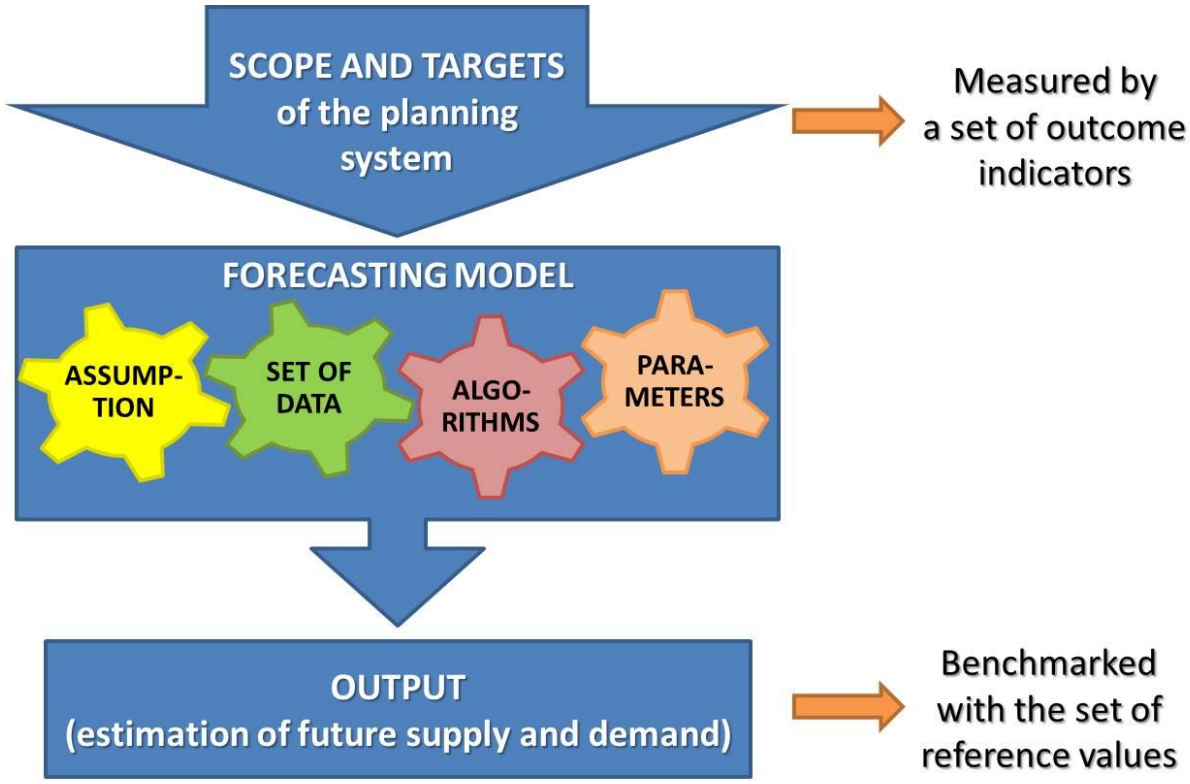

Fig. 1: Elements of the planning process

The process of planning works if the forecasting model is based on precise targets with good knowledge of the error factor on these targets and on the model reliability:

> "***Health workforce planning is not an exact science and needs regular updating:*** *Assessing the future supply and demand for doctors, nurses or other health professionals 10 or 15 years down the road is a very complicated task, fraught with uncertainties on the supply side and even more so on the demand side. Projections are inevitably based on a set of assumptions about the future; these assumptions need to be regularly re-assessed in light of changing circumstances, new data, and the effect of new policies and programs.*"[12]

12 OECD, Health Workforce Planning in OECD Countries 2013 p. 11.

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The output is expressed (measured) by the indicators defined by the planning process. The forecasting model is composed of a set of data as input, a certain number of scenario based parameters, assumptions and algorithms. The necessary set of data (the second wheel in the previous figure) depends on the targets and on the indicators.

3. What is a minimum data set for health workforce planning (MDS for HWFP)

A minimum data set consists of the data items that are necessary and sufficient to start a decision-making process to reach a certain goal. The decision-making process in this case is planning for the future needs of the health work force. [13]

> *A Health Workforce Planning System consists of a core set of key indicators which are used, generally, at a national level, for the collection and reporting on key aspects of health system delivery, including current workforce/staffing resources and future Health workforce needs. This can enable the comprehensive analysis of supply, requirements and adequacy in professional-based workforce planning (WHO – 2008). The data are for planning as well as promoting coordination and collaboration between stakeholders at the national and European level.*[14]

The process of collecting data is very costly in terms of time, resources, quality control and necessary reiteration of the process. Thus it is necessary to assess the need of each data item before starting the process, balancing the cost of collecting and processing the information and the value of the decision to be made on the basis of that information.

3.1 How to set a MDS for HWFP

The Feasibility Study on forecasting need, workforce planning and health workforce trends[15] pointed out:

> *"**A significant problem driver in this respect is the lack of a sense of cohesive purpose behind data collection**. Data on human resources for health are collected for various purposes; but only in a very limited number of countries data are collected for health workforce planning. Hence, certain indicators, which are crucial to forecast and carry out an effective planning of resources, are not covered by data collection. As a consequence, many of the data available at national level are also not integrated and used in health workforce planning."*

13 The Feasibility Study suggests a "common" data set in order to facilitate the exchange of information across Europe and across regions. In this case common means a data set that is the same for all Member States. As today's situation of planning is very different between the EU countries, the EC has found that it is more important to define a "minimum" data set that will fulfill the basic need for planning in a Member State that starts the HWF planning process.

14 See note 4.

15 See note 4. (p.146)

It is thus necessary to identify a set of key indicators that are instrumental to health workforce planning and forecasting.
The set of data used in the key planning indicator formulas, which are necessary for the Minimum Purpose of Planning, is the MDS.

3.2 More reasons to draft a MDS for HWFP

Health systems differ significantly within the EU. Even the use of HWF, both as a whole and as single group of professionals, varies widely. In comparing European Countries it is surprising to see the stability over time and the differences between them[16], depending on traditions, organisation of the health services and social security systems. The new Member States, which have acceded into the European Union during the last fifteen years, increase the disparity of traditions and organisations.

The planning of human resources in health must take into account these differences and respect the autonomy of each MS. On the other hand, the free movement of workers in the EU market tends towards an integrated system with common elements throughout MS.
Accordingly, the first hypothesis is that, despite the differences, a common minimum data set for health workforce planning (MDS for HWFP) can be established and adopted by all MS's, thus allowing for development of common practices and an exchange of meaningful data and reports.

3.3 The principles on the basis of the MDS for HWFP

The Minimum Data Set presented in this document is based on some basic planning principles.

1. **Universal coverage**, i.e. the health care system will provide assistance to all citizens without excluding poor or rich. This implies that the need of professionals of the whole population of the Country has to be considered.
2. **Affordability**, i.e. the cost of the future health care system has to be kept within the limits of what is considered sustainable for the population.
3. **Effectiveness**, i.e. in considering the future need of professionals, is it important to bear in mind good production parameters.
4. **Imbalances are not an option** (according to the affordability of the system, see point 2) as they are a threat to the coverage and quality, i.e. it is not acceptable to plan for a number of professionals which would be lower than a number which ensures a good quality.
5. **Education and not immigration to meet Healthcare needs**, i.e. each country has to plan how cover its own HWF needs, migration is a right for EU citizens but it should not be used systematically as a source to cover the population's need.[17]

16 See note 4.
17 See WHO Global code of practice on the international recruitment of health personnel (2010).

Thus the Health Workforce MDS for planning is focused on doctors on **doctors, pharmacists, dentists, nurses and midwive**s.

3.4 Scope and purposes of the MDS for HWFP

The Work Package 5 (WP5), as part of the Joint Action EUHWF, has defined **the scope**, the **key planning indicators** and the **set of data** that are *necessary and sufficient* for basic planning, **thought of as a starting point for the countries that need to develop a planning process of Health Work Force**.

Identifying the key planning indicators requires, firstly, the definition of the scope and, subsequently, of the HWF planning purposes.

The WP5 partners and experts, agreed that **the scope is**:

1. **to recognise the major imbalances of HWF;**
2. **to analyse these imbalances;**
3. **to identify possible solutions.** [18]

The three stages (targets) of the scope may be defined as follows:

Scope	Description
To recognise the major imbalances of HWF	Must allow for assessment of the current situation and identify imbalances vs. overall evaluation of supply and demand for healthcare.
To analyse the imbalances	Must allow for assessment of the impact of basic actions carried out correcting those imbalances. Basic actions focus on: • health production; • inflow (training and immigration); • outflow (retirement and emigration). Evaluation is defined through: major cost aspects of HWF; an initial evaluation on the impact of imbalances on quality; monitoring overall coverage and geographical variances; investigating whether domestic production meets population needs.

18 See WP5 Minutes Milan Workshop, in Appendix 9.8.

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Scope	Description
To identify possible solutions	Must allow scenario based forecasting, including changes in the health care system. This is considered to be an advanced model and is not included in the Minimum Data Set, though it will be discussed as a perspective of the next action in the sustainability work package. Special attention should be given to non-health indicators which are included in the major health care determinants. Health workforce planning is a perfect example of the concept of "Health in All Policies."

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4. The key planning indicators (KPI) and the related set of data

A set of key planning indicators has been defined in order to monitor each of the above-mentioned targets. Consequently, a list of data that are *necessary and sufficient* (minimum) has been selected in order to determine those indicators.
In particular, by introducing a priority scheme with the objectives and targets that are necessary to include in a basic planning process, WP5 developed a set of key planning indicators related to the first and the second target and postponed the analysis of a third one to a future version of the MDS for HWFP.

4.1 "To recognise the major imbalances of HWF": key planning indicators and set of data

One of the purposes of the planning process is to i**dentify the major imbalances of the HWF.** Therefore, it is important to establish an indicator which allows for the measurement of difference between supply and demand for labour, on the one hand and, on the other, evaluation of the total amount of supply and demand. This evaluation may be facilitated by comparing the indicator values of different Member States.
In order to keep the model simple, we will assume that supply and demand are presently in equilibrium. Also, we will assume, at this stage, that it is a static system (no change in health consumption patterns, technology, professional scope of practice and so on).

It is fundamental to identify any future imbalances between supply and demand when planning for the labour market. In regard to this, it may be useful to calculate the **ratio between future supply and demand.** Once calculated, the demand (exogenous variable) can be considered in the current planning system as a basis for considering interventions on the supply side (endogenous variable).

This numerical ratio may assume higher (a) or lower (b) values or values equal to zero (c). In case (a), there will be a future supply that exceeds demand. In case (b), future supply will be less than the demand. In case (c), there is equilibrium between the health care professionals "demanded" and the health care professionals "supplied" to the labour market. Case (c) represents the ideal objective of the planning system.
Therefore, we have defined an indicator to determine the future balance between supply and demand:

- future supply (numerator) / future demand (denominator).

This indicator can be calculated by taking into consideration either health care professionals as a whole (in this case we have a generic measure of the number of healthcare professionals which are

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necessary to satisfy the demand) or by individually concentrating on each of the five health care professions in focus.

In the latter case, the default value of the indicator for each of the five professions also provides a measure of priority to the State; in other words, the process highlights the profession with the greatest predicated future imbalance.

The above said indicators consist of two variables (supply and demand), which can be determined through the following elements (for a detailed presentation see appendix n.2):

SUPPLY	DEMAND
Training	Population need
Labour Force	Health production
Migration	
Retirement	
Job retention	

4.1.1 "To recognise the major imbalances of HWF": set of Supply Side data

As for the supply side, this Document takes into account Training, Labour Force, Migration and Retirement, postponing Job Retention to a later version of the MDS.
Additionally, in order to highlight the labour supply determined by the migration of workers across EU Member States, the supply of labour is further divided in two elements:

- labour supply within the State (*domestic*)
- labour supply from outside the State (foreign)

The supply of future domestic work can be calculated in this way:

- supply of future domestic work = "current labour force" (**a**) + "training" (**b**) – "retirement" (**c**)

where:

- **current labour force**: current number of professionals (headcount) that are currently producing health care stratified by type (5 types) and age.
- **training**: forecast of number* of professionals (headcount) that complete education (basic or specialist) and are licensed to practice during the period; for the first years it will be calculated on the basis of the current students in training; subsequently the actual training capacity (average of the statistics of the last years) will be used.
- **retirement:** forecast of number* of professionals (headcount and full time equivalent) that retire each year according to existing statistics.

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Foreign labour supply can be calculated:

- Foreign labour supply (*abroad*) = + "migration inflow" (**d**) – "migration outflow" (**e**),

where

- **migration inflow:** forecast of number* of licensed and recognised professionals (headcount) that may enter the Country, calculated using average flow numbers in recent years.
- **migration outflow:** forecast of number* of practising professionals (headcount) that may leave the Country, calculated using the average flow numbers in recent years.

To summarize: The **numerator** of the proposed indicator for determining the level of the future balance of supply and demand is defined as:

·["current labour force" (**a**) + "training" (**b**) – "retirement" (**c**)] + ["migration inflow" (**d**) – "migration outflow" (**e**)].

***FORECAST OF NUMBER:** quantitative forecasting methods used in the various planning systems in the EU countries, particularly the evaluation and dissemination of good practices in this field, will be the objective of WP5's activities over the next two years inside the Joint Action.

Which data are needed to calculate the numerator of the indicator, i.e. to determine the amount of future supply, both internally and externally?

According to what has been defined above, the necessary data are:

- "current labour force": number of health workers currently producing health care (practising) characterized by
  - profession (one of the five in focus);
  - age;
  - headcount;
  - FTE.

- "training": number of health professionals that complete education (basic or specialist) and are licensed to practice during the period [?]characterized by
  - profession (one of the five in focus);
  - age;
  - headcount.

- "retirement": number of health professionals that will retire each year characterized by
  - profession (one of the five in focus);
  - age;
  - headcount.

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- "migration inflow": number of licensed and recognised health professionals that may enter the Country characterized by
  - profession (one of the five in focus);
  - age;
  - headcount.

- "migration outflow": number of practising health professionals that may leave the Country characterized by
  - profession (one of the five in focus);
  - age;
  - headcount.

4.1.2 "To recognise the major imbalances of HWF": set of Demand Side data

Both the determinants for demand of labour force (*population needs* and *health production*) have been deemed as fundamental for predicting the amount of future demand for health care professionals.

WP5 partners agreed to utilize a simplified method to predict future demand of the labour force (for details of this model, see section 5.2), where:

- "population need" depends on the size of the population stratified by age (age groups) and age groups' consumption of healthcare (Total Health Consumption - THC);
- "health production" is expressed by the parameter "k" which "transforms" the demand for health into demand for healthcare professionals.

The indicator of future demand (**denominator**) is expressed by the following formula: kp *THCx
where

- kp: the constant that links total health production to the demand for a specific profession.
- THCx : the total health consumption in year x.

Dealing with a static model, the indicator has to be considered on the grounds of the following assumptions:

- Health consumption per capita for each age group remains constant (no compression or expansion of morbidity).
- The percentage of public consumption and private consumption will remain constant so the total health consumption (HCT) will include also the private consumption.
- Health service remains as it is: no change in productivity or technology.
- The roles or the scope of practice for each profession remain unchanged (no interaction between the 5 different professional groups).

Based on these assumptions, future total consumption of health comes from the following formula:

- THCx = (HC10*Pop1x + HC20*Pop2x + HC30 *Pop3x)

where:

- THCx : total health consumption in year x.
- HC10: per capita consumption of age group 1 in year 0 (basic year)
- HC20: per capita consumption of age group 2 in year 0 (basic year)
- HC30: per capita consumption of age group 3 in year 0 (basic year)
- Pop1x: population of age group 1 in year x.
- Pop2x: population of age group 2 in year x.
- Pop3x: population of age group 3 in year x.

Which data are necessary to calculate the denominator of the indicator, i.e. to determine the quantity of demand of future healthcare professionals?

In accordance with the definitions above, considering that parameter K, related to "*health production,*" is the result consumption of current health needs divided by the number of current professionals, the sufficient and necessary data are only related to "*population need.*" Therefore,

- per capita consumption of age group 1 in year 0 (basic year),
- per capita consumption of age group 2 in year 0 (basic year),
- per capita consumption of age group 3 in year 0 (basic year),
- population of age group 1 in year x,
- population of age group 2 in year x,
- population of age group 3 in year x

4.2 "To analyse the major imbalances of HWF": key planning indicators and set of data

"To analyse the major imbalances of HWF" one must assess the impact of basic actions to correct the imbalances previously identified.
Basic actions may focus on:

- health production;
- inflow (training and immigration);
- outflow (retirement and emigration).

Evaluation is defined through:

1. major cost aspects of HWF;
2. an initial evaluation of the impact of imbalances on quality;
3. monitoring overall coverage and geographical variances;
4. identification if domestic production meets the needs.

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The data set is the same used to calculate the KPI presented in section 4.1. By adding some characterizations (for example, "Geographical area" and "Gender" related both to "Labour Force" and "Population" "and "Specialization" related to "Labour Force"), it will be possible to calculate the following KPI in order to analyse the four evaluation tools mentioned above:

Indicator	Stratified by	Reason for the indicator
2. Change in health consumption Numerator: Future health consumption Denominator: Current health consumption	Depends on the responsibility for the health consumption (either regional or national). If it is on a country level, the indicator will not be articulated further.	This indicator forecasts health consumption as a result of the changes in population. It is a base for overall evaluations of what the country can afford in relation to the total cost and, perhaps, determines which changes in Health Production will be necessary in order to offer the same quality as today to the citizens. A value of the indicator >1 means higher consumption in the future compared with the current situation, a value = 1 means a balance between future and current consumption, and a value < 1 means lower consumption in the future compared to today's situation.

Indicator	Stratified by	Reason for the indicator
3. Coverage of future demand, detailed Numerator: Future supply domestic + Future potential supply from abroad Denominator: Future demand **4. Coverage of needs by foreign professionals today and in the future** Numerator: N° of professionals with foreign first qualification. Denominator: Total n° of professionals.	Profession. **Single specialisation** within the profession.	The first indicator shows, for each specialisation, the future balance of the HWF in the country using the current legislation and the current organisation regarding education, retirement, migration etc. Any shortage (indicator <1) will require an action, for example on the number of intake in university. Any surplus (indicator >1) may require an action in the opposite direction. The second indicator shows the share of professionals covered by immigration. This is a potential critical issue in the light of international policy of migration (WHO Code of Conduct) and the need to introduce foreign professionals in the national system.

Indicator	Stratified by	Reason for the indicator
5. N° of professionals per inhabitant today and in the future Numerator: N° of professionals Denominator: population **6. N° of professionals per weighted inhabitant today and in the future** Numerator: N° of professionals Denominator: population weighted by the consumption per age group (basic index: average of EU countries)	**Region** within the country articulated by macro-area in order to separate greater urban areas (for example Province in Italy, Department in France, etc.).	The two indicators are complementary as the first one shows real figures of the number of professionals per inhabitant but might not be connected to the differences in age of the population. The second indicator makes it possible to compare different countries or different regions within a country. The method to weigh the population is the same that is used to calculate future demand (indicator 3). There are no international standards for this indicator.

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5. The MDS for HWFP

Here are listed the necessary and sufficient (minimum) data to create the indicators described in the previous paragraph.

Areas	Supply					Demand	
Category / Characterisation	Labour force	Training	Retire-ment	Migration (outflow)	Migration (inflow)	Populatio n	Health Consumption
Profession	X	X	X	X	X		
Age	X	X	X	X	X	X	X
Head count	X	X	X	X	X	X	X
FTE	X						
Geographical area	X	X	X	X	X	X	X
Specialisation (where relevant)	X	X	X	X	X		
Country of first qualification	X	X	X	X	X		
Gender	X						

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5.1 Countries profiles

In the tables below we give an overview of the use of the MDS in the planning model adopted in some European countries.

SUPPLY SIDE VARIABLES

SUPPLY SIDE		Countries with Supply-projection and DEMAND-BASED (1) model			Countries with Supply-projection and NEED-BASED (2) model			
		Belgium	**Germany**	**Ireland**	**Finland**	**Netherlands**	**Norway**	**UK**
	Type of profession	**Doctors, Dentists, Nurses**	**Doctors, Dentists**	**Doctors, Nurses, Midwives**	**Doctors, Dentists, Nurses, Midwives, Pharmacists**	**Doctors, Dentists, Nurses**	**All publicly employed health personnel**	**Doctors, Nurses, Midwives**
CATEGORY	***Labour force***	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Training	Yes	Data available but not directly relevant to planning	Yes	Yes	Yes	Yes	Yes
	Retirement	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Migration inflow	Yes	Yes	Yes, but assumption: net migration 0	Yes (data available)	Yes	No data on migration flow, but specific assumption in the model (i.e. constant number of foreign physicians)	data included in the stock
	Migration outflow	No (assumption 0)	Yes		Yes (data available)	Yes		No

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SUPPLY SIDE		Countries with Supply-projection and DEMAND-BASED (1) model			Countries with Supply-projection and NEED-BASED (2) model			
		Belgium	**Germany**	**Ireland**	**Finland**	**Netherlands**	**Norway**	**UK**
	Type of profession	**Doctors, Dentists, Nurses**	**Doctors, Dentists**	**Doctors, Nurses, Midwives**	**Doctors, Dentists, Nurses, Midwives, Pharmacists**	**Doctors, Dentists, Nurses**	**All publicly employed health personnel**	**Doctors, Nurses, Midwives**
CHARACTERISATION	***Age***	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Headcount	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	FTE	Yes, by calculation	No	Yes, by calculation	No	Yes	Yes, by calculation	Yes
	Geographical area	Yes (location of practice)	Yes	No specific evidence on this based on the sources analyzed	Yes	Yes	Yes	Yes
	Specialisation	Yes	Yes	Yes	Yes	Yes	Demand for health workers are estimated separately for 12 different activity areas	Yes (GPs and hospital doctors)
	Country of first qualification	No	No	Distinguishing between Irish and non-Irish healthcare workers	No specific evidence on this based on the sources analyzed	No specific evidence on this based on the sources analyzed	No specific evidence on this based on the sources analyzed	No specific evidence on this based on the sources analyzed
	Gender	Yes (for current stock)	No	Yes	No specific evidence on this based on the sources analyzed	Yes	Yes	Yes

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DEMAND SIDE VARIABLES

DEMAND SIDE		Countries with Supply-projection and DEMAND-BASED (1) model			Countries with Supply-projection and NEED-BASED (2) model			
		Belgium	**Germany**	**Ireland**	**Finland**	**Netherlands**	**Norway**	**UK**
	Type of profession	**Doctors, Dentists, Nurses**	**Doctors, Dentists**	**Doctors, Nurses, Midwives**	**Doctors, Dentists, Nurses, Midwives, Pharmacists**	**Doctors, Dentists, Nurses**	**All publicly employed health personnel**	**Doctors, Nurses, Midwives**
CATEGORY	***Population***	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CATEGORY	***Health Consumption***	Yes	The utilization of health services as measured in health insurance refund points for the population group	No	Models use data on current health expenditure and health service use by sex and age	No	Differential utilization patterns by age, sex and type of services. Constant utilization rate by age/sex	1) Population (the size of the population, by age and sex), 2) Level of need (the needs of this population given the distribution of health and illness, and future risk factors), 3) Level of service (the service planned to be provided according to the population's level of need). 4) Productivity (the ability of the workforce to deliver the necessary services, taking into account factors such as skill mix and technology)

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DEMAND SIDE		Countries with Supply-projection and DEMAND-BASED (1) model			Countries with Supply-projection and NEED-BASED (2) model			
		Belgium	**Germany**	**Ireland**	**Finland**	**Netherlands**	**Norway**	**UK**
	Type of profession	**Doctors, Dentists, Nurses**	**Doctors, Dentists**	**Doctors, Nurses, Midwives**	**Doctors, Dentists, Nurses, Midwives, Pharmacists**	**Doctors, Dentists, Nurses**	**All publicly employed health personnel**	**Doctors, Nurses, Midwives**
CHARACTERISATION	***Age***	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Headcount	Yes	Yes	No	Yes	Yes	Yes	Yes
	Geographical area	Yes	Yes	Data is available but the planning is centralized	Data is available but the planning is centralized	Data is available but the planning is centralized	Yes	Yes

Source: elaboration on Matrix - Feasibility study, OECD - Health Workforce planning in OECD Countries, WP5's survey on planning system and models

Note: Lithuania has a needs-based model, too, but it isn't its own model. The University of Health Sciences decided to import the Australian supply model and the Dutch demand model (developed by NIVEL) for health workforce planning

(1) Demand - based approach: examines quantity of health care services demanded by the population in the future, based on number and type of projected services and on physician-per-population ratios.

(2) Needs-based approach usually taking epidemiological factors into account, this involves defining and projecting health care deficits and looking at the number of workers necessary to provide an optimum standard. This is a more advanced version of a demand-based approach, taking more factors into account

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6. Appendices

6.1 Appendix no. 1 - The HWF forecasting: main determinants

The scope of a quantitative forecasting model is to estimate future scenario as a function of past and current data (time series, cross-sectional or longitudinal data) on the basis of specific assumptions. Accordingly it is appropriate when past and current data are available.[19] However, it is important to emphasize that, although the forecasting model presented below has a quantitative basis (the indicators proposed in the following pages require the collection of time series of quantitative data), it is clear that the estimates of future quantitative values also depend on judgements and opinions of experts and stakeholders (qualitative forecasting).

The forecasting model proposed here contains seven categories of data belonging to two areas: **supply** of HWF and **demand** of HWF (see figure below).

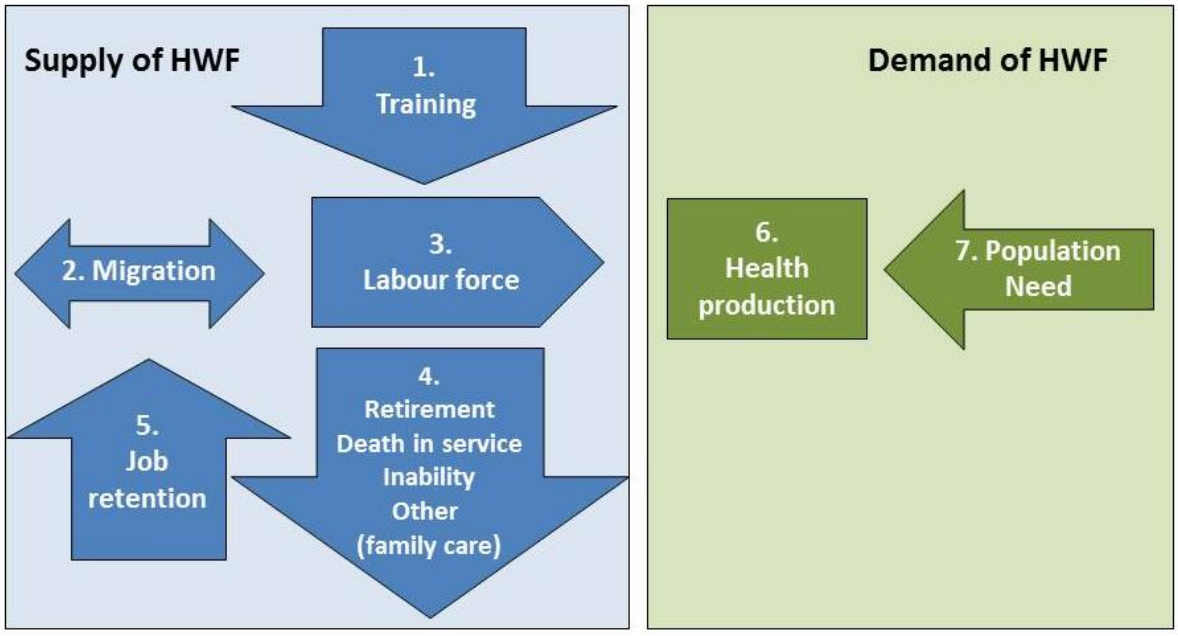

Fig. 2: 7 data categories for the HWF quantitative forecasting model [20]

To influence policy decisions, forecasting models must be credible. The assumptions underlying different models have a strong influence on results. Transparency of methods and assumptions is a prerequisite for model quality, as is a strategy to validate results[21].

19 On the other hand, in the qualitative forecasting models the estimations are based on the opinion and judgement of experts, stakeholders or users and they are appropriate when past data are not available.

20 WHO – 2009

21 Astolfi R., Lorenzoni L. Oderkirk J. (2012)

6.2 Supply side

- **Training** (item 1) represents the number of new professionals produced each year by educational institutions. We suggest, as a basic estimation, to forecast the first years based on the number of students currently within the education system and the following years as the average of the first years. Most of the existing forecasting models are built on the assumptions that the number of trained professionals is the main parameter to create balance between demand and supply of HWF.
- The size of the actual **Labour force** (item 3) depends mainly on the capacity to identify the professionals that are not directly employed in the system but that are actually producing health care, for example retired but still active on a private payment basis. An assumption might be that the numbers of professionals not directly employed but active in producing healthcare will be stable over time. In this case, they will not influence changes in supply.
- **Migration** (item 2) has a different importance according to the weight that this phenomenon has in each country. At any rate, its impact on forecasting models will probably grow in the future with more integration within the EU.[22]
- **Retirement** (item 4) depends on individual decisions and on the legislation that governs the right to retirement. The assumption of the legislation can be part of the parameters that will be shared with the policy makers as the size of the labour force is very sensitive to this parameter[23].
- **Job retention** (item 5) might be more closely linked to some professions (i.e. nurses) than to others. Its importance changes in different EU Member States and depends also on early retirement for family reasons. This item can be shared with the policy makers as a parameter which can be under their control.

On the basis of what is stated above, the items on the supply side can be considered stable or can be shared with the policy makers as political decisions to be made.

6.3 Demand side

Concerning the demand side, there are numerous studies which analyse the wide range of factors influencing the demand of healthcare. These include[24]:

- the socio-demographic factors like age distribution and education;
- the geographic and environmental factors;
- the cultural factors like social norms, behaviour and self-efficacy;
- the economic factors like income and wealth.

22 The indicators 5 and 6 proposed in the section 7, articulated by geographical area, are useful just to measure the impact of the mobility flows in a specific geographical area.

23 See note 20.

24 See Zegal L., Bolton T. – 2009

Technology is a significant factor in the diagnosis and cure of diseases, and technological development may have an important role in the demand of health care services.
The actions from the authorities like health promotion and policy decisions will also influence the demand for health care services and thus changes in demand of the health workforce.

Unlike the elements relating to the supply side, the many factors that determine the HWF demand are more difficult to measure and therefore predict (see appendix 1). The aim of this paper is to identify the minimum data set for a basic quantitative forecasting model. Considering that the projection period useful for our basic model will be variable with a maximum of fifteen years for the physicians and taking into account that in this medium period the past trends will be significant for the result, the actual consumption for each age group will represent a good assumption for a basic model. In any case, as the institutions and the policies may be an important part of the model, it is necessary to discuss this assumption with the policy makers and ensure that any findings are not misunderstood.

The proposed conceptual model includes all these factors in two categories of data: population needs and health production. WP 5 partners and experts, in the framework of the Joint Action EUHWF, accordingly to the recent OECD and EC studies and guidelines[25], proposed to use a simplified basic model that permits calculation of the demand of HWF on the basis of:

- population by group of age;
- health consumption (per age group);
- and "k" parameter which transforms the population demand in HWF demand (number of professionals needed in headcount).

In order to complete the definition of the forecasting model, a number of basic assumptions, valid also for more advanced model, have to be made.

- Health consumption per capita for each age group remains constant (no compression or expansion of morbidity).
- The percentage of public consumption and private consumption will remain constant so the total health consumption (HCT) will also include private consumption.
- Health service remains as it is: no change in productivity or technology.
- The roles or the scope of practice for each profession remain unchanged (no interaction between 5 different professional groups).
- Current balance between supply and demand.

On the basis of these assumptions and in the framework of a "minimum purposes of planning" these are the proposals for the two categories of the demand side model.

Population need (item 7)

25 See Przywara B. (2010); Astolfi R. et al. (2012); De la Maisonneuve C. et al. (2013)

- The trend of future demand will be estimated on the basis of the demographic change. It can be assumed that the service prevision does not change over time and the needed growth/reduction in health workforce is equal to the growth in demand based on demographic structure of population. Inflation is not taken into account. For simplicity, we will base population on age and disaggregate into three groups: children (Pop1), adults (Pop2) and elderly (Pop3). These groups have to be further defined: children can be in the 0-14 age interval, adults in the 15-64 age interval and elderly in the 65+ interval. The model proposed measures of the per-capita healthcare consumption (HC) for each age group in year 0 ($HC1_0$, $HC2_0$ and $HC3_0$) and calculates future healthcare consumption by multiplying future population in year x ($Pop1_x$, $Pop2_x$ and $Pop3_x$) by proportions of healthcare consumption in year 0:
  Here's the formula: $HCT_x = (HC1_0 * Pop1_x + HC2_0 * Pop2_x + HC3_0 * Pop3_x)$

The need of health workers for **health production (item 6)**

- The EC measures health expenditure by age and is also publishing the forecast of the population by age group[26]. The formula recommended by the WP5 partners and for the calculation of the future need is expressed below:

  $$\mathbf{HWF_{px} = k_p * HCT_x}$$

  where $\mathbf{HCT_x = (HC1_0 * Pop1_x + HC2_0 * Pop2_x + HC3_0 * Pop3_x)}$

  Each group of professions has a specific ratio to the health expenditure (k_p).For example in the Italian case, more than 20% of the total public health expenditure is for physicians and close to 40% is for all the professions included in this project[27]. Any change in expenditure will therefore be closely related to the cost of and the numbers of the professionals working in the health care sector.

Other changes in the assumptions of the demand side model

- Simplification of the demand side model:
  - As a result of the discussion with the policy makers and the stakeholders it might be questioned that the increasing age of the population will also increase the demand for health services (see appendix 1). In this case we can assume HC1=HC2=HC3=1 (every single individual demand absorbs the same level of health care consumption). This simplified model will estimate the demand only by the changes in population size; an approach commonly known as a **constant health workers to population ratio approach**.

  - An alternative way to calculate the future need of health personnel is to use the health consumption per age group (HC1, HC2, HC3) for calculating a weight per age group and then calculate a weighted population (see appendix 3) today and tomorrow. It is important to point out that even if the measurement used in this case (weighted

26 See the analysis done by the Working Group on Ageing Population and Sustainability (AWG) of the Economic Policy Committee (http://europa.eu/epc/working_groups/ageing_en.htm).

27 Source: Ragioneria dello Stato.

population) is not expressed in monetary terms like in the main proposal above, it is based on exactly the same assumptions (health consumption in monetary terms per age group).

- Extension of the demand side model:
  - Productivity improvement: this can be expressed as a reduction of "k_p" by a certain percentage (you need less health workforce per total health consumption).[28]

28 For a disquisition on the proposal demand model see Appendix 9.1.

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6.4 Appendix no. 2 - Some basic concepts for the indicators concerning the HWF demand

OECD has recently published two documents, OECD Health Working Papers no 59 "Comparative Analysis of Health Forecasting Methods"[29] and OECD Economic Policy Papers no 6 "Public spending on health and long-term care: a new set of projections"[30].

The first paper classifies the quantitative demand forecasting model proposed in this paper as a "Component based model": indeed, it forecasts health expenditure by component, such as by financing agent or providers of care and the forecast is usually estimated by age group. This type of forecasting model is the dominant class, accounting for more than half of all forecasting models surveyed by their study. One of the reasons for their proliferation is a focus on demographic drivers of health expenditure growth. They are also less data intensive and less complex than other type of models, and they are considered the most appropriate for short-term projections as they depend on clear and undisturbed trends. According to the study, virtually all existing models account for demographic shifts in the population and some focus specifically on scenarios about the future potential health status of older people. The study points out two other important influences on health expenditure growth that are the least understood, including technological innovation and the role played by changes in health-seeking behaviour and underlying social norms about health and illness. Furthermore, it states that there is little empirical evidence on these factors upon which models may be developed.

Regarding "Demographical factors and health status," the authors report that around 25% of life time health expenditures are concentrated in the last year of life, and it might be that traditional projection methods overestimate the influence of population ageing because longevity gains could progressively postpone health expenditure from one age class to the next, rather than raise it. The relationship between life expectancy and morbidity can follow different paths. The first is known as the "health ageing" hypothesis and assumes that an increase of life expectancy corresponds to an equal increase in years of healthy life before the morbidity period prior to death. The second is a pesimistic view of expansion of morbidity whereby increases in life expectancy yield a longer time spent with ill-health and reduced quality of life. The third and opposite theory is known as "compression of morbidity" where longevity gains can be associated with an increase of healthy-life period.

The paper does not report evidence that one or another model is better than the others but concludes that forecast models should be valued for their ability to demonstrate the likely future course of events, if past trends continue.

29 OECD 2012.
30 OECD 2013.

The second study compares the actual evolution of public health and long-term care expenditures with the projections made by an OECD study in 2006. They found that the actual development of the last few years was higher than the most expensive trend (called the "cost-pressure scenario"). The study then assumes the "compression of morbidity" relationship between life expectancy and morbidity (for definition, see the first study above) and makes projections up to 2060. The projections show that the more mature countries (the Nordic countries as well as the United States and the United Kingdom) will have a lower increase of costs while the poorer countries will have above average increases in public health expenditures. As an average, the percentage of GDP will increase in an interval between 3.5% of GDP to 8% of GDP. With these assumptions made, the demographic and income effects will play only a minor role in the projected increase of public health and long-term care expenditures.

When considering the implications of these two studies for this project we have to take into account that the projection period in our case will be around fifteen years and not fifty years. Past trends will therefore be more significant to the result. Even if the role of the ageing population in the increase of future expenditures is not certain (see the first study), we think that, at the present state, it will represent a good assumption for our model. As the institutions and the policies may be an important part of the model, we think that it is necessary to discuss the effects with the policy makers and not only present the results as facts. The overall effect of the indicators, and in particular indicators 2, 5 and 6 may help in these discussions.

6.5 Appendix no. 3 - Definition of each indicator

6.5.1 Coverage of future demand, high level

Numerator: Future supply domestic + Future supply abroad Denominator: Future demand **Articulated by:** Profession
Numerator: Future supply Future supply domestic= current stock + from education - retired Future supply abroad = + immigration - emigration **Current stock**: Current number of professionals (headcount and full time equivalent) that are currently producing health care stratified by type (5 profession) and age. **From education**: Forecast of number of professionals (headcount) that complete education (basic or specialist) and are licensed to practice during the period. The first years will be calculated on the basis of the current students in training; subsequently the actual training capacity (average of the statistics of the last years) will be used. **Retired:** Forecast of number of professionals (headcount) that will retire each year using the actual probability. **Immigration:** Forecast of number of licensed and recognised professionals (headcount) that may enter the country, calculated using the average of the last years. **Emigration:** Forecast of number of practising professionals (headcount) that may leave the country, calculated using the average of the last years.
Denominator: Future demand Future demand = $HWF_{px}=k_p * HCT_x$ where $HCT_x= (HC1_0*Pop1_x + HC2_0*Pop2_x + HC3_0 *Pop3_x)$ (2) HWF_{px} : The demand of a specific profession "p" (headcounts) in the year x. k_p: The constant that connects the total health production with the demand for a specific profession. HCT_x: The total health consumption in year x.(1) $HC1_0$: The per capita consumption of age group 1 in year 0 (basic year) $HC2_0$: The per capita consumption of age group 2 in year 0 (basic year) $HC3_0$: The per capita consumption of age group 3 in year 0 (basic year) $Pop1_x$: The population of age group 1 in year x. $Pop2_x$: The population of age group 2 in year x. $Pop3_x$: The population of age group 3 in year x. **Note**(1)**:** it is important to check the sustainability of the total health consumption in year x compared with the current consumption. **Note**(2): the values of these parameters are available from OECD / Eurostat / WHO

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6.5.2 Relative Affordability

Numerator: Future health consumption Denominator: Current health consumption **Articulated by:** Depends on the institution responsible for the health consumption. If it is on a country scale, the indicator will not be articulated further, otherwise it has to be further detailed.
Numerator: Future health consumption HCT_x: The total health consumption in year x. $HCT_x = (HC1_0 * Pop1_x + HC2_0 * Pop2_x + HC3_0 * Pop3_x)$ HCT_x: The total health consumption in year x. $HC1_0$: The per capita consumption of age group 1 in year 0 (basic year) $HC2_0$: The per capita consumption of age group 2 in year 0 (basic year) $HC3_0$: The per capita consumption of age group 3 in year 0 (basic year) $Pop1_x$: The population of age group 1 in year x. $Pop2_x$: The population of age group 2 in year x. $Pop3_x$: The population of age group 3 in year x.
Denominator: Current health consumption: HCT_0 : The total current health consumption. $HCT_0 = (HC1_0 * Pop1_0 + HC2_0 * Pop2_0 + HC3_0 * Pop3_0)$ $HC1_0$: The current per capita consumption of age group 1 $HC2_0$: The current per capita consumption of age group 2 $HC3_0$: The current per capita consumption of age group 3 $Pop1_x$: The current population of age group 1. $Pop2_x$: The current population of age group 2. $Pop3_x$: The current population of age group 3.

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6.5.3 Coverage of future demand, detailed

Numerator: Future supply domestic + Future potential supply from abroad Denominator: Future demand **Articulated by:** Profession, specialization within the profession, geographical area
Numerator: Future supply Future supply domestic= current stock + from education - retired Future potential supply from abroad = + immigration - emigration **Current stock**: Current number of professionals (headcount and full time equivalent) that are currently producing health care stratified by type (5 types) and age. **From education**: Forecast of number of professionals (headcount) that complete education (basic or specialist) and are licensed to practice during the period. The first years will be calculated on the basis of the current students in training; subsequently the actual training capacity (average of the statistics of the last years) will be used. **Retired:** Forecast of number of professionals (headcount) that will retire each year using the actual probability. **Immigration:** Forecast of number of licensed and recognised professionals (headcount) that may enter the country calculated using the average of the last years. **Emigration:** Forecast of number of practising professionals (headcount) that may leave the country calculated using the average of the last years.
Denominator: Future demand Future demand = $HWF_{px}=k_p * HCT_x$ where $HCT_x = (HC1_0 * Pop1_x + HC2_0 * Pop2_x + HC3_0 * Pop3_x)$ HWF_{px} : The demand of a specific profession "p" (headcounts) in the year x. k_p: The constant that connects the total health production with the demand for a specific profession. HCT_x: The total health consumption in year x.(1) $HC1_0$: The pro capita consumption of age group 1 in year 0 (basic year) $HC2_0$: The pro capita consumption of age group 2 in year 0 (basic year) $HC3_0$: The pro capita consumption of age group 3 in year 0 (basic year) $Pop1_x$: The population of age group 1 in year x. $Pop2_x$: The population of age group 2 in year x. $Pop3_x$: The population of age group 3 in year x. (1) **Note:** it is important to check the sustainability of the total health consumption in year x compared with the current consumption.

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6.5.4 Coverage of needs by foreign professionals today and in the future

Numerator: N° of professionals with foreign first qualification. Denominator: Total n° of professionals. **Articulated by:** Profession, specialization within the profession, geographical area
Numerator: N° of professionals with foreign first qualification. **Current stock of professionals with foreign qualification:** The part of the current stock with country of first qualification <> current country of activity. **Future stock of professionals with foreign qualification:** The part of the future stock with country of first qualification <> current country of activity.
Denominator: Total n° of professionals. **Total current stock**: Current number from indicator 3. **Total future stock:** Numerator of indicator 3

6.5.5 N° of professionals per inhabitant today and in the future

Numerator: N° of professionals Denominator: population **Articulated by:** Profession, specialization within the profession, geographical area
Numerator: Actual number of professionals **Actual number of professionals:** From indicator 3 **Future number of professionals:** From indicator 3
Denominator: population Actual population: Number of population (without weighting) **Future population:** Number of population (without weighting) from a reliable institute of forecasting.

6.5.6 N° of professionals per weighted inhabitant today and in the future

Numerator: N° of professionals Denominator: weighted population **Articulated by:** Profession, specialization within the profession, geographical area
Numerator: Actual number of professionals **Current number of professionals:** From indicator 3 **Future number of professionals:** From indicator 3
Denominator: population Current population: Number of inhabitants weighted by health consumption for each age group (average current EU countries). **Future population:** Number of population from a reliable institute of forecasting weighted by health consumption for each age group (current average of EU countries).

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6.6 Appendix no. 4 – Two examples of calculation for the indicator 1

In order to make the calculation clearer, we have included two examples of the calculation of the demand formulas in the Indicator 1:

a. calculation of the current and the future health consumption (the main alternative)
or
b. calculation of the weighted population (the alternative presented on page x).

The supply formulas are the same in the two examples.

6.6.1 Example a Indicator 1 (Doctors) with the demand calculated on the basis of the future health consumption

Numerator: Future supply 2028 (Italian figures)

Future supply = current stock + from education - retired + immigration -emigration

Current labour force(practising)	**254.000**	
Training (2013-2028)	**140.578**	*estimation*
Retirement (2013-2028)	**168.597**	*estimation*
Migration inflow (2013-2028)	**3.819**	*estimation*
Migration outflow (2013-2028)	**7.918**	*estimation*
Future supply 2028	**221.883**	

(254.000 + 140.478 - 168.597 + 3.819 - 7.918)

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Denominator: Future demand 2028 (Italian population)

Step 1 Construction of the current health consumption.

Current population

	N° of inhabitants (a)	Health consumption (euro per person, European average) (b)	Health consumption (millions of euro) (a)*(b)/1.000.000
Pop1 = population aged 0-14	8.325.217	772	6.427
Pop2 = population aged 15-64	38.698.168	1.287	49.805
Pop3= population aged 65+	12.370.822	3.861	47.764
Total Italian population	59.394.207		103.995

Step 2 Calculation of the conversion factor for doctors

Current number of doctors	254.000	
kp	2,442417	(254.000/103.995)

Step 3 Calculation of the future health consumption

Population 2028

	N° of inhabitants (a)	Health consumption (euro per person, European average) (b)	Health consumption (millions of euro) (a)*(b)/1.000.000
Pop1 = population aged 0-14	8.073.662	772	6.233
Pop2 = population aged 15-64	39.374.526	1.287	50.675
Pop3= population aged 65+	15.893.206	3.861	61.364
Total Italian population	63.341.394		118.272

Step 4 Calculation of the future number of doctors

kp	2,442417	
Number of doctors 2028	288.868	(118.272 * 2,442417)

Indicator 6.1.1 = coverage of future demand

Future supply 2028/Future demand 2028 **0,8** **is < 1** **Future shortage**

(221.883 / 288.868)

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6.6.2 Example 2 b Indicator 1 (Doctors) with the demand calculated on the basis of the future weighted population

Numerator: Future supply 2028 (Italian figures)

Future supply = current stock+ from education-retired+immigration-emigration

Current labour force (practising)	**254.000**	
Training (2013-2028)	**140.578**	*estimation*
Retirement(2013-2028)	**168.597**	*estimation*
Migration inflow (2013-2028)	**3.819**	*estimation*
Migration outflow (2013-2028)	**7.918**	*estimation*
Future supply 2028	**221.883**	

(254.000 + 140.478 - 168.597 + 3.819 - 7.918)

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Denominator: Future demand 2028 (Italian population)

*Future demand (HWF_{2028}) =kp * HCT_{2028}*

Step1 Construction of a Weight for each age group

Current consumption of health care

	Health expenditure (euro per person European average)	Weight per age group
Pop1 = population aged 0-14	772	0,6
Pop2 = population aged 15-64	1.287	1
Pop3= population aged 65+	3.861	3
Total Italian population		

Step 2 Construction of the current weighted population (Italian population).

Current population

	N° of inhabitants (a)	Weight (b)	Weighted pop = (a)*(b)
Pop1 = population aged 0-14	8.325.217	0,6	4.995.130
Pop2 = population aged 15-64	38.698.168	1	38.698.168
Pop3= population aged 65+	12.370.822	3	37.112.466
Total Italian population	59.394.207		80.805.764

Step 3 Calculation of the conversion factor for doctors

Kp = current number of practising doctors/weighted population * 1000

Kp = 254.000 / 80.805.764 * 1.000

Kp	**0,00314**

Step 4 Calculation of the future weighted population

Population 2028

	N° of inhabitants (a)	Weight (b)	Weighted pop = (a)*(b)
Pop1 = population aged 0-14	8.073.662	0,6	4.844.197
Pop2 = population aged 15-64	39.374.526	1	39.374.526
Pop3= population aged 65+	15.893.206	3	47.679.618
Total Italian population	63.341.394		91.898.341
HCT_{2028}	**91.898.341**		

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Step 5 Calculation of the future demand of practising doctors
Future demand 2028 ***(HWF2028):*** *0,00314 * 91.898.341 =*

288.868

Indicator 6.1.1 = coverage of future demand

Future supply 2028/Future demand 2028	0,8	is < 1	future shortage

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6.7 Appendix no. 5 – Glossary

ITEM (alphabetical order)	DEFINITION
Age group	Population by single year of birth or age groups (i.e.: 0-4; 5-9; 10-14;.... 60-64; 65+).
Demand (of HWF)	Number of practising health professionals required to satisfy the population needs (see definition below). It can be expressed in headcount or in FTE depending on the measure used in the forecasting model adopted.
Dentists	Dental practitioners *(see Directive EC/2005/36 section 4, article 34).*
Emigration (outflow)	Annual number of professionals exiting from the Country for practising profession full time abroad.
Forecasting model (quantitative)	A quantitative forecasting model is a set of formal statement about variables and relationships among variables. The scope is to estimate future data as a function of past data (time series, cross-sectional or longitudinal data) on the basis of specific assumptions. Accordingly it is appropriate when past data are available. Quantitative forecasting models are usually applied to short- or intermediate-range decisions. On the other hand, qualitative forecasting models (in which estimations are based on the opinion and judgement of experts, stakeholders or users) are appropriate when past data are not available and they are usually applied to intermediate- or long-range decisions.
Full time equivalent (FTE)	Unit to measure employed persons in a way that makes them comparable although they may work a different number of hours per week. The unit is obtained by comparing an employee's average number of hours worked to the average number of hours of a full-time worker. A full-time person is therefore counted as one FTE, while a part-time worker gets a score in proportion to the hours he or she works or studies. For example, a part-time worker employed for 24 hours a week, where full-time work consists of 48 hours, is counted as 0.5 FTE.
Health production	It is the maximum output of healthcare services that can be produced out of a given combination of human and non-human resources
Job retention	Number of practising professionals that will stay at work, especially in the age groups with a high likelihood to leave job (i.e. nurses aged 25-34 or 60+)
Labour force	Current number of professionals (headcount) that are currently producing health care in the Country/Region.
Midwives	Midwives *(see Directive EC/2005/36 section 6, article 40).*

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ITEM (alphabetical order)	DEFINITION
Migration (inflow)	Annual number of licensed and recognised professionals entering the Country.
Nurses	Nurses responsible for general care*(see Directive EC/2005/36 section 3, article 31)*
Pharmacists	Pharmacists *(see Directive EC/2005/36 section 7, article 44).*
Doctors	Doctors of medicine *(see Directive EC/2005/36 section 2, article 24).*
Planning process	The planning process is the set of organized activities, task lists and schedules required to achieve the objectives defined in the health workforce planning system. It includes the making and maintenance of a plan and it combines forecasting of developments with the preparation of scenarios of how to react to them (strategies). With this understanding, it is the counterpart of the spontaneous order. The planning process is a fundamental function of management since it is aimed at the best satisfaction of the needs given the resources available.
Planning system	The planning system is used to make decisions about the future development and use of health workforce ("*what it should look like in the future*"). It considers both the internal and external factors that affect the health workforce supply and demand (where development should happen, where it should not and how development should be). The planning system balances different interests to make sure that the healthcare system works and it is developed in a way that creates high quality at sustainable costs. The health workforce planning systems in the different Countries will tend to vary and are flexible due to the periodic and adaptive nature of the applied strategy. These will also have political aspects.
Population	Number of inhabitants in the Country or Region considered at the reference date (Source: National Institute of Statistics).
Population needs	Population *healthcare* needs are the requirements at the individual, family, community and population level of care and services to achieve physical, cognitive, emotional, social well-being, taking into account the broad determinants of health
Professions	Health professions included in the Directive 2005/36/EC of the European Parliament and of the Council on the recognition of professional qualifications: doctors, nurses, midwives, pharmacists, dentists *(please see details in the items).*
Retirement	Annual number of professionals retiring from labour market.
Shortage	Negative gap between supply and demand.

ITEM (alphabetical order)	DEFINITION
Supply (of HWF)	Number of health practising professionals. Number of professionals trained and licensed to practice in the Country who are not yet employed and looking for a job. It also includes recognises foreign professionals entering the Country.
Training	Annual number of professionals who complete education (basic or specialist) and are licensed to practice.

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6.9 Appendix no. 7 – WP5 general description

6.9.1 WP5 scope

The aim of Work Package 5 (WP5) is to promote and support the use of quantitative model-based planning methodologies (both supply-side and demand-side) based on what is in use today or shortcomings in EU countries and the "good practices" evaluation.
Health professions in focus are doctors, nurses, pharmacists, dentists and midwives (the five health professions covered by the Recognition of Professional Qualifications Directive).

6.9.2 WP5 actions

The WP5 specific objective is to "*define guidelines on quantitative HWF planning methodology and increased quantitative planning capacity*".

N#	Title		WHEN
	3.1	**Minimum data set (MDS)**	
3.1	MILESTONES 5.1	Agreement on the minimum data set	October 2013
	DELIVERABLE D.051	Minimum planning data requirements	November 2013
	3.2	**Exchange of good practices**	
3.2	MILESTONES 5.2	Experts' group conference on HWF planning methodologies	May2014
	DELIVERABLE D.052	Report of good practices in planning methodologies	September 2014
	DELIVERABLE D.053	Web portal on HWF planning methodologies, with WP2	January 2015
	3.3	**Defining and experimenting guide lines on HWF planning (handbook)**	
3.3	MILESTONES 5.3	Validation of the handbook	March 2015
	MILESTONES 5.4	Start-up of the Pilot studies	June 2015
	MILESTONES 5.5	Finalisation of the handbook	September 2015
	DELIVERABLE D.054	Report on WP5 pilot study experiences	March 2016

6.9.3 WP5 team members

WP5 is managed by Italy. The WP5 Team Leader is Giovanni Leonardi, General Director Health Professions and Human Resources at Ministry of Health.

There are two Italian organisations covering the competencies of WP5: the Ministry of Health (MoH) and the National Agency for Regional Healthcare (AGENAS); their roles, within the project, were divided accordingly.

Their primarily responsibilities are:

MoH
- Results of WP5
- Represent the Italian knowledge broker
- Relationships with international contacts
- Dissemination to Italian stakeholders
- Pilot study project

AGENAS
- Project management
- Methodology of research
- Budget and reporting management
- Logistics and organisation of meeting
- Operational secretariat

Italian team

Ministry of Health
Giovanni Leonardi - WP5 Leader
Egle Parisi
Annalisa Malgieri
Cristina Sabatini

AGENAS
Achille Iachino
Ragnar Gullstrand
Paolo Michelutti
Anna Maria Pacini

Italy is supported by WP5 Partners and experts, divided into WP Leaders, Associated and Collaborative partners, which together make up the team. They are:

WP Leader			
Country	**Acronym**	**Role**	**Name**
Belgium	BE_FPS	Michel Van Hoegaerden	Program Manager
Belgium	BE_FPS	Lieve Jorens	WP1 Leader
Slovakia	SK_MOH	Zuzana Matlonova	WP2 Leader
Europe	STAK_EHMA	Jeni Bremner	WP2 Leader
Europe	STAK_EHMA	Paul Giepmans	WP2 Leader
Finland	FI_MOH	Marjukka Vallimies-Patomäki	WP3 Leader
Malta	MT_MOH	Andrew Xuereb	WP3 Leader
Hungary	HU_SU	Zoltan Aszalos	WP4 Leader
United Kindom	UK_DoH	Matt Edwards	WP6 Leader
United Kindom	UK_DoH	John, Fellows	WP6 Team member
Bulgaria	BG_MUV	Todorka Kostadinova	WP7 Leader
Europe	STAK_EAHC	Caroline Hager	EA Representative
Europe	STAK_EC	Balazs Lengyel	EC Representative
Europe	STAK_EC	Antoniette Martiat	EC Representative
Europe	STAK_EC	Angela Blanco	EC Representative

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Associated partners		
Country	**Acronym**	**Name**
Belgium	BE_FPS	Pieter-Jan Miermans
Bulgaria	BG_NCPHA	Nastashka Danova
Bulgaria	BG_NCPHA	Milena Vladimirova
Bulgaria	BG_NCPHA	Plamen Dimitrov
Bulgaria	BG_MUV	Nikolina Radeva
Finland	FI_MOH	Reijo Ailasmaa
Germany	DE_UNI-HB	Melanie Boeckmann
Germany	DE_UNI-HB	Heinz Rothgang
Greece	EL_NSPHJ	Despena Andrioti
Hungary	HU_SU	Eszter Kovacs
Hungary	HU_SU	Edit Eke
Hungary	HU_SU	Edmond Girasek
Iceland	IS_MOH	Valgerdur Gunnarsdottir
Netherlands	NL_CAPORG	Victor Slenter
Netherlands	NL_MOH	Leon Van Berkel
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Poland	PL_MOH	Bartosz Baran
Portugal	PT_ACSS	Ivo Rui Santos
Portugal	PT_ACSS	Filomena Parra da Silva
Portugal	PT_ACSS	Ana Paula Gouveia
Portugal	PT_ACSS	Gustavo Ferreira
Slovenia	SI_IVZ	Rade Pribakovic
Spain	ES_MOH	Pilar Carbajo
Spain	ES_MOH	Mercedes De Jorge
Spain	ES_MOH	Sebas Martin
Europe	STAK_AMREF	Giulia De Ponte
Europe	STAK_EFN	Silvia Gomez
Europe	STAK_EFN	Alessia Clocchiatti
Europe	STAK_EFN	Paul de Raeve
Europe	STAK_HOPE	Isabella Notarangelo
Europe	STAK_PGEU	Patricia Munoz
Europe	STAK_PGEU	John Chave

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Collaborating partners		
Country	**Acronym**	**Name**
Belgium	BE_FPS	Peter Willemé
Denmark	DK_DHMA	Anders Haahr
Germany	DE_KBV	Filip J. Lassahn
Ireland	IE_DoH	Gabrielle Jacob
Italy	IT_AIC	John Williams
Moldova	MD_MoH	Eugenia Berzan
Moldova	MD_MoH	Nicolae Jelamschi
Serbia	RS_IPHS	Milena Vasic
Serbia	RS_UNI-BG	Milena Santric Milicevic
Europe	STAK_ENMCA	Tanja Schubert
Europe	STAK_ENMCA	Marie Colegrave-Juge
Europe	STAK_UEMO	Marie-Christine Bonnamour
Europe	STAK_IOM	Benedict Roumyana
Europe	STAK_IOM	Giuliana Urso
Europe	STAK_OECD	Michael Schoenstein
Europe	STAK_OECD	Tomoko Ono
Europe	STAK_WHO	Galina Perfilieva

6.10 Appendix n. 8 – WP5 workshop minutes – Milan 19th – 20th of September 2013

See the pdf document attached to this document.

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WP5 Workshop
"Defining the Minimum data set"

WP5 Workshop minutes

Joint Action Health Workforce Planning and Forecasting

Milan, 19th and 20th November 2013

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Joint Action Health Workforce Planning and Forecasting

WP5 Workshop "Defining the Minimum data set"
Milan, 19th and 20th of September 2013

Meeting Minutes

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Joint Action Health Workforce Planning and Forecasting

WP5 Workshop "Defining the Minimum data set"
Milan, 19th and 20th of September 2013

Meeting Minutes

0. Introduction

The Work package 5 (WP5), in accordance with the Joint Action (JA) agreement, has to deliver by November 2013 a minimum data set (MDS) to allow Member States (MS) to start or to improve effectively monitoring, analyzing and planning their Health Workforce (HWF). Such a MDS will be a key element within the JA and the activities of the different Work packages: for WP4 it will the standard to measure the availability in the MSs of useful data for HWF planning and forecasting; for WP5 it will be the base to develop models of HWF planning and forecasting and experiment it within the pilot studies in Portugal and in the Italian Regions; for WP7 as starting data set which could be subjects for future enhancement actions.

The Workshop on MDS was organized in Milan on September the 19th and 20th in order to define a first list of indicators on the basis of the agreed criteria and requirements. All the WP5 partners were present (*for the list of the attendees see appendix n.1*).

Activities of Thursday 19th September 2013

1. Welcome

Alberto Brugnoli, General Director Eupolis Lombardy, who kindly hosted the meeting, welcomed the participants. Éupolis is the Institute for research, statistics and formation of the Lombardy Region, to emphasize the increasing attention to knowledge as the foundation of political and administrative action.

2. Introduction to the activities

Michel Van Hoegaerden, Project Manager, put in evidence the importance of every partner's contribution to build up the MDS. This project will bring knowledge together and spare efforts and money to all the EU countries in developing their planning capacity. (see Michel's speech on www.euhwforce.eu for more).

3. The aim of the workshop

Giovanni Leonardi, WP5 leader, has clarified to the attendees the scope of the workshop: to agree on founding principles, targets, and potential users of MDS; to qualify a set of requirements for MDS; to define the draft of the MDS.

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4. The results of the first WP5 survey

Paolo Michelutti, WP5 project manager, reported the first findings from the WP5 survey on the HWF planning currently in use in 12 EU MSs [1].

The most interesting information related to the MDS are the following:

- physicians are take into the planning in every of the 12 Countries, while Nurses and Dentists are planned in 8 Countries and only in 4 Countries they planned for Pharmacists and Midwives;
- according to what declared by the Countries involved in the survey, for everyone the most important aim of the HWF planning system is to "adapt the supply to the variations of the demand";
- on the base of the WP5 meta-model, in which 38 measuring items are listed concerning both supply and demand side, the most frequent measured indicators in the 12 planning systems are:

  <u>for the supply side</u>

  1. training (6 items of which "n° of students starting university" is measured by all),
  2. current labour force (5 items, of which "geographic localization" is measured by all),
  3. migration (2 items of which "n° of immigrants from abroad" is measured by all);

  <u>for the demand side</u>

  1. the population needs (3 items, of which "population size" and "morbidity" is measured by two-thirds).

5. Tools for MDS

Ragnar Gullstrand (WP5 content leader) and Annalisa Malgieri (WP5 statistic expert) put in evidence the importance to identify the necessary attributes, characteristics and quality of the data used by the Health Work Force planning system to create value and utility for the users, (organization, internal user or other stakeholder). That means it's necessary to have a common groundwork on which build the MDS made by:

- founding principles of the MDS;
- targets of the MDS;
- users of the MDS;
- and some common main definitions.

[1] WP5 collected information from 13 partners representing the following EU MSs: Belgium, Denmark, Finland, Germany, Greece, Hungary, Iceland, Italy, Netherlands, Poland, Portugal, Slovenia, Spain. Greece is not computed in calculation because there is no planning and forecasting methods for HWF used in that Country. So, by now, 12 Countries are in the survey.

One of those common definitions on which it would be necessary coming to an agreement regards the categories of the 5 "regulated" health professions [2]:

- Which professions do we have to include in the MDS release 1?
- Do different professions need different data set?
- Which level of aggregation of the professions is most efficacy?

Some possible alternatives are explored as base for the following sub-groups discussions.

6. Basic requirements for the MDS

After those introductory plenary presentations, Michel Van Hoegaerden, JA Program Manager, introduced the next two parallel sessions. Objective for these working sessions was to create some "common bricks" to use in the definition of the MDS for the working sessions of the day after.

The organization of the two parallel groups was as follow:

A. *Group animated by Ragnar Gullstrand*, started from the Netherlands model simplifying the bricks of that model into a Core Minimal Model (MDS) and Enhanced Modules (top-down approach);
B. *Group moderated by Michel van Hoegaerden*, started from scratch and created the bricks that are needed (bottom-up approach).

6.1 Group A: top-down approach

- *Participants: Annalisa Malgieri, Achille Iachino, Verdiana Morando, Lucia Ferrara, Pieter-Jan Miermans, Sebas Martin, Eszter Kovacs, Edmond Girasek, Bartosz Baran, Aleksandra Kotowicz, Ivo Rui Santos, Rade Pribakovic, Cecilia Sironi, Isabella Notarangelo, Patricia Munoz, Anders Haahr, Gabrielle Jacob, Milena Vasic, Zuzana Matlonova, Matt Edwards, Angela Blanco.*
- *Moderator: Ragnar Gullstrand, Agenas, Italy.*
- *Expert of the Dutch model: Leon Van Berkel, Ministry of Health, Netherlands.*

Brief summary of the workshop to identify the parameters of the minimum data set through a comparison with a model considered "successful" (The Netherlands).

Ragnar Gullstrand opened the session remembering the task of the group as specified in the "Road book - basic requirements for Minimum Data Set".
The group was to fill in the forms of:

- founding principals for the minimum data set;
- targets;

[2] The JA agreement states that WP5 will focus only on the 5 Health professions regulated by the EU Directive 2005/36: physicians, nurses, dentists, pharmacists and midwives.

- users of the MDS;
- definitions of some important variables like health professions, geographical dimensions and sector of employment.

As the base of the discussion was the Dutch model, Ragnar Gullstrand continued with a short description of this model that regards only Physicians (*see appendix n.2*). After this presentation the partecipants discussed various elements of this model with Leon Van Berkel.

The next step was to define the Targets of the Minimum data set. Each member of the group had to propose one target or to agree with a target already proposed. At the end there were 12 targets rigrouped in 11 targets.

Subsequently each member was asked to give a priority of the 11 targets by assigning his vote to two targets. The targets proposed ordered by number of votes is presented in table 1.

Table 1* Proposed targets that should be reflected in the Minimum Data Set

Targets	Votes
1.Affordability of the production	9
2.Demand of health care	7
3.Quality of care	6
4. Access to post-graduate education	6
5. Regional (i.e. by language) distribution	4
6. Balance of the demand for care between General care and Specialized care (horizontal) and between the professions (vertical).	4
7. Mapping movements of specialized professionals between countries	2
8. Reaching a set of indicators (i.e. doctors per 1000 habitants)	2
9. Retention of professionals within the country	2
10.Controlling the retention process.	1
11. Affordability of training	1

Commento [AMP1]:
From MILENA SANTRIC MILICEVIC AND MILENA VASIC (MSM,MV)_RS: Does it mean production of services? If not, what is the difference between this point and point 11?

Commento [AMP2]:
From MSM, MV_RS: It needs clarification: reaching the consensus on the set of indicators or maybe determine a set of indicators?

*The table above doesn't necessarily mean that the affordability is the main proposed target, but might reflect the wish of many participants to include this target compared to the models that are used at the moment.

Commento [AP3]:
From LEON BARKEL_NL

As regarding the users of the MDS the members agreed upon the statement that "Each model has its own data-set, so each country, depending on the choose model, might have different datasets". As a result, the users should be principally on national and regional level and would probably regard the countries that choose a new model: the ones that will start programming now.

The members of the workshop agreed on that the disaggregation of the health professions should be as detailed as possible, depending on the national organization of the education, as this is the level needed to be able to take decisions.
Regarding the geographical areas the members tended to indicate the single countries and regions within the countries and not the whole EU or Macro-areas (i.e. language areas) of countries within the EU.

Commento [AMP4]:
From PAUL DE RAEVE_EFN: Regarding this issue the EFN pointed out that for the MDS, it would be sufficient to include the 4 categories of nursing care and that going into too much detail doesn't make sense for the MINIMUM data set.
Note: This comment was made in the Plenary when the results of both workshops were presented to the all group. (see §7)

6.2 Group B: buttom-up approach

- *Participants: Giovanni Leonardi, Cristina Sabatini, Paolo Michelutti, Nikolina Radeva, Heinz Rothgang, Despena Andrioti, Pilar Carbajo, Reijo Ailasmaa, Edit Eke, Valgerdur Gunnarsdottir, Gustavo Ferreira, Ana Paula Gouveia, Silvia Gomez, Nicolae Jelamschi, Milena Santric Milicevic, Galina Perfilieva, Tomoko Ono, Zoltan Aszalos, John Fellows.*
- *Moderator: Michel Van Hoegaerden, JA Program manager.*

The exercise took place as a role-playing game, enabling the different participants to think broader than from the sole healthcare perspective. Description of the role playing gaming is to be found on the slides on www.euhwforce.eu.

Conclusions

The workshop identified the following overall comment:

- Playing the real game shows that many actors consider health workforce from very different perspectives. Their basic needs creates an huge list of requirements. The awareness that not meeting at least a few requirements of many partners means a rejection is high.
- The participants nevertheless made some choices and believe that there is a way to define a minimal data set (even though broad).
- It was mentioned that in a real country context, the minimal data set can be smaller due to the local context and system.

The priority one principles and target identified are:

Main Principles (groups)	Main Targets (groups)
Availability of service.	Numbers needed on current people. Numbers needed on population & geography.
Adapting education to the needs of Healthcare.	Numbers needed on future skills & needs.
Cost effectiveness is important.	Numbers needed on cost & effectiveness.
Planning help evaluating current situation and new initiatives.	Relation between current reality, scenarios and cost effectiveness.

Commento [AMP5]:
From MSM, MV_RS:HWF stock?

From MELANIE BOEKMANN_DE: Could you specify whom you mean by „people"?

Commento [AMP6]:
From MSM, MV_RS: Reconsider to delete this word from the table.

Commento [AMP7]:
From MELANIE BOEKMANN_DE: Do you also mean skills that will be needed in the future?

For a full overview of the opinions gathered see the slides on www.euhwforce.eu

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7. Sharing the results and closure

The findings raised in the two groups and described above were displayed in the plenary session.

The main comments were on the criteria of a hypothetical basic model: Valgerdur Gunnarsdottir evidenced the importance of the effectiveness of a planning model based on evidences but admitted the difficulties to measure it.

Tomoko Ono added that every planning model should declare the incurred and estimated costs, even if it is hard to interpret this dimension.

The EFN pointed out that in relation to the MDS, it would be sufficient to include the 4 categories of nursing care and that going into too much detail doesn't make sense for the MINIMUM data set. The EFN made reference to the discussions under WP4, where the EFN 4 nursing care categories were presented.

Finally, Michel Van Hoegaerden completed stating that stakeholders need cost analysis. The discussion and agreement on those findings were postponed to the day after.

Activities of Friday 20th September 2013

8. Review of the previous day sessions

Michel Van Hoegaerden and Giovanni Leonardi reviewed the results of the previous day sessions and, considering the goal of the workshop, defined the scope of the ongoing workshop and of the MDS delivered by this Joint Action.

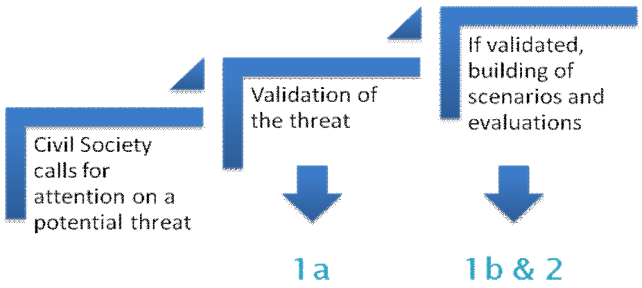
The framework of targets and requirements defined during the two parallel sessions of the day before was very rich and the amount of priorities too huge to set a coherent and effective group of indicators (*see table below*).

Principles		Targets
Planning & forecasting are must do's to allow both monitoring and policy making.		Current HWF.
Shortages are no options as it is a threat to the coverage and quality.		Benchmark against population information's (incl. real coverage).
Universal coverage.		Measuring the impact of policies.
Affordability.		Monitoring the effect of HWF on cost.
Effectiveness.		Monitoring the effectiveness of HWF.
Education to meet Healthcare needs.		Monitoring HWF workload.
Quality of work/private balance.		Evaluate potential new strategies.

In order to become to a shared and common declination of a MDS, it was proposed to the attendees an optional definition of "minimal", then it was proposed to challenge it and, finally, it was request to populate the choose option.
Here the optional definition for "minimal", described from a "release management" point of view:

Version	What
MDS 1a	Today, focus on a subset of the principles and targets listed yesterday that, within the priority one items, are the very obvious and feasible. Delivery: Minimal Data Set Month 7
MDS 1b	During the Joint Action, focus on an additional subset of the principles and targets listed yesterday taking main number of priority one items on board. Delivery: Together with the handbook on methodology Month 18
MDS 2	Together with WP7, listing the most important proposed enhancement to the methodology and the data set which could be subjects for future actions. Delivery : Within the final recommendation Month 36

Considering a virtual decision making process on a short (1-3 years) and mid-term (4-9 years) the three options could be view as tools useful in different steps:



The scope of stage 1a should be to identify the major problems and gather the data to face those problems. Tomoko Ono specified: "to assess the current situation".

The scope of stage 1b should be to assess the problems identifying the possible solutions (and gather the data to identify those solutions).

The scope of stage 2 should be to draw future scenarios and implement the found solutions (and gather the data to deliver those scenarios to the decision makers who decides on the implementation).

Afterwards, it was requested to the attendees, working in two parallel sessions (same composition of the day before) to split the targets of table into stage 1a, stage 1b and stage 2.

9. Defining the distribution of targets, discuss the proposed split & criteria's

The two parallel sessions were introduced by Michel Van Hoegaerden.
The criteria to define what should be in stage 1a were:

- availability and feasibility of data collection;
- enabling the policy makers to identify the major threats in a "fixed" context.

According to those criteria international reporting requirements are not to take into account in this first stage (out of scope).
What should be in stage 1b:

- not only identifying threats but proposing some strategies on retention, retirement, training, mobility and all the inflow and outflow triggers the decision makers have available.
- What should be in stage 2:
- recommendations and suggestions to the MSs to improve their capacity to build future scenarios.

Michel Van Hoegaerden proposed to the two groups to challenge to following distribution of targets (done accordingly with the above specified criteria).

1a	1b	2
Identify high level shortage* vs. overall evaluation demand of Healthcare	Identify detailed shortage	Impact on scenario like skills transfer.
Monitor overall coverage	Monitor geographical variances of coverage	Impact on scenario on coverage.
…	Identify if in land production meets the needs	Impact on scenario on updating the in land production.
	dentify major costs aspects of HWF	Evaluate effectiveness & cost vs. Results.
	First evaluation on impact of shortages on quality	Balance between primary care & Specialized care.
	…	International migration aspects.

Commento [AMP8]:
From MELANIE BOEKMANN_DE:
Replace Land with „country"

Commento [AMP9]:
From MELANIE BOEKMANN_DE
Replace Land with „country"

***It has been discussed to replace the term shortage with imbalance.**

9.1 Group A

- *Participants: Verdiana Morando, Lucia Ferrara, Pieter-Jan Miermans, Sebas Martin, Leon Van Berkel, Eszter Kovacs, Edmond Girasek, Bartosz Baran, Aleksandra Kotowicz, Ivo Rui Santos, Rade Pribakovic, Cecilia Sironi, Isabella Notarangelo, Patricia Munoz, Anders Haahr, Gabrielle Jacob, Milena Vasic, Zuzana Matlonova, Matt Edwards, Angela Blanco.*
- *Moderator: Ragnar Gullstrand and Lieve Jorens.*

Remarks on 1a:

- What is meant by 'overall coverage': not clear.
- Focus of the planning on health care professionals or on health care in general: different opinions in the group.
- 1a as assessment of current situation is too limited: should include improvement of assessment of current situation AND allow planning in the future.
- What are needs? What is demand? Definitions not clear!!
- 1a can use 'public expenditure' as a reference, most basic inf.

Remarks on 1b

- This should contain geographical variances in HWF coverage.
- 1b should foresee possibilities to look into items such as HWF productivity.

9.2 Group B

- *Participants: Cristina Sabatini, Paolo Michelutti, Nikolina Radeva, Heinz Rothgang, Despena Andrioti, Pilar Carbajo, Reijo Ailasmaa, Edit Eke, Valgerdur Gunnarsdottir, Gustavo Ferreira, Ana Paula Gouveia, Silvia Gomez, Nicolae Jelamschi, Milena Santric Milicevic, Galina Perfilieva, Tomoko Ono, Zoltan Aszalos, John Fellows.*
- *Moderator: Giovanni Leonardi and Achille Iachino.*

On the base of the proposed distribution of targets these are the main opinions:

Zoltan Aszalos: to identify a MDS to assess a shortage or to evaluate the demand is very complex. At least the demand side should put out of the MDS.

Tomoko Ono: it should be better to start assessing the shortage of supply and the approach the demand side because we have to be careful to evaluate the demand; indeed there's difference between health services demand and HWF demand (and surplus or oversupply is about the second), and we have also to be careful to compare population size and health service demand. Take into account all these warnings the „minimum" target might be „to adapt the supply to the variation of the demand".

Heinz Rothgang: it's necessary to have a simple model for the demand. And we can adopt the assumption that there's no imbalance at the moment.

Edit Eke: the minimum target of the MDS should be, first of all, to measure and assess the current workforce.

Nikolina Radeva: the priority is to measure the current workforce.
Milena Santric Milicevic: the MDS should give answers to simple question as „how much resources do we have?"

Ana Paula Gouveia: if the targets is to identify high level of future shortage based on an overall evalutation of the demand of health care, it's important to compare the standard of production between countries with shortage and countries with no shortage.

10. Every group shares the results. Discussion and conclusion

- *Moderator: Michel Van Hoegaerden.*

The results of both workgroups are presented.
Important to note that:

- Only the scope of 1a has been discussed and the scope of 1b will be postponed to a mail survey among the participants.

Both groups in joined assembly agreed that the scope of the 1a priority (scope of the MDS to be delivered in November 2013) will take the following target into account:

- **Target 1.**/ Identify domestic MACRO current and future level demands for health workforce
- **Target 2.**/ Identify current and future supply of health workforce, with a focus on demand of health workforce
- **Target 3.**/ Identify high level imbalance of Health workforce

We also agreed that, even though very important for both group, the target: *Monitor overall coverage has to be postponed to the 1b scope.*

Important

- The WP5 Team has been especially requested to provide in the introductory work of their document a lexicon of the concepts and words used in order to make sure that everybody understood the same concepts.
- The assembly still highlighted the importance of distinguishing between the demand of healthcare and the demand of Health Workforce. This discussion has been added to the scope of the afternoon workshops.

11. Defining the content of the MDS for each profession

➢ *Introduced by Michel Van Hoegaerden.*

The attendees were split up in three groups working on different parts of the MDS:

- Supply side: training and mobility;
- Supply side: current health workforce and outflow;
- Demand side.

A template containing a proposal of measurable items of each own part was distributed to every participant within each group.

Each group had the same mandate, i.e. within the items of the specific part of the meta-model assigned to the group, find an agreement on a MDS for stage 1a (basic) which answers to these targets:

- identify domestic MACRO current and future level demands for health work force;
- identify current and future supply of health work force;
- identify high level imbalance of Health work force.

Commento [AMP10]:
From MSM, MV _RS: Is it high level of imbalance or Macro level imbalance?

11.1 Group 1 - Supply: training and mobility

- *Participants: Lucia Ferrara, Pieter-Jan Miermans, Nikolina Radeva, Pilar Carbajo, Eszter Kovacs, Edit Eke, Valgerdur Gunnarsdottir, Bartosz Baran, Aleksandra Kotowicz, Ivo Rui Santos, Rade Pribakovic, Silvia Gomez, Isabella Notarangelo, Patricia Munoz, Anders Haahr, Gabrielle Jacob, Zuzana Matlonova, Matt Edwards.*
- *Moderators: Giovanni Leonardi and Cristina Sabatini.*

The distributed template was discussed with the following results:

Training:

- changing starting university to Starting education (not only university level);
- considering age and gender in all category of training;
- considering foreign students (UE- non UE);
- observing if the Universities have separate headquarters abroad;
- changing number certified in number licences.

As for professionals with more than one specialization, the group decides to discuss in plenary session whether MDS should consider only the main specialization or all of them and, then, collect individual positions through e-mail.

The same is decided for attriton, since the attrition rate may be calculated knowing the number of intakes and that of graduates. On the other hand, a focus on attrition might provide deeper insights of drop-out causes.

Mobility:

Immigration:

- considering citizenship of immigrant, country of diploma ,age, gender.
- changing number of certifications recognized in number of recognitions (foreign qualifications).

Emigration:

- number of compliance certificates.

Commento [AMP11]:
From PILAR CARBAJO_ES: As for multi-specialization, we believe that the data of MDS most interesting is the specialty practiced, not the number of specialties that has a professional. However, we consider very important to analyze the causes of multi-specialization beyond the MDS (in second time)

Commento [AMP12]:
From AANDERS HAAR_DK: My suggestion would be to only consider the latest achieved speciality.

A doctor with more than one speiclaity is most likely to primarily work in one of the fields.

Commento [AMP13]:
From PILAR CARBAJO_ES: It is more important to consider the causes of attrition that their absolute number, so it would not be included in MDS. For us it is important to know the causes of attrition in basic training and too in specialized training

11.2 Group 2 - Supply: retirement, retention and stock

- *Participants: Reijo Ailasmaa, Edmond Girasek, Gustavo Ferreira, Cecilia Sironi, Nicolae Jelamschi, Galina Perfilieva*
- *Moderators: Ragnar Gullstrand and Paolo Michelutti.*

Ragnar Gullstrand opened the session remembering the task of the group. Then, every participants started from the items present in the template[3] and proposed which of those items (or other items not present but considered important) were more significant on the base of the MDS targets (they also express the reasons of their choice and any useful comments).

These are the main remarks concerning the "current health workforce items":

- Number of health workers: it's important to measure the full capacity but it's not easy to collect, because you can measure headcounts or Full Time Equivalent; if's decided for FTE, it is measurable counting the part time hours or estimating the FTE (better the second if we take into account also private sector). This issue is linked with job retention and gender of health workers.
- Sector of work – hospital/not hospital: that's an important issue for assessing the current situation (and monitoring the transition from an hospital-based health system to a primary-based health system) but not to estimate the future situation.
- Age structure of health workers: to gather the year of birth is better than measure 5-years intervals. This issue is linked to retirement (estimation of retirement percentage).
- Sector of employment
  - Public/Private: it's important to measure both sector, not so important to distinguish between the two.
  - Non health sector: for example government, university, research institutes, etc. It's difficult to measure it. Not for a MDS.
  - Unemployment: it's important to estimate oversupply, ~~especially for nurses sector~~, not for physicians, but it's difficult to measure it.
- Gender: important to measure it (linked to retirement, retention, FTE).
- Place of work: it's important to manage the network of services (to guarantee the equity in a specific area). Depending on the Country, it should be necessary to measure different levels (National, regional, sub-regional, etc.). To manage maldistribution it could be better to measure urban/rural (it depends on the detail of the geographic measurement).
- Specialization: important for physicians.

These are the main remarks concerning the "outflow" (emigration was not taken in consideration because it was treated in the sub-group 1):

- Retirement: one of the most important outflow items (but it's related to retention).

Commento [AMP14]:
From PAUL DE REAVE_EFN doesn't see the relevance of including a reference to nurses oversupply when the general trend is a nurse shortage.

FROM LEON BERKEL_NL: The Netherlands does see the relevance. The coming 3-5 years there might be an oversupply of some type of nurses.

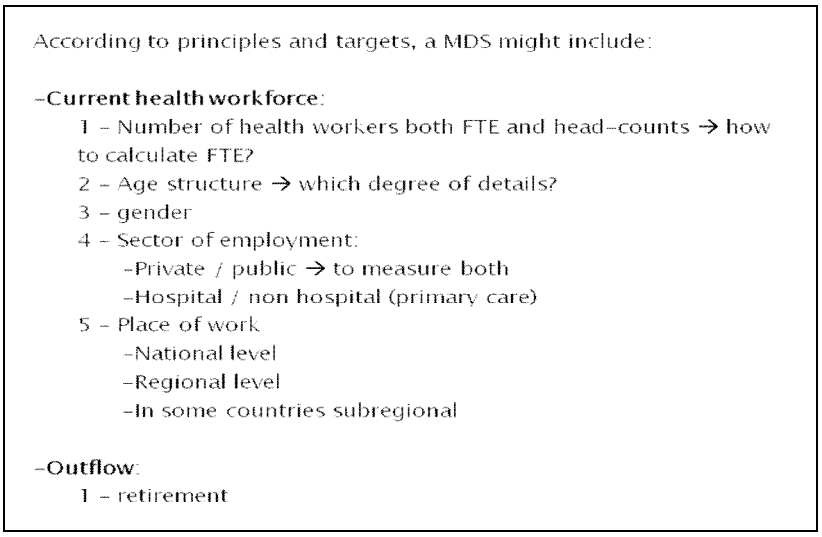
[3] The items were "current health workforce" (i.e. part time / full time, hospital / non hospital, vertical substitution, age structure, public / private sector, geographical level, urban / rural, non health sector and unemployment) , "outflow" (i.e. retirement, death in service, inability, family care) and "retention".

- Death in service / inability: not so important to measure 'cause of the low numbers.
- Other (for example family care): it could be important for nurses (linked to retention).

These are the main remarks concerning the "job retention": it could be important as trigger once the problems are assessed. Not so important to identify and analyze the current situation (low numbers, and it's also hard to define and to collect data).

Subsequently each member was asked to give a priority of the chosen items by assigning degree 1 (high), 2 or 3 (low).

The final result of the discussion is shown in the picture below:



At the end the group identified 5 items on "current health workforce" and 1 item on "outflow" as part of MDS for stage 1a.

11.3 Group 3 - Demand

- *Participants: Verdiana Morando, Heinz Rothgang, Despena Andrioti, Sebas Martin, Leon Van Berkel, Ana Paula Gouveia, Milena Santric Milicevic, Milena Vasic, Tomoko Ono, Zoltan Aszalos, John Fellows, Angela Blanco.*
- *Moderators: Lieve Jorens and Achille Iachino.*

Central idea behind the demand-model proposed: for a basic model, you have all the data you need for the demand side within the demographic data of the country. Every country has this information. There is no need to collect information on health care services.

On which professions is the model applicable: in principle, the model can be used by all professions, by just using other data and other categories. The WG proposes however to start at a Macro level and to break down into different professions, different specializations, … once the Macro level is done.

Commento [AMP15]:
From MELANIE BOEKMANN_DE: Would it be helpful for future reference to specify what the macro level entails exactly?

We know some population groups use more resources for health services than others. For simplicity, we will base it on age and disaggregate into three groups: children, adult, and elderly.

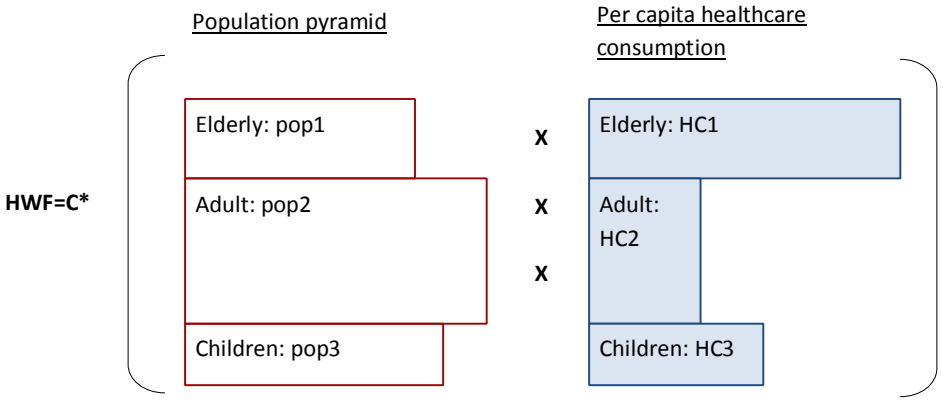
- Number of people in each age group is: pop1 (elderly), pop2 (adult) and pop3 (children)
- Per capita healthcare consumption of each age group is : HC1 (elderly), HC2 (adult) and HC3 (children).
- Total number of health workforce demand: HWF
- C is a conversion factor from the total amount of healthcare consumption of population to demand for health workforce

$$HWF = C*(HC1*pop1 + HC2*pop2 + HC3*pop3)$$

We estimate C based on current number of health workforce, population, and health care consumption for each age group. Assuming C, HC1, HC2, and HC3 remain constant over time, change in health workforce demand is

Commento [AMP16]:
From PILAR CARBAJO_ES proposes to include an explanation: *"HC (health care consumption) is not constant over time, and that is why we called this as assumption."*

$$\Delta HWF=C*(HC1*\Delta pop1 + HC2*\Delta pop2 + HC3*\Delta pop3)$$



12.Sharing the results and closure

The results of the three groups are presented in the last plenary session but not discussed due to lack of time. Giovanni Leonardi closed the workshop remembering that the minutes of the workshop will be sent to the participants to ask their checks and additions.

Based on the final minutes, the WP5 will wrote a report that will be circulated among the partners by the end of October, thus starting the final discussion on the MDS. The contents so agreed will be reported on the final Deliverable #D.051 to be ready by the end of November 2013.

12.1 List of decision taken

Here you can find a final summary list of the decisions taken.

1) To split MDS in three stages:

Stage	What
1a	Focus on a subset of the principles and targets listed by the WP5 partners that, within the priority one items, are the very obvious and feasible. Delivery: Minimal Data Set Month 7
1b	During the Joint Action, focus on an additional subset of the principles and targets listed by the WP5 partners taking main number of priority one items on board. Delivery: Together with the handbook on methodology Month 18
2	Together with WP7, listing the most important proposed enhancement to the methodology and the data set which could be subjects for future actions. Delivery : Within the final recommendation Month 36

2) To characterize the 3 stages with the following scopes:

Stage	What
1a	The scope of stage 1a should be to identify the major problems and gather the data to face those problems (to assess the current situation).
1b	The scope of stage 1b should be to assess the problems identifying the possible solutions (and gather the data to identify those solutions).
2	The scope of stage 2 should be to draw future scenarios and implement the found solutions (and gather the data to deliver those scenarios to the decision makers who decides on the implementation).

3) To detail the 1a scope into these three targets:

Stage	Targets
# 1a	1 Identify domestic MACRO current and future level demands for health work force.
	2 identify current and future supply of health work force.
	3 Identify high level imbalance of Health work force.

4) To populate, in the first instance, the 1a MDS with the following items:

Category	Sub-category	Item	
Supply	Training. §11.1 (starting from the distributed template)	Changing starting university in Starting education (not only university level).	
		Age and gender in all category of training.	
		Foreign students (UE- non UE).	
		if Universities have separate headquarters abroad.	
		Changing n# certified in n# licences.	
	Mobility. §11.1 (starting from the distributed template)	*Immigration*	Citizenship of immigrant, country of diploma, age, gender.
			Changing number of certifications recognized in nunmber of recognitions (foreign qualifications).
		Emigration	Number of compliance certificates.
	Current labour force. §11.2	Number of health workers	
		Sector of work – hospital/not hospital	
		Age structure of health workers (linked to estimation of retirement %).	
		Sector of employment	Public/Private.
			Non health sector.
			Unemployment.
		Gender (linked to retirement, retention, FTE).	
		Place of work (to guarantee the equity in a specific area).	
		Specialization.	
	Outflow §11.2	Retirement (related to retention).	
		Death in service / inability	
		Other (for example family care, linked to retention).	
Category	**Sub-category**	**Item**	
Demand	Population size. §11.3	Population size per age group.	

12.2 To do list

Planning for next actions.

WP5 Activities to do in Oct/Nov 2013			
WHAT	**FROM WHO**	**TO WHO**	**WHEN**
Milan minutes - mailing	Italy	Workshop participants	4th Oct.
Milan minutes - comments	Workshop participants	Italy	Until 14th Oct.
Milan minutes - final	Italy	Workshop participants and WP1	Until 21th Oct.
Deliverable #D.051 - in draft	Italy	WP5 partners	Until 30th Oct.
Deliverable #D.051 - agreement	WP5 partners	Italy	Until 15th Nov.
Deliverable #D.051 - translation	Italy	Translator	Until 25th Nov.
Deliverable #D.051 - delivery	Italy	WP1	30th Nov.

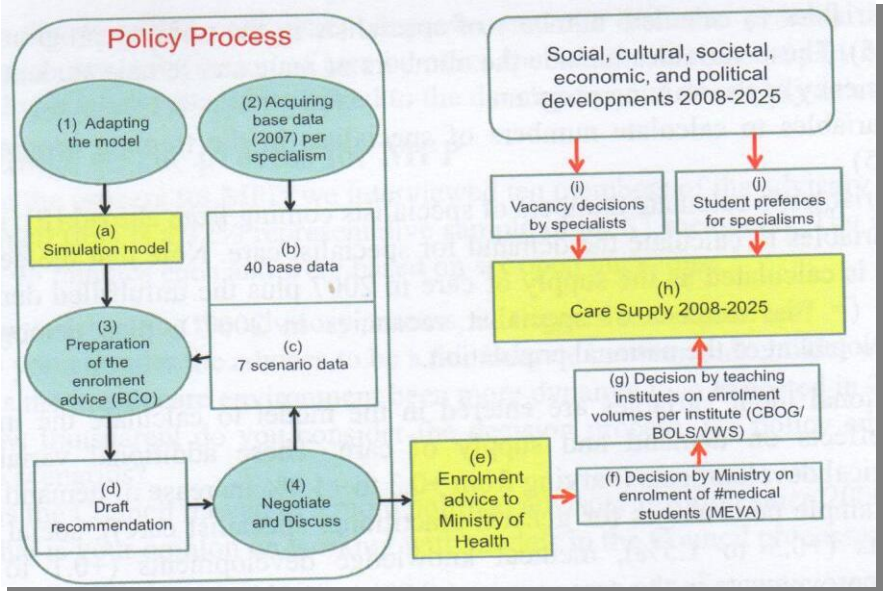
13.Appendix 1 - List of participants, in country alphabetical order

COUNTRY	ORGANISATION	NAME SURNAME	ROLE
Belgium	Federal Public Service Health, Food Chain Safety and Environment	Michel Van Hoegaerden	Program Manager
		Lieve Jorens	WP1 Leader
		Pieter-Jan Miermans	WP5 Associated Partner
Bulgaria	Medical University of Varna	Nikolina Radeva	WP5 Associated Partner
Denmark	Danish Health and Medicines Authority	Anders Haahr	WP5 Collaborating Partner
Europe	EU Federation of Nurses Associations	Silvia Gomez	WP5 Associated Partner
		Cecilia Sironi	WP5 Associated Partner
Europe	EU Hospital and Healthcare Federation	Isabella Notarangelo	WP5 Associated Partner
Europe	Pharmaceutical Group of the EU Union	Patricia Munoz	WP5 Associated Partner
Europe	WHO, Regional Office for Europe	Galina Perfilieva	WP5 Collaborating Partner
Europe	OECD	Tomoko Ono	WP5 Collaborating Partner
Europe	European Commission	Angela Blanco	EC Representative
Finland	Ministry of Social Affairs and Health	Reijo Ailasmaa	WP5 Associated Partner
Germany	University of Bremen	Heinz Rothgang	WP5 Associated Partner
Greece	National School of Public Health	Despena Andrioti	WP5 Associated Partner
Hungary	Semmelweis University	Eszter Kovacs	WP5 Associated Partner
		Edit Eke	WP5 Associated Partner
		Edmond Girasek	WP5 Associated Partner
		Zoltan Aszalos	WP4 Leader
Iceland	Ministry of Health and Welfare	Valgerdur Gunnarsdottir	WP5 Associated Partner
Ireland	Ministry of Health	Gabrielle Jacob	WP5 Collaborating Partner
Italy	Ministry of Health	Giovanni Leonardi	WP5 Leader
		Annalisa Malgieri	WP5 Team
		Cristina Sabatini	WP5 Team
Italy	National Agency for Regional Healthcare	Achille Iachino	WP5 Team
		Paolo Michelutti	WP5 Team
		Ragnar Gullstrand	WP5 Team
		Anna Maria Pacini	WP5 Team
Italy	Eupolis Lombardy	Verdiana Morando	Venue guest
		Lucia Ferrara	Venue guest
Moldova	Ministry of Health	Nicolae Jelamschi	WP5 Collaborating Partner
Netherlands	Ministry of Health	Leon Van Berkel	WP5 Associated Partner
Poland	Ministry of Health	Bartosz Baran	WP5 Associated Partner
		Aleksandra Kotowicz	WP5 Associated Partner
Portugal	Central Administration of the Health System	Ivo Rui Santos	WP5 Associated Partner
		Gustavo Ferreira	WP5 Associated Partner
		Ana Paula Gouveia	WP5 Associated Partner

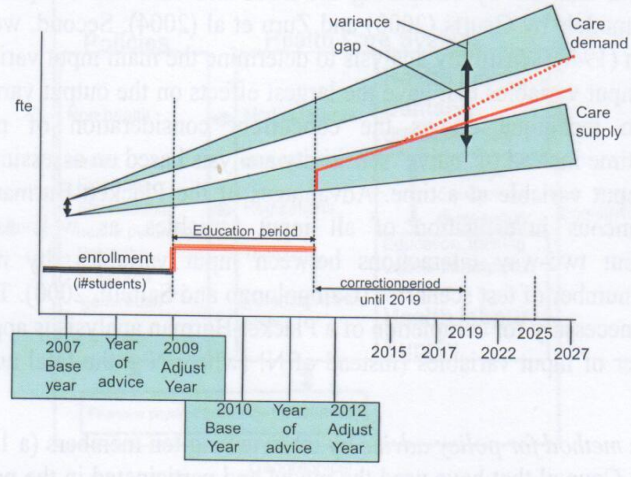
Serbia	University of Belgrade	Milena Santric Milicevic	WP5 Collaborating Partner
	Institute of Public Health of Serbia	Milena Vasic	WP5 Collaborating Partner
Slovakia	Ministry of Health	Zuzana Matlonova	WP2 Leader
Slovenia	National Institute of Public Health	Rade Pribakovic	WP5 Associated Partner
Spain	Ministry of Health	Pilar Carbajo	WP5 Associated Partner
		Sebas Martin	WP5 Associated Partner
United Kindom	Centre for Workforce Intelligence	Matt Edwards	WP6 Leader
		John Fellows	WP6 team

14. Appendix 2 - Some elements of the Dutch model for Physicians

The process



incremental policy advices for required enrolment figures, if the new data indicate different long-term developments.



Input variables (summary) (27)

1. Supply of professionals in base year (8 variables).
2. Number of specialists in training programs period 2007-2015 (5 variables).
3. Number of specialists in training program after 2015 (4 variables).
4. Number of specialists from abroad - EU (3 variables).
5. Demand for specialist care (2 variables).
6. Additional input variables for additional effects on demand and supply of care (7 variables).

Input variables (detail)

1. Supply of professionals in base year (8 variables)
   - Number of professionals baseline year (registrations).
   - Gender frequencies (registrations).
   - % FTE per professional baseline year per gender (surveys).
   - % FTE per professional future years per gender (expert estimations).
   - % retirement per period (medical registration and others).
   - Age groups (registration).

2. Number of specialists in training programs for a period of 8 years (5 variables)
   - Number in training (information from training).
   - Gender frequencies (information from training).
   - Duration of training (information from training).
   - Yield of training (information from training).
3. Number of specialists in training program after the preceding period (4 variables)

4. Number of specialists from abroad - EU (3 variables)
   - • Annual immigration (medical registration and expert estimation).
   - • Gender frequencies (medical registration and expert estimation).
   - • Yield immigration (different sources).

5. Demand for specialist care (2 variables)
   - Unmet demand base year (expert estimations).
   - Demographical development of the national population (projections).

6. Additional input variables for additional effects on demand and supply of care (7 variables)
   - Epidemiological developments (+0,3% to +1,3% per year of demand) - expert estimations.
   - Social cultural developments (+0,5% to 1,5% per year of demand) - expert estimations.
   - Medical knowledge developments (+0,1% to 1,1% per year of supply) - expert estimations.
   - Efficiency improvements in the care process (-0,2% to 1,2% per year of demand) - expert estimations.
   - Vertical substitution of care (-0,5% to -1,5% per year of demand) i.e. substitution by nurses - expert estimations.

- Horizontal substitution by other specialists (-0,6% to +0,4% per year) of supply - expert estimations.
- Increase of part-time factor (-0% to -1,0% per year) of supply - expert estimations.

Sources of data

- Registration of professionals.
- Surveys.
- Expert estimation.
- Empirical data if available.

Targets

Target	Why
1.Main task is to advise the Ministry about the required enrolement of students in the basic medical training and in the postgraduate medical specialist educational programs to balance future demand and supply of specialist care.	Increase of medical specialists with differences between the specialities.

Users of the results of the process

1. Medical specialist representatives (lower amount than the Health insurance but enough young specialists to take over the practices)
2. Health insurance company representatives (high amount of doctors as competition can increase quality of care and decrease prices, but consider also unwanted effects of supplier induced demand)
3. University training programs (stable student groups because teaching capacity is difficult to adjust).
4. The Ministry of Health.

Disaggregation Physicians

1. Primary care (3)
2. Hospital care (incl ambulatorial care) (27)
3. Public/ occupational care (10)
4. Profiled physicians (7)
5. Dental care (4)
6. Beta-professions (3)

List of Specialization (Physicians)

Primary care	**12.006**	
- General practitioners	10.371	pediatricians?
- Physicians for elderly	1.443	
- Physicians for mentally disabled	192	
Hospital care (incl. ambulatorial care)	**17.350**	
- Anesthesiology	1.445	
- Cardiology	850	
- Cardio-thoracic surgery	120	
- Dermatology	430	
- Surgery	1.100	
- Internal medicine	1.780	
- Ear Nose Throat medicine	440	
- Pediatrics	1.270	
- Clinical Genetics	100	
- Clinical Geriatrics	170	
- Pulmonary diseases	490	
- Gastroenterology	320	
- Medical microbiology	225	
- Neurosurgery	125	
- Neurology	785	
- Nuclear medicine	135	
- Obstetrics/ gynaecology	900	
- Ophtalmology	600	
- Orthopedics	590	
- Pathology	355	
- Reconstructive surgery	235	
- Psychiatry	2.700	
- Radiology	940	
- Radiotherapy	230	
- Reumatology	235	
- Revalidation medicine	430	
- Urology	350	
Public/ occupational care	**3.815**	
- Occupational medicine	1.968	
- Insurance medicine	933	
- Public Health	218	
- PH +profile juvenile medicine	346	
- PH + profile infectious disease	60	
- PH + Profile Tuberculosis	17	
- PH + Profile Policy	140	
-PH + Profile forensic medicine	96	
- PH + Profile environmental medicine	14	
- PH + Profile social services	23	
Profiled physicians	**612**	
- Profile juvenile medicine	431	
- Profile infectious disease	13	
- Profile Tuberculosis	2	
- Profile Policy	35	
- Profile forensic medicine	91	

Funded by the Health Programme of the European Union

- Profile environmental medicine	0
- Profile social services	40
Dental care	**11.813**
- oropharingeal surgeons	233
- Orthodontics	275
- Dentists	8.880
- Dental hygienists	2.425
Beta-professions	**925**
- Clinical chemistry	260
- Clinical Physics	285
- Hospital Pharmacy	380

Disaggregation Geographical dimensions: Country

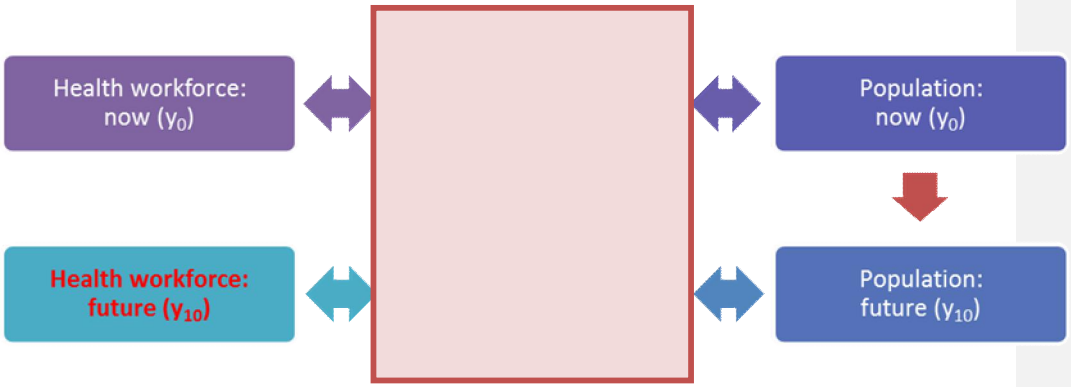
Disaggregation: Sector of employment,

No difference between public and private sector. Total figures for all sectors.

15. Appendix 3 – Group 3 - Tomoko Ono in-depth analysis on Demand Model

Here you can find an in-depth analysis on demand model made by Tomoko Ono – OECD

Proposal for demand model is to build a simple model with several fundamental building blocks and to outline the assumptions, so that the model can be developed further depending on data availability and need in each country. The final objective of forecasting is to estimate the future demand of health workforce.



The growth of demand will be estimated based on the demographic change. It will be assumed that the service provision does not change over time and the needed growth/reduction in health workforce is equal to the growth in demand based on population demographics.

Taking into account aging of population

We know some population groups use more resources for health services than others. For simplicity, we will base it on age and disaggregate into three groups: children, adult, and elderly.

- Number of people in each age group is: pop1 (elderly), pop2 (adult) and pop3 (children)
- Per capita healthcare consumption of each age group is : HC1 (elderly), HC2 (adult) and HC3 (children).
- Total number of health workforce demand: HWF
- C is a conversion factor from the total amount of healthcare consumption of population to demand for health workforce

$$HWF = C*(HC1*pop1 + HC2*pop2 + HC3*pop3)$$

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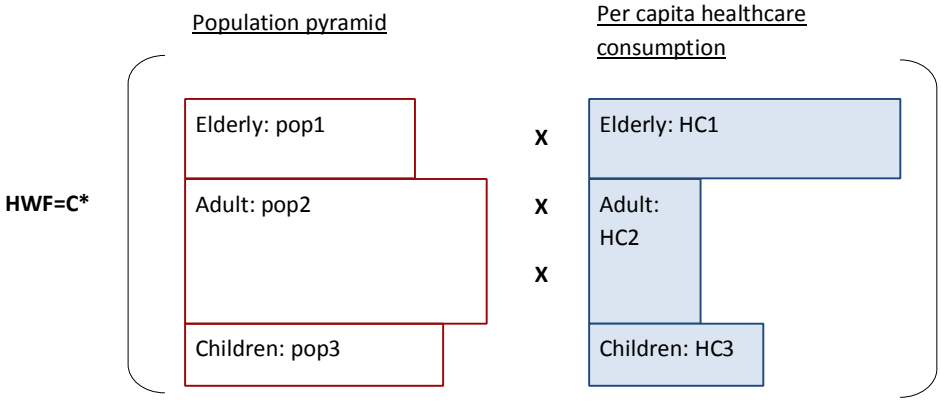
We estimate C based on current number of health workforce, population, and health care consumption for each age group. Assuming C, HC1, HC2, and HC3 remain constant over time, change in health workforce demand is

ΔHWF=C*(HC1*Δpop1 + HC2*Δpop2 + HC3*Δpop3)



Data we need for this basic model

- Population estimates and its projection by age (all country have this info)
- Per capita health consumption by age group, for example
  - Health expenditure by age (EC have this info)
  - The ratio can be adjusted for different professional groups using other utilization

data; for example, number of prescription dispensed for pharmacists, number of delivery for midwives.

- Some specialists which serve certain segment of population (pediatrics, OBGYN, geriatrics) can be estimated simply based on population growth.
- Assumptions (that we can choose to relax for 1b and 2)
- Health consumption per capita for each age group remain constant (no compression or expansion of morbidity)
- Health service remain as it is: no change in productivity, technology
- The roles or the scope of practice for each profession remain unchanged (no interaction between 5 different professional groups)
- Current shortage gap between supply and demand
- [Please list more…]

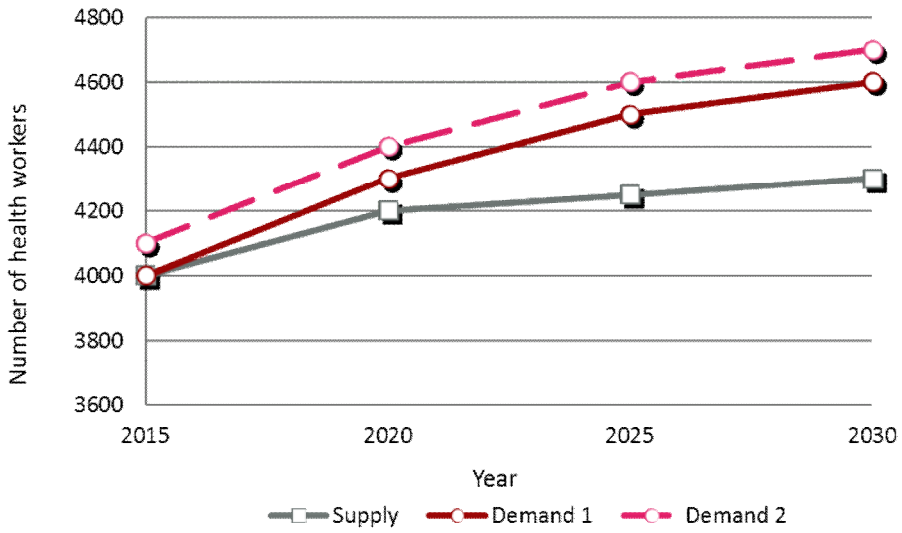
How to include current gap between supply and demand in the projection model

Measuring the exact magnitude of shortages can be difficult and we have no consolidate way to measure the shortage at the moment. Some uses the size of vacancy, survey of employers (Japan), or Delphi methods to consider multiple indicators.

Whatever the indicators and methods used to estimate the size of current shortage, it is easily integrated in the model discussed above. The proposed model allows calculations of additional health workforce needed, in order to provide services to **additional** demand due to changes in population structure. We just need to include that current shortage in the equation above as follows;

Future shortage = Current shortage + ΔHWF

Graphically, if we assume there is a balance between the supply and demand now (year 2015 in graph), the future shortage is the gap between projected supply (grey) and projected demand (red, demand 1). If we incorporate the current shortage (demand>supply in 2015) of 100 health workers (pink, demand 2), the growth of demand between 2015 and 2030 does not change, but simply the magnitude of shortage is larger by 100 health workers.



Other changes in assumption

- Simplification of the model: If we assume HC1=HC2=HC3=1 (every single individual demand the same level of health care consumption), then we have a model that estimate the demand simply by the changes in population size; a commonly known as a constant health workers to population ratio approach.
- Extension of the model:
  - Expansion and compression of mobility can be integrated in to the model by shifting the per capita health care consumption for elderly up/down
  - Productivity improvement: reduce C by x% (you need less health workforce per the total health consumption).