Health workforce wages

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This desk-search study intends to be informative for purpose of health workforce planning and forecasting and illustrative by drawing on experiences from countries with developing and developed market economies countries. Five lines of the presented paper are not meant to be exhaustive. The paper starts with description of the usual role of wages in policy actions to balance the supply and demand for health care workers. The following part of the text explores the effect of wages in the dynamics of health workers labour market. In view of that, expected wage effects on labour market supply side were discussed. Than, in the focus were wage effects on labour market supply side encompassed with some countries' experiences. Finally, the paper moves to explore the potential of using wages in models for health workforce planning and forecasting, by drawing on mechanisms to overcome obstacles related to quality of health workforce expenditures data and it concludes with brief descriptions of several models for health workforce planning and forecasting.

"Inclusion of wages as a variable may affect the future supply and demand for health workers"

Ono T, Lafortune G, Schoenstein M, 2013

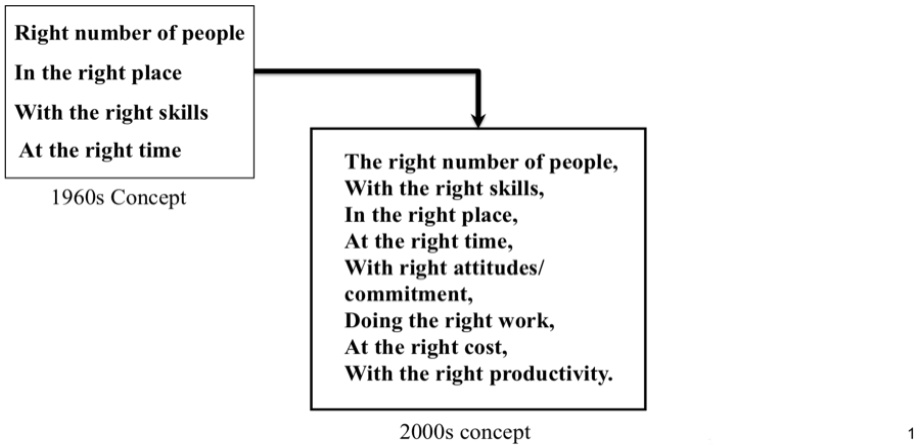
Among global factors in the last three decades, macroeconomic problems and crises have been important causes of public health sector reform usually by imposing fiscal and structural stabilization measures.

In such situation, financial decisions taken at health sector level (or and other sectors policy) are manifested in changes of working conditions (i.e. decreasing salary and benefits, altering the career prospects, extend of retirement age, changed workload, capital investments and other medical resourcing) [1]. In turn, those financial modifications determine the dynamic of components of health worker labour market including fluctuations of the total workforce stock and flow, skills-mix and distribution, labour relations, motivation and productivity. Those changes variously affect performance dimensions of health system -

equity of access to services, service effectiveness, efficiency and responsiveness; and capacity of financial protection against the impoverishing effects of ill health [1].

Accordingly, for all health care stakeholders the central issue is how to reduce cost of the health workforce, which generally consumes 60-80% of the annual health expenditure in the large majority of country health systems, while maintaining or improving both the quality of service and the development of the service itself. In case of financial interventions, imbalances in supply and demand for health care workers characterize health worker labour market, such as surpluses or shortages. As a response in some countries, the health workforce planning process moved away from traditional health workforce planning with limited attention to costs or efficiency, to strategic one in which staff numbers, mix and deployment are the central focus (Diagram 1).

Diagram 1- Changing concepts of HRH planning



Source: Hornby P, Santric Milicevic M. Human resources in health planning. In: Basics of health care system management. Health management guides, readings and references. Training in Health Service management in Serbia Belgrade: Ministry of Health of the Republic of Serbia, 2011; p.109-127.

Effects of health workforce surpluses and shortages are not possible to be solved neither by sole year-to-year planning nor isolated health workforce supply- nor by demand side measures. What has become clear is that disorders in supply, demand and mobility of health workers have to be addressed in a comprehensive approach that includes both strategic and tactic actions. For example, health workforce surplus because of decreased demand for

health workforce (due to economic measures to control health expenditure growth) are commonly addressed in tactic mode by downsizing, hiring freeze, pay-freeze or/and reduction and demotions, and strategically by early retirement, re-profiling, work sharing, and private sector and migration encouragement.

However, health workforce surplus, because of overproduction (manifested usually in unemployment), can be addressed tactically by extension of service packages or retirement age, and strategically by raising the criteria for training enrolments, reducing training capacities and increasing qualification standards. If not monitored and controlled, after a certain period the effects of those measures may turn the surplus into shortage of health workers. Shortage of health workers because of failure at the supply or demand side of labour market is usually addressed by short- or long term actions such as the following: turnover reductions; increase in the remuneration/benefits; hiring temporary employees and retrained transfers; enhancement of workers internal mobility; recruitments and outsourcing; overtime work; reduction of service packages; improvement of reputation and increase of training capacities including institutions, quotas and access to education.

Again, if not planned and evaluated, measures to resolve health workforce shortages can turn into surplus after a while, and may produce shortage in less advantageous work environment (manifested in rural and remote areas to urban moves, public sector to private outflows, primary to hospital care transfer). In addition, it can also distort health worker choice for profession and career (by going for higher wages and greater prestige i.e. generalists versus specialist occupation).

Strategic health workforce planning and projections has a purpose to rationalize abovementioned health workforce policy options recommended to match expected health workforce supply and requirements with regard to financial feasibility and the overall health plans. It assumes benchmarks to determine the relative success of any policy measure aimed at addressing a projected shortage or surplus at health workforce labour market.

"*The role of wages in determining the supply and demand of workers in the health sector'*

Ono T, Lafortune G, Schoenstein M, 2013

In economic theory, health care labour market equilibrium occurs when demand and supply for health workers are equal [2]. Demand for health workers derives from the demand

for health services (a proxy measure of health needs), while the health workforce supply side is linked to the market for health workers training. That equilibrium in health system means at least determining and assuring the provision of right skill-mix of health workers with available financial resources (see Diagram 1). Number of factors may (de)stabilize the balance between needs, demand and supply of health workers and skills. For instance, demand for health workers tends to increase as populations and economies growth, as levels of urbanization, private and population mobility increase, with investment in health facilities and in new health technologies, with unexpected environmental and epidemiological emergencies and growth of private health care sector.

Changes in wages and vacancies are key indicators in health worker labour market [2]. In general, their increase indicates a shortage, and *vice versa*, when their decrease indicates a surplus of health workers. In case of health workforce surplus, reductions in wage rates are not always easy to implement, in particular if they were already low, because of workforce resistance (protest of Bulgarian emergency units staff described in reference 1). Instead, the response may be to evade or delay wage payments, and by that, encouraging private or other sectors to compete for health workers. In case of health workers shortages, if wages are not permitted to increase enough to remove them, then the vacancies are the result of low wages rather than of a health workforce shortage.

A labour market approach defines how many workers are employed and at what wage level. Mathematically, an overall measure of the responsiveness of the labour market to changes in wages is the *wage elasticity of health worker employment* - E. It points to the needed percentage increase of wages to increase worker employment by a certain percentage. (E= % change in employment / % change in wages). The E equals 1 when percentage change in employment generate adequate percentage change of wages. Elasticity below 1 is pointing at wage per cent increase insufficient to yield required health workforce employment. Based on a health service demand analysis, one might observe how much of a wage increase is required to generate the necessary number of health workers at the market in order to satisfy health care requirements.

When health labour markets do not follow labour market forces, they are at risk to fail [2]. Often, it is the case when government regulates or small number of employers dominate the health workforce labour market, causing the market to behave differently from a competitive market. For instance, in case of health workforce shortage, th increasing wages to address it may have a big effect on overall wage costs, thus, a monopsonistic employer may be reluctant or could take a long time to adjust increase wages to remedy a shortage. For that reason, the

calculation of health workforce demand is not equal to the calculation of health workers based on health needs. A symptom of market failure is the presence of "ghost workers" in public sector. Those low motivated and unproductive workers draw salaries regardless of their attendance and often decide for dual practice. The remedy in this case would be to link health workers remuneration with their productivity, and to tie productivity growth with a wage raise [2].

By understanding the interplay of demand and supply components of labour market, wages potential and of other compensation is recognized to influence on the number and location of health workers deployment; by changing wages and other benefits one also can change the health worker supply and demand across time.

"Wages expected influence on attractiveness of different fields of study and occupations, the choice of practice location, as well as retention rates and retirement patterns"

Ono T, Lafortune G, Schoenstein M, 2013

Wage related payments, such as annual income guarantees, or bonus payments (grants an annual premium fee) are used to compensate for longer working hours or other less advantageous and challenging working conditions in rural and underserved area [3, 4].

They can be set at different points of the career of a health worker in rural postings this areas. The kind of financial incentive (salary, fee-for-service payments, capitation-based payments) and its dynamics depends on the outcome that was meant to be guarantied [4]. For example, it could be for establishment and the first two years of a practice in an underserved region (in France and Denmark), or during the entire career in underserved areas (in Canadian province of British Columbia). Also, it could be at the end of the career to improve health worker retention and to postpone retirement (in Alberta, Canada and in Germany), or to smooth over retirement and replacement.

Financial incentive could be based on a fixed list size of patients and linked with a return-of-service obligation of few years (in Denmark), based on the characteristics of their community (in Canadian province of British Columbia), when they meet certain quality standards (family doctors in the Republic of Moldova), or measures of population deprivation related workload and a rurality index to assign overall weightings to patients (England and Wales) [4, 5].

Monitoring and evaluation of the effect of financial incentives may be difficult for various reasons. Frequent reasons are that instead of on source and one kind of financial incentive there is a package of various incentives, or multiple grants from different sources at the same time, which are making difficult to delineate variety of payment mechanisms across a range of institutional arrangements.

Available evidences report mixed effects of direct financial incentives to practise in rural areas or placing medical graduates in developing and in developed countries, ranging between positive and inconclusive results. For example, in Australia financial incentives succeeded to sustain a 65% retention rate of long-servicing physicians in remote and rural areas five years after financial incentives [6]. Nigerian financial incentives scheme in two years attracted 42- 46% of health workers to rural areas [6]. Some South-eastern Europe countries have also moderately increased the number of general practitioners and nurses in rural or remote areas by offering them financial incentives [5].

Financial incentives besides education, regulation, and personal and professional support are included in WHO Global Policy recommendations evidence-based to be effective in improving attraction, recruitment and retention of health workers in remote and rural areas [5-7]. Its quality is low, but supportive evidence implies for the long-term effects and they have to outweigh the opportunity costs of living in rural areas, and that implies high recurrent costs and combination with other interventions.

Financial incentives are frequently used as a "first-aid" measure to address acute health workers retention in rural regions [1]. They are strongly recommended to be used to increase retention rates and for only short term, but are less effective for recruitment, since staffing levels remained low in these areas across time. Strongly recommended was to provide bundle of retention strategies in order to successfully attract and retain health workers in remote and rural areas [6].

"Wage level can be expected to influence the number and mix of health workers that can be employed under any overall or sector budget constraints".

Ono T, Lafortune G, Schoenstein M, 2013

The level of remuneration and other recurrent costs is important determinant of the number and skill-mix of deployed health workers, particularly in countries that have global

budgets for public spending on health. Particularly in those countries, evidences suggest that crisis-related financial measures led to reduced intake in medical schools numbers and retirement benefits [1]. In addition, some health systems extended retirement age, diminished job and career prospects, which has in turn increased outflow of health workers [1].

For example, in Spain, many physicians opted for early retirement after announced changes in penalties for early retirement, out of which some went to the private sector. Due to salary and promotions freeze and authorized only 50% post-replacement, some evidence pointed to increased emigration of nurses and physicians [1]. In Estonia and Poland, the significant fall of number of health professionals applying for recognition of competence coincided with salary increase and improved working conditions, introduced in the preceding years to decrease move abroad and retain the active workforce in the country [8, 9].

Similarly, Lithuania introduced structural wage increase for medical workers (by 220% in the period of 2006 and 2009) in order to keep medical workers in the system after EU entry in 2004 [10]. However, financial incentives alone were not sufficient to keep health professionals in the domestic market. Ghana retaining system also failed due to introduction of relatively low "bonding schemes" requiring health workers to serve for a number of years after graduation before leaving the Ghana health service, otherwise pay back [10].

"Any current or future gaps (shortages or surpluses) of different categories of health care providers can also be expected to be mitigated through wage adjustments, though these adjustments were almost never taken into account in the models."

Ono T, Lafortune G, Schoenstein M, 2013

All models for health workforce planning and projection require data on health workforce expenditures to make meaningful policy recommendations. Policy questions, feasibility and costs of data collection and processing determine the number and type of these indicators and the level of data disaggregation to be used in the model. A minimum set of indicators for monitoring expenditure on health workers consist of [11]: total and per capita health workforce expenditure, GDP proportion of total expenditure on health, government expenditure on health workforce as a proportion of general government expenditure on health, and government expenditure on health workforce as a proportion of recurrent general government expenditure on health. Besides those data on health workforce expenditures,

models have to use estimations of: economic growth (average predicted annual percentage change in GDP; total public health sector expenditure, public health sector expenditure on personnel/ non-personnel expenditures), projected changes of remuneration and other recurrent costs (salary bands for each type of staff, in the annual real wage costs and other non-wage compensation (health benefits, housing moving expenses, pension, job security) and estimated private sector expenditure in health care and personnel costs, over the planned period.

Data validity directly determines model accuracy and reliability of the workforce requirements and supply projections. Accordingly, due to variety of validity related reasons, data on wages are not often used in health workforce planning. Common reasons to many health systems are: lack of centralized database, boundary problems to distinguish between labour resources and other activities in health care system, partial coverage of costs, inconsistent information across various data sources, differences in methodologies for collecting and processing data; and potential double-counting due to multiple qualifications or job positions.

Since remuneration of workers in the health sector should be linked to their productivity, the latter can be used to indirectly estimate the former. To be precise, health worker productivity is described as the relationship between the input of health workers, such as the number of hours they work, and the health service output (number of patient visits per hour per health worker over a period of a week or a month, days spent in hospital and other encounters. By using "calculation square" [12], total earnings represent annual earning multiplied by number of jobs or, it can be obtained with multiplying of hourly wages and paid hours. To get annual earnings, hourly wages are multiplied by paid hours per job. In addition, paid hours represent the product of number of jobs multiplied by paid hours per job.

The search for data on health workforce expenditures should include multiple sources. To name some: routine administrative records (employment registries), social health insurance records, budgetary records and others earnings statistics, periodic labour force and other household surveys and censuses, professional regulatory bodies, business and facility registries, book keeping records of private facilities; sickness absence and seasonal workers database; published studies, reports and unpublished information from the ministries of health, education and finance. However, in the absence of reliable data, professional judgement and estimates of key stakeholders may be required. WHO has developed some documents to strengthen health information system (A System of Health Accounts, the Guide to producing national health accounts and other) [11].

The process of simulation is the major tool for assessing the potential impact of various changes on future remuneration for health workforce. Deterministic models assume that an outcome is certain while stochastic models allow for the introduction of random changes in variables and reveal the most likely outcomes and the most robust array of inputs. A range of tools and resources exists to assist countries in developing a national health workforce strategic plan [12]. Examples of models that used wages as a variable in health workforce projections are listed briefly in chronological order:

- WHO Simulation models for health workforce planning, developed by Thomas L. Hall in 2001, explores consequences of alternative policies, includes alternative scenarios and sensitivity analysis to compare input costs and output effects and identify those input variables where errors are likely to have greatest impact on outputs. It also uses economic feasibility test to compare projected public sector workforce costs with projected funds to pay workforce salaries, assuming scenario is considered "feasible" if costs are within 20% of available funds [14].
- For most low- and middle-income countries, the WHO workforce projection model is among the most useful tools available for HRH planning and projections with viable policy proposals. It incorporates two validity tests of the projections of the stock of health workers, first against the likely finances available and, second, against the ability of the health and education systems to produce the type and size of the workforce proposed [15].
- Keel University (UK) 1.0 2006 software for health workforce planning is applicable for 400-500 workplaces with option to be electronically linked to WHO HRH Strategic projection model (Box 1 presents example of its application) [15].
- Western Pacific Workforce Projection Tool is a software application designed to facilitate the production of comparative, cadre-specific and summary reports for health workforce projections and cost parameters [13].
- The iHRIS Plan software package is an open source application for human resources information systems strengthening developed by the Capacity Project with financial support from the United States Agency for International Development [13].
- Dewndey model used estimates of national economy forecasts and proportion of government budgets allocated to health and to personnel and annual staff training costs [16].

- The 2012 report from the Centre for Workforce Intelligence (United Kingdom) describes the model that used wages as a variable affecting the future supply and demand for health workers. It identified that different growth rates in public spending on health might influence the future ability to employ doctors in the NHS over the 30 years projection period [17].

All models are consistent in that formal evaluation of accuracy, quality and impact of a health workforce planning model means its actual use, regular review and appropriate adjustments as circumstances require.

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Modeling the health workforce requirements at the national level (Serbia)

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INTRODUCTION

Planning and development of human resources for health (HRH) are important to improve health system performance. The provision of inappropriate health care is possible when health workers issues (i.e. number, skill, place, time, attitude, work, cost and productivity) are "not right" with regard to the dynamic and change of the key contextual factors.

OBJECTIVES

The research objective was to model the health workforce requirements for the public sector of Serbian health system by 2017 with regard to possible objectives of national health plans. Short- and long-term modeling included application of six workforce planning models based on: health workers supply, health service demand, population health needs, benchmarking, the WHO Workforce Planning model and regression analysis with ARIMA/Transfer Function.

MATERIALS and METHODS

Physicians (with and without specialist degree), nurses and midwives (all educational levels and vocation), dentists, and pharmacists employed in the public health care sector of the Republic of Serbia were investigated by age-intervals, sex and workplace.

The cross-sectional analysis of health workers density, distribution and performance was undertaken to understand the shortcomings of the current situation taken as the baseline year (2007) for short (2012) and long-term health workforce modeling (2017). The strategic health workforce modeling included the revision of the previous planning efforts, the analysis of health workers provision patterns (density per 100.000 population, 1961-2007), and the scope of recent effects (1997-2007) of contextual factors (demographic - population growth, sex and age structure; epidemiology - mortality rates; policy - students` enrolment and graduation; social - deployment and unemployment rates, and economical - health expenditures and salaries).

The projections of full-time equivalent (FTE) health workers were tested for the macroeconomic feasibility in three scenarios 2017 (Table 1).

Table 1. Components of the macroeconomic scenarios for testing feasibility of the modeled health workforce requirements for Serbia` public sector 2017

Assumptions (calculated with regard to the source)	Macroeconomic scenario in 2017		
	Baseline	Pessimistic	Optimistic
Average annual % change in GDP (MoF)	3,5%	3,5%	5,5%
% of target year GDP spent on recurrent public sector (MoF)	43,1%	39%	39%
% of target year recurrent health budget spent on personnel (NHA Serbia)	61.2%	60%	65%
% of target year recurrent public sector spent on health (NHA Serbia)	14.1%	13%	13%
Public sector annual rate of change in real incomes	1%	1%	1%
The economic feasibility threshold – aerage annual % change in personnel expeditures (WHO/Keel University 1.0 - 2006)	*3,5%*	*1,4%*	*4,1%*

Data sources were: registrars of the Institute of Public Health of Serbia, the Republic Statistical Office and the National Employment Biro; and documentation of the Ministry of Health, Ministry of Finance and Ministry of Education. Statistical analyses consisted of description (numbers, %, mean, standard deviation, 95% confidence interval, Box-Ljung statistics and MaxAE), and application of Student t-test of related samples, Kolmogorov-Smirnov test, time-series models (two-parameter, Joinpoint analysis, ARIMA, and Transfer Function models) with statistical significance achieved at p<0,05. The WHO/Keel HRH software 1.-2006, Joinpoint Regression Program 3.4 and PASW Statistics 18 were used.

RESULTS

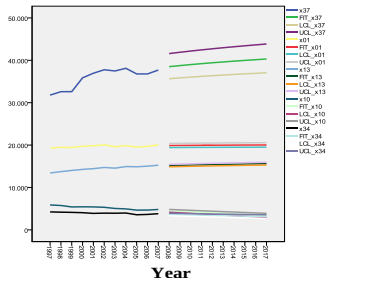
By 2107, the number of dentists, pharmacists, highly educated nurses and midwives in the public sector is decreasing, and on contrary to the number of medical doctors and nurses (Figure 1). Most of the current health cadre in public sector are females (82%) and employed for the lifetime and full-time job (98% FTE health workers).

Instable economy, depopulation, aging and the fact that considerable portion of young adults suffer from chronicle non-communicable diseases, place many serious demands for health care service providers in Serbia.

Health workers (employed and unemployed, public and private sector) were dieing before age of 60 years (92%). In 2007, in 301 health institutions in public sector there were 23% specialists, 21% dentists, 17% medical doctors without specialization, 15% pharmacists 15% and 5% of nurses older 55 years. Annual indicators of productivity levels were low and different across districts and within the same type of health institutions.

During 2000-2007 the average annual rise of the HRH unemployment rate was 2.5%. The highest annual rise had dentists' unemployment rate, 11%, and medical doctors <30 years old, 9.4%. The HRH enrolment rate to publicly funded studies and schools have been decreasing during 1997-2007 (except of pharmacists and midwives). However, the number of graduates has increasing trend by 2017 (except of specialists and nurses) due to prolonged years of schooling and possibility to switch from private to public funded after the first year of studies.

Figure 1. Health workers' obeserved and fitted numbers by 2017 (with coresponding 95% confidence level, upper -UCL and lower -LCL) in the public sector of Serbia



Legend:
Nurses and midwives with secondary education (x37), all medical doctors (x01), medical doctors-specialists (x13), general practitioners (x10) and nurses and midwives with higher education (x34)

In overall, projected health workers requirements (density rates per 100,000 population) for public sector in 2017, and comparing to 2007 year, are:

- Lower by 23% and 24% according to the health services demand model, assuming HRH policy objective to increase health service utilization;
- Lower by 30% and 34% according to the health services demand models, assuming HRH policy objective to increase health workers productivity;
- Higher by 3-25% in respect to the cadre, and according to the health workforce supply model that assumed the baseline flow of staff persistent;
- Higher by 3-72% in respect to the cadre, according to the health workforce supply model that assumed 10% HRH employment increase and 2.5% retirement rate per year;
- Higher by 42% according to the health-needs based model assuming that all females 15+ years in 2017 would be screened for Ca cervix uteri according to the clinical guideline in public primary health centers of Serbia;
- Higher by 11% or 20% if the benchmarks were of Estonian nurses or medical doctors rates per population, respectively;
- To be balanced by 23-29% depending on the particular staff according to the WHO / Keel University Health Workforce Planning model; and
- Higher, if modeled with regression ARIMA /Transfer Function model which utilized, as specific predictors annual data (1997-2007) of: GDP, population number, number of enrolled students at the first year of studies and number of graduated students and pupils in the field of medicine, stomatology and pharmacy, number of health visits per capita, number of hospital beds and discharges. The medical doctors' rate will increase by 26%, nurses' rate by 38%, dentists' rate by 32% while pharmacists rate by 4%.

Model is economically feasible if the projected health workforce requirements are 80-120% in balance with the macroeconomic assumptions (near 100% is best). Five of six health workers' planning models were feasible in three predefined macroeconomic scenarios (Table2). Population health needs- based model for health workers planning requires different financial framework and prioritization.

Table 2. Macroeconomic feasibility of modeled health workforce requirements for public sector of Serbia by 2017

Health workforce planning models for public sector of Serbia		Feasibility ratio by macroeconomic scenario 2017		
		Baseline	Pessimistic	Optimistic
Health workers supply model	Baseline flow of cadre	94%	116%	89%
	10% increased employment rate and 2.5% retirement rate	122%	150%	115%
Population health needs model		170%	208%	160%
Health services demand models	Increased utilization of health services in primary health care	87%	106%	82%
	Increased utilization of hospital health services	85%	105%	80%
	Increased HRH production in primary health care	102%	125%	96%
	Increased HRH production in hospitals	73%	89%	69%
Benchmarking model		100%	122%	94%
WHO/Keel University 1.0 2006 Health Workforce Planning Model		85-94%	105-116%	80-89%
ARIMA – Transfer Function regression model	Projected value	104%	127%	98%
	Lower 95% confidence level	111%	136%	105%
	Upper 95% confidence level	118%	127%	96%

Legend: Green color denotes economically feasibility ratio while red color unattainable modeled health workforce, and blue color denotes that model allow higher salary rise than assumed or incentives.

CONCLUSIONS

The analysis of the key national HRH issues in the past and current situation supported better understanding of the dynamic links between health system' context complexity, and health outcomes improvement. To address possible health care policy objectives, each of the applied health workforce planning models had different objectives, assumptions and therefore have yielded specific health workers projections. As an unpredicted intervention may distort the projections, having multiple combinations of health workers' planning models and economic feasibility tests provide decision makers with relevant information needed for strategic approach in planning and development of health workers.

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ACKNOWLEDGEMENTS

The poster presentation for the ASPHER Young Researchers Forum 2010 is part of the research done for the doctoral dissertation of the author, entitled "Modeling the planning of the health workforce requirements for the public health care sector at the national level" finished at the Belgrade University Faculty of Medicine in 2010. Special gratitude the author express to late Peter Hornby Associate Fellow of the IIHD/Queen Margaret University UK, for the updated version of WHO/Keel 1.0 2006 software for health workforce planning.

Box1. An example of application of the WHO/Keel University 1.0 2006 software for health workforce planning. It is rewarded at ASPHER Young Researchers Forum 2010, 3rd European Public Health Conference (ASPHER-EUPHA) Amsterdam, The Netherlands.