Human Resources for Health

BioMed Central

Research

Open Access

Assessing human resources for health: what can be learned from labour force surveys?

Neeru Gupta[1], Khassoum Diallo[2], Pascal Zurn[3] and Mario R Dal Poz*[4]

Address: [1]Demographer, Department of Health Service Provision, World Health Organization, Geneva, Switzerland, [2]Demographer-statistician, Department of Health Service Provision, World Health Organization, Geneva, Switzerland, [3]Health economist, Department of Health Service Provision, World Health Organization, Geneva, Switzerland and [4]Coordinator, Human Resources for Health, Department of Health Service Provision, World Health Organization, Geneva, Switzerland

Email: Neeru Gupta - guptan@who.int; Khassoum Diallo - diallok@who.int; Pascal Zurn - zurnp@who.int; Mario R Dal Poz* - dalpozm@who.int

* Corresponding author

Published: 22 July 2003

Human Resources for Health 2003, **1**:5

Received: 04 June 2003

Accepted: 22 July 2003

This article is available from: http://www.human-resources-health.com/content/1/1/5

Abstract

Background: Human resources are an essential element of a health system's inputs, and yet there is a huge disparity among countries in how human resource policies and strategies are developed and implemented. The analysis of the impacts of services on population health and well-being attracts more interest than analysis of the situation of the workforce in this area. This article presents an international comparison of the health workforce in terms of skill mix, sociodemographics and other labour force characteristics, in order to establish an evidence base for monitoring and evaluation of human resources for health.

Methods: Profiles of the health workforce are drawn for 18 countries with developed market and transitional economies, using data from labour force and income surveys compiled by the Luxembourg Income Study between 1989 and 1997. Further descriptive analyses of the health workforce are conducted for selected countries for which more detailed occupational information was available.

Results: Considerable cross-national variations were observed in terms of the share of the health workforce in the total labour market, with little discernible pattern by geographical region or type of economy. Increases in the share were found among most countries for which time-trend data were available. Large gender imbalances were often seen in terms of occupational distribution and earnings. In some cases, health professionals, especially physicians, were overrepresented among the foreign-born compared to the total labour force.

Conclusions: While differences across countries in the profile of the health workforce can be linked to the history and role of the health sector, at the same time some common patterns emerge, notably a growing trend of health occupations in the labour market. The evidence also suggests that gender inequity in the workforce remains an important shortcoming of many health systems. Certain unexpected patterns of occupational distribution and educational attainment were found that may be attributable to differences in health care delivery and education systems; however, definitional inconsistencies in the classification of health occupations across surveys were also apparent.

Background

The World Health Organization's *World Health Report 2000* underlined that human resources are "the most important of the health system's inputs" [1]. The health sector is a major employer, and human resources account for a high proportion of national budgets assigned to health [2]. In most countries, wage costs (salaries, bonuses and other payments) are estimated to represent between 65% and 80% of renewable health system expenditures [3,4]. Yet despite the cost of producing and maintaining human resources in the health system and the undoubted importance of human resources to its functions, there is a huge disparity among countries in how human resource policies and strategies are developed and implemented. Major variations occur in the numbers of health care workers per inhabitant and in the skill mix employed.

Several factors play a role in determining the numbers of health care workers and skill mix of a particular health system, including resource availability, regulatory environment, culture and customs. The extent to which any one of these factors influences the typical mix of health care occupations in different countries remains unknown. A recent review of the literature pointed to rapidly growing interest in examining the roles and mix in medical and nursing occupations. In terms of the published literature, few studies were found offering a cross-national perspective [5]. The most frequently used bases for comparing international health care resources are health care expenditures, measured either as a fraction of gross domestic product or on a per capita basis. Assessments of non-monetary resources, such as medical equipment or health personnel, are less widespread; working the latter into international comparisons of health care resources has been taken up only slowly [6].

The availability of quantitative, methodologically sound analyses of the stock and mix of health care occupations across different settings and health systems could be an important catalyst towards better understanding labour issues in health care and identifying appropriate solutions for human resources for health (HRH) planning and management. Despite the importance of an evidence base for policy decisions, information on the health workforce tends to be fragmented, and the sources that can potentially produce statistics relevant to this issue are often underused in health research. Although many general data sources can be exploited as tools for conducting HRH assessments – including population censuses, routine administrative records and sample surveys – their potential for defining the scope of the health system including human resources has generally not been met [7]. For example, censuses can provide valuable information on the occupational distribution and other sociodemographic characteristics of the population of economically active age; however, they tend to contain limited information on other indicators of labour force activities. Administrative records can provide data on licensing and regulations of health occupations in some countries, but often only with emphasis on the public sector. While each type of data source tenders at least some analytical potential, household-based employment and income surveys offer the advantage of providing nationally representative information on many aspects of labour force participation.

This article presents a quantitative comparison of health occupations for 18 countries, drawing on information from labour force and income surveys conducted between 1989 and 1997. The data were obtained from the Luxembourg Income Study (LIS), a compilation of cross-national microdata from representative household surveys [8]. The surveys provided comparable statistics on areas including occupation, income and education. To the extent possible, health occupations were classified according to international standards to enhance comparability. The main objective was to profile the workforce of health practitioners in terms of skill mix, sociodemographics and other characteristics, with an emphasis on differences by country, gender and over time, in order to establish an evidence base for HRH monitoring and evaluation. A secondary objective was to investigate the uses of cross-national survey data for identifying appropriate human resource interventions, as a step towards formulating appropriate health policy options.

Methods

Our data source is the LIS Project, a research and databank project for the compilation of household income and labour force surveys across participating countries in Europe, America, Asia and Oceania. The surveys collect nationally representative information on a range of labour force and sociodemographic indicators, such as occupation, employment status, earnings, industry and educational attainment. With funding mainly provided by the national science and social science research foundations of its member countries, LIS (in conjunction with its companion Luxembourg Employment Study project) compiles microdata sets for sample surveys that have already been collected by the countries' Central Statistical Offices and transforms them to a common variable structure. While the surveys themselves are diverse and the types of data not necessarily uniform in nature, a process of data harmonization is undertaken to enhance comparability for public use [9]. We used information from surveys with occupational data that permitted distinction of health occupations.

Data on health occupations were available for 18 countries with surveys conducted between 1989 and 1997. Twelve of the countries were characterized with developed market economies: Austria, Canada, Denmark, Finland, France, Germany, Netherlands, Norway, Spain, Switzerland, United Kingdom and the United States of America. Six were countries with economies in transition: Czech Republic, Hungary, Poland, Russian Federation, Slovakia and Slovenia. Moreover, for 11 countries two or more surveys were accessible that allowed identification of health occupations, enabling us to conduct time-trend analyses. (The LIS project had compiled surveys for nine other countries that were not used here because the occupational data did not enable differentiation of the health workforce.)

The standardization of classification of health occupations was facilitated through the International Labour Office's latest revision, in 1988, of the International Standard Classification of Occupations (ISCO-88). This internationally comparable classification pools occupational titles into a hierarchical four-digit system, which can be aggregated to progressively broader groups, representing a value set describing the different tasks and duties of jobs [10]. Within ISCO-88, occupations are essentially organized according to two dimensions: skill level and skill specialization [11]. The former refers to the complexity of skills required for the job (but not necessarily the way the skills were acquired). Skill specialization is related more to areas of knowledge required, such as subject matter, services produced or equipment used. Different user areas may have different degrees of interest in the various elements, so classification structures may vary nationally. Many national statistical agencies participating in the LIS project mapped their occupational classifications to ISCO-88 for data dissemination. Otherwise, where possible, the project provided ISCO-88 classification codes by reconciling national classifications through standardized mapping techniques of occupational status scales (for example, techniques cited in [12]).

Among the 10 major ISCO-88 occupational groups, two were of interest here: group 2 "professionals" (generally well-trained workers in jobs that normally require a university or advanced-level degree for recruitment) and group 3 "technicians and associate professionals" (generally requiring skills at a non-university educational qualification level). Identification of the health workforce is possible when the classification is coded to a degree of detail that minimally corresponds to the three-digit level, and preferably to the four-digit level for distinction of practitioner specializations. The professional major group includes physicians, nursing and midwifery professionals and other health professionals, such as dentists, pharmacists and veterinarians (see Table 1). Classified as associate professionals are modern health associate professionals (except in nursing), nursing and midwifery associate professionals and traditional medicine practitioners. The former encompass medical assistants, dental assistants, pharmaceutical assistants, opticians, veterinary assistants, physiotherapists, sanitarians and others. Traditional medicine practitioners include herbalists and faith healers.

We performed basic analyses on characteristics of the health workforce where occupational data were standardized at the three-digit ISCO-88 level or equivalent. Further in-depth analyses were conducted where identification of health occupations was possible at the four-digit ISCO-88 level or equivalent. In either instance, occupational categories were aggregated to reflect national classifications or sample size limitations for some surveys. It should be noted that despite efforts to standardize, the definition of certain categories of health occupations may have varied across surveys; for example, in some cases the classification of nurses and midwives did not distinguish between professionals and associate professionals. The precision of mappings to ISCO-88 would have largely depended on the level of detail in the national classifications. Moreover, while certain related occupations aside from medical and nursing practitioners are identifiable at the four-digit ISCO-88 classification level – in particular, medical equipment operators (code 3133), health and safety inspectors (code 3152), and institution-based personal care workers (code 5132) – they were excluded from the present analysis to maintain comparability with data where the selection of occupations was possible only at the three-digit level or equivalent.

The surveys' sampling designs and sizes were not homogeneous: while most sampling frames drew on stratified random selections of private households, some datasets were based on income tax or other administrative records of government agencies. Although several different data types may have been available in many countries, only selected surveys were retained by the LIS project based in part on comparability of information on income sources or other labour market indicators. Non-response rates, for the entire interview or per item, varied and were treated differently across countries [9]. No attempt was made in the present analysis to further adjust the data for coverage or completeness of information.

To monitor the relative allocation of human resources to the health system, all samples were limited to the population of economically active age (15 years and over) declaring an occupation. The numbers in the samples with health-related occupations ranged from 60 to 12,248 (see Table 2). Our study includes profiles of the health workforce by selected sociodemographic and labour force characteristics, including sex, age, migration status, education,

Table 1: Selected health occupations in the International Standard Classification of Occupations (1988 Revision)

Major group 2: Professionals	
Sub-major group 22: Life sciences and health professionals	
222 Health professionals (except nursing)	
	2221 Medical doctors
	2222–2229 Dentists, veterinarians, pharmacists, health professionals (except nursing) not elsewhere classified
223 Nursing and midwifery professionals	
	2230 Nursing and midwifery professionals
Major group 3: Technicians and associate professionals	
Sub-major group 32: Life sciences and health associate professionals	
322 Modern health associate professionals (except nursing)	
	3221–3229 Medical assistants, sanitarians, dieticians and nutritionists, optometrists and opticians, dental assistants, physiotherapists, veterinary associate professionals, pharmaceutical assistants, modern health associate professionals (except nursing) n.e.c.
323 Nursing and midwifery associate professionals	
	3231–3232 Nursing associate professionals, midwifery associate professionals
324 Traditional medicine practitioners and faith healers	
	3241–3242 Traditional medicine practitioners, faith healers

Source: [10]

income and industry. Such information can offer valuable insight into specific aspects of HRH as an input to assessing health systems performance [7].

Standardization of indicators was ensured to the extent the available data permitted. In terms of migration of health workers, an audit of human resources can show movement between localities (e.g. rural to urban), between sectors (e.g. public to private), or between countries. Relying on information on immigration status available from the LIS datasets, we defined migrants as non-native born. Education was assessed by university-level attainment versus secondary schooling at most, as a gauge of the skill distribution of health care personnel. Depending on the source, this was captured by either the individual's highest level of general education or vocational training, total length of education, or age when the highest level was obtained. The indicator for income – information of value when discussing countries' health care financing options – was measured through either net or gross occupational wages. Workforce industry encapsulated the economic activity of the main job establishment. However, the classification of health services only sometimes distinguished the various health care activities, such as hospitals or practitioners' clinics versus veterinary or pharmaceutical services.

Gender issues were emphasized as being important not only for assessing equity in human resources, but also for health services planning. Studies have shown that increased participation of women in the medical field may be accompanied by differences in working patterns; in particular, female physicians are likely to work fewer hours than their male counterparts [13,14], and to present different styles of care provision that may be reflected in the levels of patient participation [15].

The statistical methods used were primarily descriptive. First we sketched a general profile of the health workforce for 18 countries based on LIS surveys. Next, where data were available, we compared trends over time in the profile of health occupations; in particular, an overview of the share, mix and demographics of health occupations was drawn. We then undertook an in-depth study of the demographic and labour force characteristics for five countries for which time-trend data were available at the four-digit ISCO-88 occupational classification level or equivalent. All results presented here were compiled using remote submission procedures for microdata-processing programmed in the SPSS statistical software package [16], and have been weighted to account for survey sampling designs.

Results and discussion

Share and mix of the health workforce

Of central interest in assessing the production and planning of HRH is the size and composition of the health workforce. As seen in Figure 1, important variations were

Table 2: Sources and sample sizes of health occupations in LIS datasets

Country and year of survey		Survey name/type	Health occupations in sample (aged 15 and over)
Austria	1991	Mikrozensus	885
	1995	Mikrozensus	960
Canada	1994	Survey of consumer finances	3,046
	1997	Labour force survey	3,402
Czech Republic	1994	Vyberoveho setreni pracovnich sil	1,056
Denmark	1992	Income tax survey	627
	1997	Income tax survey	660
Finland	1990	Tyoevoiman vuosihaastattelu sysky	1,134
France	1997	Enquête sur l'emploi	2,774
Germany	1989	Social economic panel study	128
	1994	Social economic panel study	258
Hungary	1991	Household panel	93
	1994	Household panel	60
Netherlands	1991	Socio-economic panel	292
	1994	Socio-economic panel	374
Norway	1990	Arbeidskraftundersokelsen	416
Poland	1994	Stale badanie aktywnosci ekonomicznej ludnosci	819
Russian Federation	1992	Longitudinal monitoring survey	380
	1995	Longitudinal monitoring survey	237
Slovakia	1995	Labour force sample survey	416
Slovenia	1994	Anketa o delovni sili	328
Spain	1990	Expenditure and income survey	817
	1993	Encuesta de poblacion activa	1,513
Switzerland	1992	Income distribution survey	213
	1997	Enquête sur la population active	625
United Kingdom	1991	Family expenditure survey	441
	1997	National labour force survey	4,536
United States	1991	March current population survey	1,165
	1997	Combined current population survey	12,248

Source: Luxembourg Income Study and Luxembourg Employment Study (waves III and IV).

found across countries in the share of health occupations among the total population of economically active age. According to the most recent survey findings, the share ranged between 2.4% of the labour force in Spain and 8.2% in Norway. There was little discernible pattern by geographical region or type of economy. For example, a share of around 5% was found in countries of Western Europe (Austria, Finland), Eastern Europe (Russian Federation) and North America (Canada) alike. While most of the countries with the largest health workforces had developed market economies, the Russian Federation stood out as a country with an economy in transition with a relatively large share (5.3%).

The distribution of the health workforce varied markedly between the selected occupations (Figure 2). Health professionals (except in nursing) accounted for between 8% (Netherlands) and 38% (France) of all health care workers. Again, no immediate cross-national pattern emerged with respect to type of economy; countries with large proportions of health professionals were as likely to have developed economies (France and Spain) as transitional ones (Poland and Russian Federation).

The number of nursing and midwifery professionals reached at least 30% of the health workforce in Austria, Canada, Finland, Norway, Spain and the United States. However, some definitional problems evidently emerged. In Canada, where the proportion was highest (64%), comparability may have been hampered as the national classification of nursing professionals included therapists and other related occupations. There were no cases or only a handful of nursing and midwifery professionals in the samples for the Czech Republic, France, Germany, Hungary, Poland, Slovakia, Slovenia and Switzerland. Conversely, in these same countries, the proportion of associate professionals tended to be relatively higher.

Small numbers of traditional medicine practitioners were found in the Czech Republic and Slovenia (less than 0.5%), both countries with economies in transition. Some cross-national variations in the occupational distribution

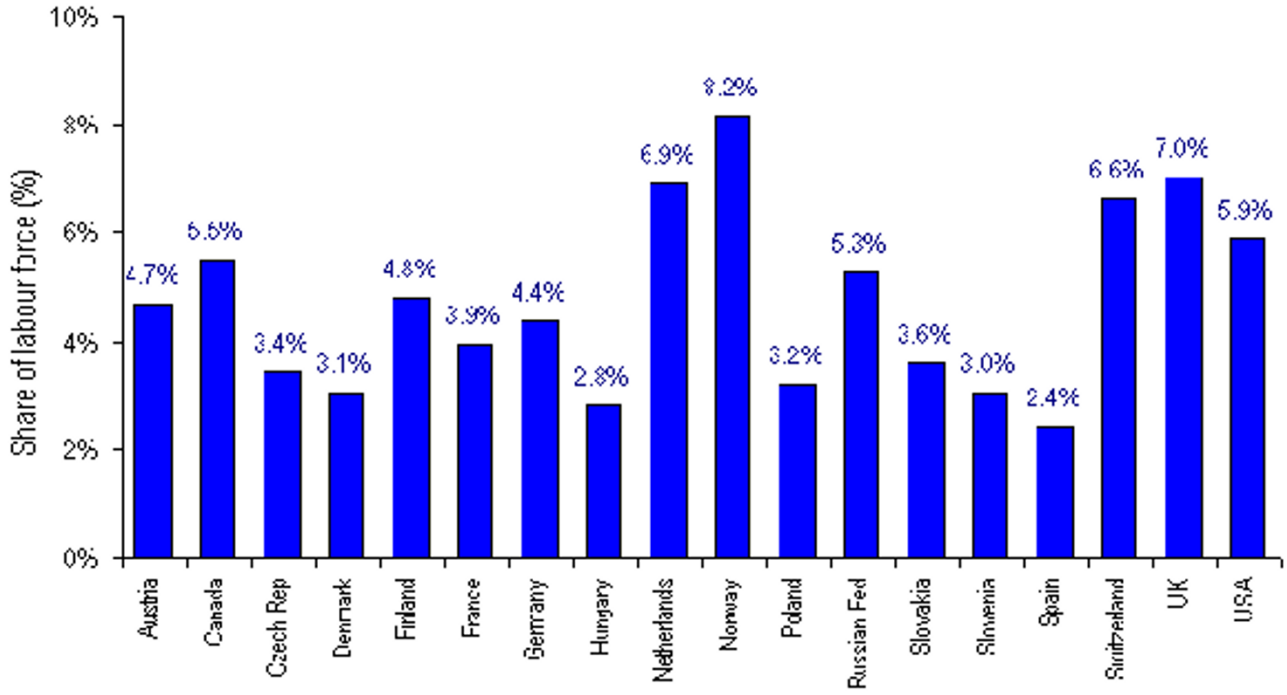

Figure 1
Share of health occupations in the labour force, 18 LIS countries, 1990s

of the health workforce may be linked to differences in health care delivery and financing systems, but may also be partially attributable to differences in the roles and practises attributed to the various types of health workers during classification procedures.

Trends in the profile of the health workforce

Consideration of changes over time in the health labour market is important for the assessment of human resource generation. In most of the countries where time-trend data were available, increases were ascertained in the share of health occupations among the total labour force (Table 3). Only Hungary and Spain experienced declines in the share of the health workforce. At the same time, certain discrepancies in the classification of health occupations should be noted.

Variability was found in the sensitivity of classification of occupational data across surveys. Despite the mapping of national classifications according to an internationally standardized classification, in some countries – notably Hungary and Spain, as well as Germany and Switzerland – the distinction of professional nurses and midwives was problematic. It is likely that in these cases the occupations were classified under health associates instead.

In general, where information appeared comparable over time, there was little discernible pattern in terms of changes in the occupational distribution of the health workforce across countries. The proportion of health professionals (except in nursing) was about as likely to have increased as to have decreased across survey rounds. Likewise, the proportion of professional nurses and midwives may have decreased in some countries, increased in others, or remained stable.

Aside from share and mix, a number of sociodemographic indicators related to efficiency, imbalances and equity can be used for HRH assessment. For one, the age structure of the health workforce holds a number of employment policy implications, chief of which is replacement of losses in the labour force due to retirement. Among the countries under observation, certain cross-national variations in the age distribution of the health workforce were found. According to the most recent survey findings, the proportion aged 30 to 59 years was between 61% and 79% (Germany and Canada, respectively). Generally, the proportion of younger health workers exceeded that of older persons, following the expected pattern for renewal of the workforce. Few countries showed large proportions of older workers, and little trend toward workforce ageing

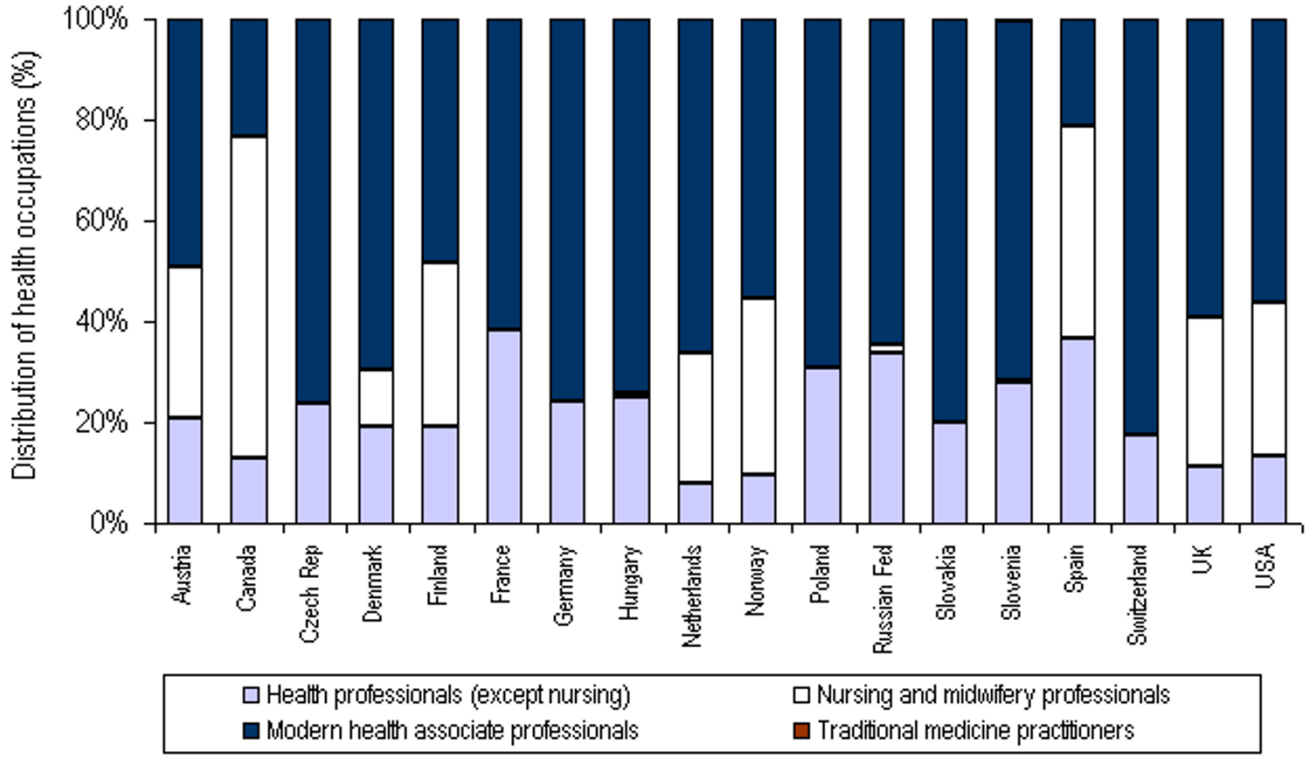

Figure 2
Occupational mix of the health workforce, 18 LIS countries, 1990s

appeared. A notable exception was Denmark, where the proportion aged 60 years or over increased over time, to the extent that the number of older workers was greater than younger workers at the time of the later survey. The Danish population is an ageing one overall, with 24% of the total workforce being in the oldest bracket in 1997.

Among the distinctive features of HRH is the notably high proportion of women employed in the sector. Results indicated that, across countries, at least 62% – and as high as 85% – of health workers were women. A certain trend toward greater feminization was seen in Germany, where the proportion female increased by 13 percentage points across survey rounds. Otherwise, any observed differences in the sex ratio over time tended to have been less important. Previous cross-national studies have reported little or no change in the feminization of nursing occupations across the 1970s and 1980s; this may have been partially attributed to the fact that nursing was already highly feminized before, so there was little room for a further increase in the proportion female [17]. It has been suggested that certain female-dominated occupations, notably in nursing, are not often given a market value commensurate with their skill level, as the work is seen simply as "women's work" [18]. Further analysis of gender imbalances in the health workforce may reveal the extent to which women and men have equal opportunities in career choice.

Sociodemographic and labour force characteristics in selected countries

In this part, we present an in-depth study on the sociodemographic and labour force characteristics of the health workforce for five countries: Denmark, Netherlands, Russian Federation, United Kingdom and the United States. These were the countries for which time-trend data on occupation were available at the four-digit ISCO-88 level or equivalent. In particular, we considered trends and differentials in the status of the health workforce in terms of education, migration, industry, income and gender equity.

The availability of four-digit occupational classification information allowed breakdown of the health workforce according to areas of specialization. As indicated in Table 4, according to the most recent survey results, physicians

Table 3: Trends in profile of health workforce, 11 LIS countries, 1989–1997

Country and year of survey		Share of the labour force	Occupational distribution*			Age distribution			Sex distribution	
			Health professionals (exc. nursing)	Nursing and midwifery professionals	Modern health associate professionals	29 years or under	30 to 59 years	60 years or over	Female	Male
Austria	1991	4.0%	25%	30%	45%	33%	64%	3%	73%	27%
	1995	4.7%	21%	30%	49%	34%	64%	2%	76%	24%
Canada	1994	4.6%	9%	68%	23%	21%	73%	6%	80%	20%
	1997	5.5%	13%	64%	23%	18%	79%	3%	79%	21%
Denmark	1992	2.9%	22%	10%	68%	19%	66%	15%	81%	19%
	1997	3.1%	19%	12%	69%	11%	72%	17%	83%	17%
Germany	1989	3.2%	32%	..	68%	28%	61%	11%	62%	38%
	1994	4.4%	24%	..	76%	33%	61%	6%	75%	25%
Hungary	1991	4.4%	12%	53%	35%	31%	66%	3%	87%	13%
	1994	2.8%	25%	1%	74%	21%	76%	3%	82%	18%
Netherlands	1991	6.2%	10%	32%	58%	37%	62%	1%	78%	22%
	1994	6.9%	8%	26%	66%	35%	64%	1%	80%	20%
Russian Federation	1992	4.7%	26%	2%	72%	29%	66%	5%	83%	17%
	1995	5.3%	34%	2%	64%	35%	63%	2%	85%	15%
Spain	1990	3.1%	33%	..	67%	27%	67%	6%	67%	33%
	1993	2.4%	37%	42%	21%	19%	74%	7%	62%	38%
Switzerland	1992	5.9%	48%	52%	0%	32%	62%	6%	75%	25%
	1997	6.6%	17%	..	83%	26%	70%	4%	77%	23%
United Kingdom	1991	5.5%	10%	34%	56%	30%	63%	7%	81%	19%
	1997	7.0%	12%	29%	59%	24%	71%	5%	82%	18%
United States of America	1991	5.4%	16%	31%	53%	26%	67%	7%	78%	22%
	1997	5.9%	13%	31%	56%	23%	71%	6%	78%	22%

* Note: Classification at the 3-digit ISCO-88 level or equivalent. .. = No observations in survey sample.

Table 4: Trends in occupational distribution of health workforce, 5 LIS countries, 1991–1997

	Denmark		Netherlands		Russian Federation		United Kingdom		United States of America	
	1992	1997	1991	1994	1992	1995	1991	1997	1991	1997
Physicians	12%	12%	7%	5%	20%	28%	6%	8%	7%	8%
Nursing and midwifery professionals	10%	12%	32%	26%	2%	2%	34%	29%	31%	31%
Other health professionals	10%	7%	3%	3%	6%	6%	4%	4%	9%	5%
Nursing and midwifery associate professionals	46%	44%	31%	37%	32%	44%	23%	19%	25%	24%
Modern health associate professionals	22%	25%	27%	29%	40%	20%	33%	40%	28%	32%

Note: Occupational classification at the 4-digit ISCO-88 level or equivalent.

tended to be more numerous in terms of the distribution of health professionals (except in nursing) compared to other specializations. In the Russian Federation in particular, the ratio of other health professionals was relatively small, about one for every four physicians. In most countries, among the health associate professionals, those in the nursing and midwifery specializations outnumbered those in other occupational groups. Again the Russia Federation stood out from the other countries, having experienced a somewhat divergent trend.

Education

Assessing the education levels of the health workforce is a key element for policy-makers, as the knowledge and skills acquired in initial vocational education are considered to affect health workers' ability to deliver high-quality performance. It is expected that, given the ISCO-88 hierarchical nature, professional-level occupations should be universally characterized with a tertiary educational attainment. Survey findings revealed that, in each country, physicians and other health professionals (except in nursing) had higher levels of schooling. Virtually all physicians had reached university or college in the Russian Federation and the United States, and the proportion of

Table 5: Trends in proportion of university-educated health workers by occupation, 5 LIS countries, 1991–1997

	Denmark		Netherlands		Russian Federation		United Kingdom		United States of America	
	1992	1997	1991	1994	1992	1995	1991	1997	1991	1997
Physicians	82%	96%	79%	85%	100%	100%	93%	98%	99%	100%
Nursing and midwifery professionals	80%	65%	25%	35%	(57%)	(75%)	58%	65%	85%	94%
Other health professionals	91%	94%	(76%)	(100%)	85%	100%	84%	97%	98%	99%
Nursing and midwifery associate professionals	80%	82%	12%	5%	59%	57%	37%	37%	32%	37%
Modern health associate professionals	54%	30%	24%	33%	50%	60%	35%	36%	72%	74%

Note: Occupational classification at the 4-digit ISCO-88 level or equivalent. Figures in parentheses refer to sample size of fewer than 10 cases.

other health professionals with higher education was seen to have increased over time in all countries (Table 5). However, important variations were observed for nursing and midwifery professionals: the percentage with tertiary education was 94%, according to the later survey in the United States, but only 35% in the Netherlands. In most countries, except Denmark, an increase was seen over time.

As expected, the level of education tended to be lower among nursing and midwifery associate professionals and other health associate professionals. Denmark was again an exception, where education levels among the former remained as high as or higher than their professionally-classified counterparts. Cross-national differences in educational attainment by occupational grouping might be explained in part by differences in education systems, but also likely to a certain extent in definitions of occupational classifications.

Migration

External migration of health workers has long been recognized as a problem for ensuring appropriate coverage of essential services in some countries. It is impossible to objectively assess the impact of international migration on health systems without clear evidence, of which little is currently available. Some evidence has been provided by the LIS surveys. The results depicted in Figure 3 show that, among the four countries for which information was available, the proportion of physicians who were foreign-born was highest in the Russian Federation (44%). This was not surprising, as the same country had the highest proportion of foreigners in the total labour force (largely having arrived from the former republics of the ex-Soviet Union). In contrast, Denmark had a low proportion of physicians who were non-natives (4%), which reflects the low proportion of foreigners overall. In between lay the United Kingdom and the United States, though it is worth pointing out that in both countries the proportion of foreign-born physicians was much greater than for any other health occupation or for the total labour force. Also noteworthy was that while the proportions of non-native born tended to be higher among physicians and other health professionals (except in nursing), the migration phenomenon might in fact have been more important in absolute terms for nursing and midwifery professionals, who were numerically a more important group.

Industry

Understanding issues regarding planning and retention of HRH requires knowledge on their deployment and distribution in the health industry. Information on workforce industry was generally classified in the LIS datasets according to international standards, such as the International Standard Industrial Classification of all Economic Activities or the General Industrial Classification of Economic Activities within the European Communities, although the variable's availability and level of detail varied across surveys. As seen in Figure 4, among four countries, an estimated 3% to 9% of the labour force were engaged in health services. Over 90% of physicians were working in health services in the Netherlands, United Kingdom and United States, and in all countries this was the occupational group of health workers most concentrated in the industry. Distributions may diverge within and across countries depending on the different roles of workers in the health sector. It should be noted that in some cases (notably in Denmark), the activities of health workers included those not currently working at the time of the survey (such as due to unemployment or studies), and so these results may have underestimated the relative attractiveness of the health industry for those with a health-related vocational background.

Income

In terms of earnings, comparisons were made for the average annual salary income by occupational group, among those health workers reporting positive income. The LIS data on earnings referred to either the gross or net income, depending on the original source. The former included all

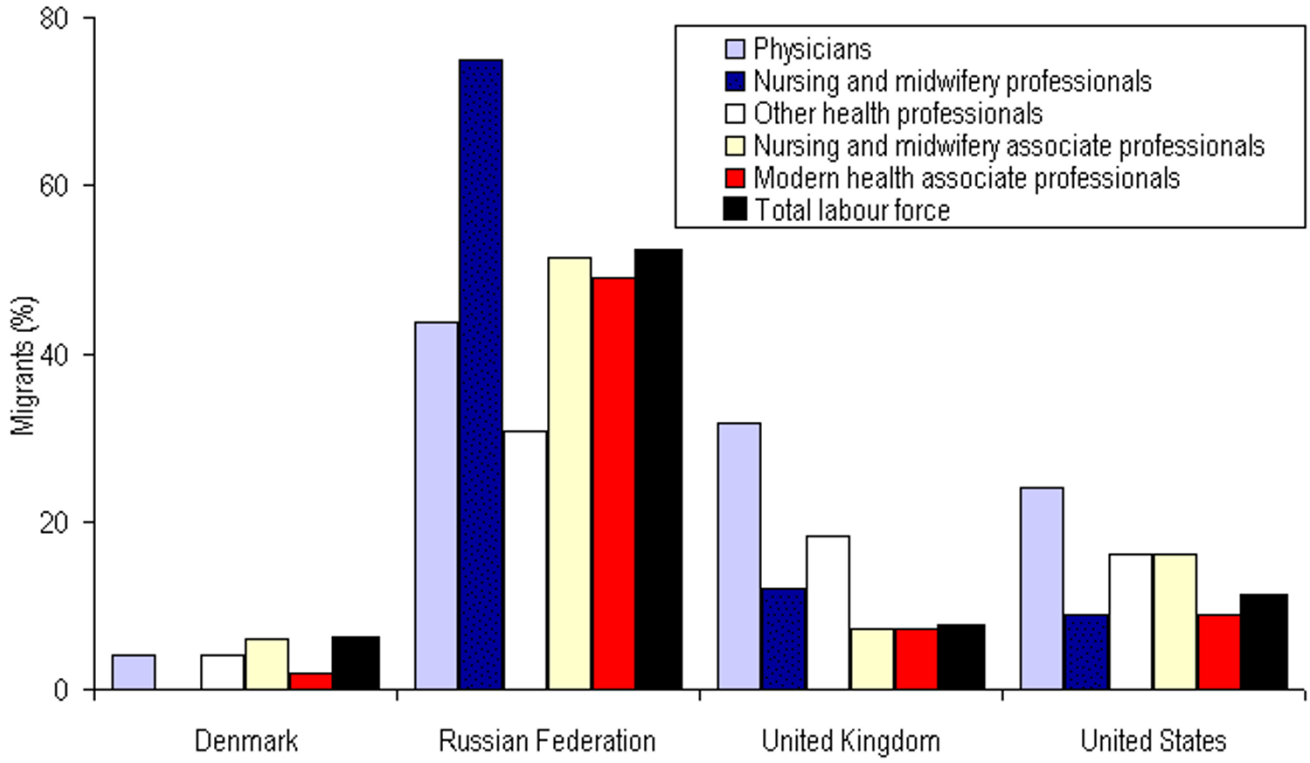

Figure 3
Proportion of health workers as international migrants, according to occupation

forms of cash wage and salary income, including employer and annual bonuses, gross of employee social insurance contributions and taxes. If that information was not available, net income was supplied. Since the variable for earnings varied across countries and was always reported in national currency amounts, average earnings of each occupation are expressed here relative to those of a reference group, namely physicians. This approach was adopted to facilitate comparisons between occupations and countries. A ratio equal to one signifies that the earnings of the group of interest are similar to the earnings of physicians. A ratio above one means that the given group tends to earn more, whereas a ratio less than one suggests lower average earnings.

In most countries, the average income among physicians was superior to the average income among other health professionals and especially among nursing and midwifery professionals (Table 6). The largest difference was found in the United States, where physicians' average wages were, according to the most recent survey, some five times as high as wages for nursing and midwifery professionals and twice as high as for other health professionals. Similar patterns were observed in Denmark and the United Kingdom, though to a lesser extent. In the Russian Federation the gaps between the wages according to professional group were less marked. A large inter-survey increase in wage differentials among categories of health professionals was found in the United States, while in Denmark and the United Kingdom the gap diminished.

Since occupational classification by ISCO-88 can indirectly serve as a measure of socioeconomic status [11], it is expected that health associate professionals will generally earn less than professionals; this tendency was confirmed according to the LIS data. The biggest discrepancy was seen in the United States, with relative average earnings of nursing and midwifery associate professionals by far the lowest.

An examination of the health labour market should also be placed in a broader perspective that takes into account other sectors and the impact of global trends. We compared the average wages of health workers with those for other non-health occupational groups. In particular, two groups were selected for comparative purposes based on

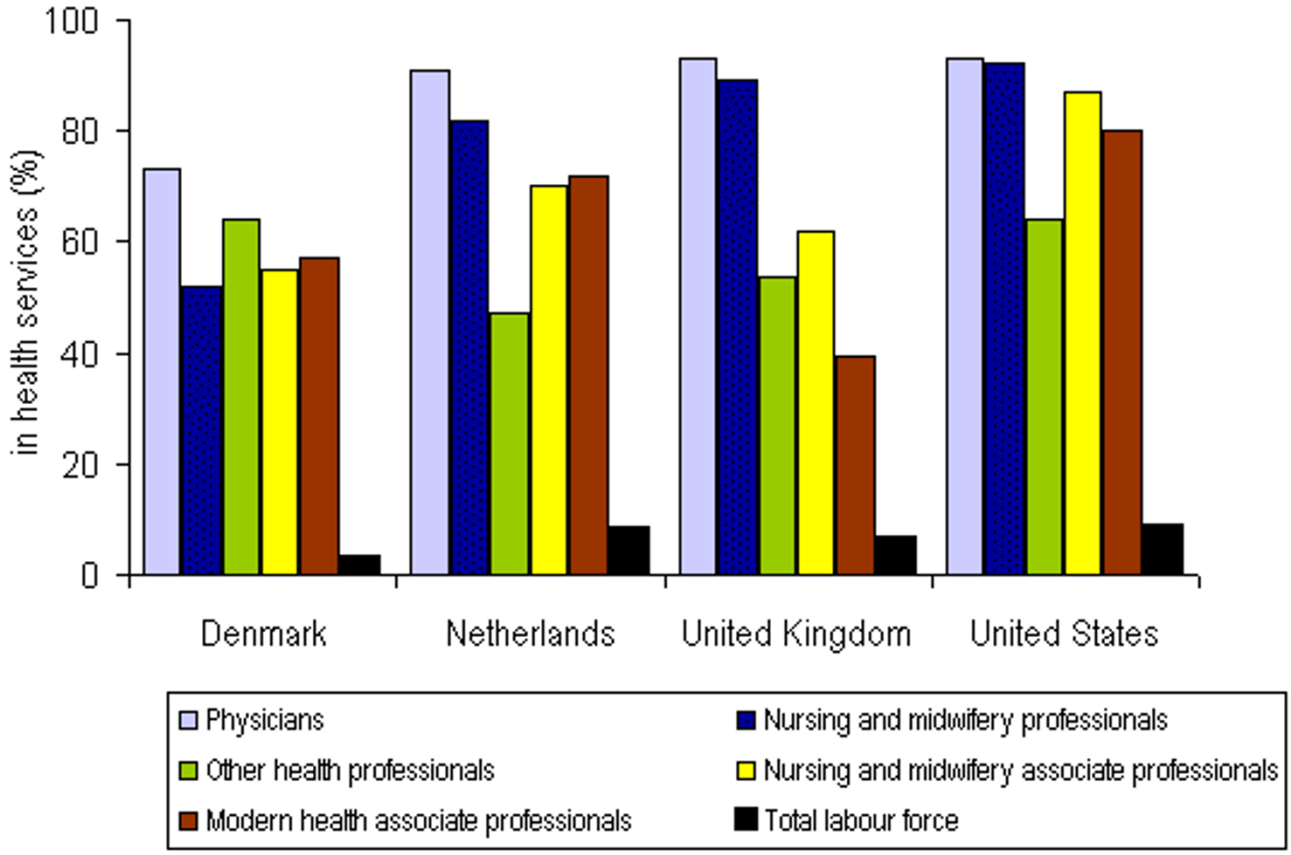

Figure 4
Proportion of health workers in the health services industry, according to occupation

their similar skill levels according to the ISCO-88 classification: science professionals (that is, group 2 professionals in the physical, mathematical and engineering science fields) and teaching associate professionals (group 3 associates in the teaching field). Science professionals tended to earn less than physicians, but often more than other health professionals and consistently more than nursing and midwifery professionals. In Russia professionals in non-health sciences were systematically earning more than their counterparts in health.

Cross-national variations were found in terms of relative wages among associate professionals. In Denmark and the Russian Federation, associate professionals in nursing/midwifery and other modern health occupations earned about the same as those in teaching. These results contrasted with the situation found in the Netherlands, United Kingdom and United States, where teaching associate professionals tended to earn relatively more. For example, in the United Kingdom those in teaching averaged twice the income as those in health, a trend that remained stable over time.

Gender imbalance

Given the predominance of women in the health workforce, an analysis of gender differences is especially important. Three main employment dimensions can be considered for the study of gender equality in the labour force: occupation, working time and earnings [19]. Occupational segregation by gender can correspond to either vertical clustering (differentials in the sex ratio according to relative job status) or horizontal clustering (sex differentials according to specialization). Working time can affect workers' economic position, especially when it results in lower monetary and non-monetary compensation among part-time workers compared to their full-time counterparts, as well as less job security and fewer opportunities for promotion. Because the labour conditions and opportunities vary markedly across occupations and countries, gender equity can be referred to as the absence

Table 6: Trends in ratio of average earnings, selected occupations, to average earnings for physicians, 5 LIS countries, 1991–1997

	Denmark		Netherlands		Russian Federation		United Kingdom		United States of America	
	1992	1997	1991	1994	1992	1995	1991	1997	1991	1997
Physicians (reference group)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Nursing and midwifery professionals	0.5	0.6	0.4	0.4	(0.5)	(1.0)	0.5	0.5	0.4	0.2
Other health professionals	0.7	0.8	(1.2)	(1.4)	0.8	0.8	0.6	0.8	0.7	0.5
Nursing and midwifery associate professionals	0.5	0.5	0.3	0.3	0.6	0.6	0.3	0.3	0.2	0.1
Modern health associate professionals	0.5	0.4	0.3	0.3	0.7	0.5	0.3	0.3	0.3	0.2
Physical and engineering science professionals	0.9	0.8	0.7	0.7	1.2	1.2	0.8	0.8	0.7	0.4
Teaching associate professionals	0.5	0.4	0.6	0.5	0.6	0.6	0.6	0.6	0.4	0.2

Note: Occupational classification at the 4-digit ISCO-88 level or equivalent. Figures in parentheses refer to sample size of fewer than 10 cases.

of observed gender differences. Table 7 offers a series of survey results for describing gender imbalances in the health field for five countries. The emphasis here is on trends in status in the nursing and midwifery specializations, which have traditionally been characterized as female-dominated.

Health occupations were found to be subject to both vertical and horizontal gender imbalances. As previously noted, women comprised the majority of health workers overall. However, closer examination revealed that the proportion of women was considerably higher for occupations at the associate professional level compared to the professional level, and also for nursing and midwifery professionals compared to physicians and other health professionals, a pattern that was observed in all countries. Except in the Netherlands, the proportion of women in nursing and midwifery associate professions was likewise higher than the proportion in other associate health professions. Across countries, at least four-fifths of the workforce in the nursing and midwifery specializations were women. For the most part, sex ratios for these specializations were quite stable over time.

Working time was captured in the LIS surveys, when available, in terms of the usual number of hours worked per week, including overtime and second jobs. Important gender differences in working time were observed in the Netherlands and the United Kingdom, with women averaging fewer hours. According to the latest survey in the United Kingdom, for example, women tended to work 80% of the hours men worked, across occupations. Differences were less consistent in the Russian Federation and the United States, where women in some groups averaged longer hours than men.

Marked differences were found in average wages by gender. In general, earnings of women were inferior to men's earnings. Exceptions were found for certain occupations in the Russian Federation. Given the longer history of high female labour force participation in transitional countries, along with social policies emphasizing equality and supporting working women and their families, gender imbalances can be expected to be less pronounced compared to countries with developed market economies [17]. However, the findings presented here should be treated with caution due to sample size limitations.

Among physicians, women tended to earn considerably less than their male counterparts. The results also showed that, over time, the gap generally decreased. In the United Kingdom in particular, the gender gap in average earnings essentially dissipated between surveys. Although males were the minority in nursing and midwifery specializations, they tended to earn much more. It is possible that higher male wages might be explained by longer working hours and/or higher levels of seniority (e.g. in terms of supervisory responsibilities) within the positions occupied, although the latter is difficult to assess from the available survey data. Moreover, there was no distinctive time-trend. Whereas the gender gap in earnings increased in some countries (notably Denmark and the United States), it decreased elsewhere (Netherlands). Interestingly, in the United Kingdom, gender inequity was found

Table 7: Trends in labour force indicators for assessing gender imbalances, selected occupations, 5 LIS countries, 1991–1997

	Denmark		Netherlands		Russian Federation		United Kingdom		United States of America	
	1992	1997	1991	1994	1992	1995	1991	1997	1991	1997
Proportion female										
Physicians	23%	31%	21%	30%	70%	67%	43%	35%	20%	23%
Nursing and midwifery professionals	97%	96%	84%	79%	(100%)	(100%)	88%	91%	93%	94%
Other health professionals	41%	46%	(13%)	(33%)	52%	67%	44%	39%	24%	32%
Nursing and midwifery associate professionals	97%	97%	85%	86%	98%	97%	93%	94%	91%	88%
Modern health associate professionals	91%	88%	85%	88%	83%	87%	76%	85%	81%	77%
Physical and engineering science professionals	12%	13%	9%	4%	48%	49%	10%	10%	12%	12%
Teaching associate professionals	77%	82%	61%	72%	97%	94%	79%	82%	75%	76%
Ratio of women's/men's average hours worked										
Physicians	NA	NA	(0.4)	(0.7)	0.8	0.9	0.9	0.8	1.1	1.0
Nursing and midwifery professionals	NA	NA	0.6	0.7	..	..	0.8	0.8	0.9	0.9
Other health professionals	NA	NA	(1.5)	(0.4)	1.1	(1.1)	(1.8)	0.8	0.9	0.9
Nursing and midwifery associate professionals	NA	NA	0.8	0.8	0.8	1.1	0.7	0.8	1.2	1.0
Modern health associate professionals	NA	NA	0.6	0.7	0.9	1.1	0.8	0.8	0.9	0.9
Physical and engineering science professionals	NA	NA	0.9	0.9	0.9	0.9	0.9	1.0	1.0	0.9
Teaching associate professionals	NA	NA	0.8	0.8	0.8	1.0	0.8	0.9	0.9	0.9
Ratio of women's/men's average earnings										
Physicians	0.7	0.8	(0.7)	(0.6)	0.6	0.7	0.7	1.0	0.6	0.7
Nursing and midwifery professionals	(0.8)	(0.7)	0.5	0.7	..	..	0.8	0.7	1.1	0.8
Other health professionals	0.7	0.9	..	..	0.6	(1.1)	(1.0)	0.6	0.6	0.6
Nursing and midwifery associate professionals	(0.9)	0.7	0.6	0.8	(1.0)	(2.6)	0.5	0.8	0.9	0.7
Modern health associate professionals	1.0	0.9	0.6	0.5	1.0	(0.9)	0.5	0.5	0.8	0.7
Physical and engineering science professionals	0.7	0.8	0.9	1.0	0.7	0.8	0.6	0.8	0.9	0.8
Teaching associate professionals	0.9	0.9	0.6	0.7	0.8	0.5	0.8	0.7	0.8	0.8

NA = Not available due to questionnaire design. Figures in parentheses refer to sample sizes of fewer than 10 cases. .. = No observations in survey sample.

to have increased among nursing and midwifery professionals but to have decreased among associate professionals.

While appreciable gender imbalances were found in the health occupations, the question remains whether the health field is more unequal than other fields. In terms of occupational segregation, the evidence was inconclusive. Among professional categories, greater gender imbalances were found in the physical science field, where the proportion of females was even lower than for physicians and other health professionals across countries, and with little sign of change over time. On the other hand, while women were overrepresented among teaching associate professionals, the imbalance was less pronounced than among nursing and midwifery associate professionals.

With regard to working times, women in non-health science professions tended to average somewhat fewer hours than or about the same as their male counterparts; gender differences were minimal compared to those sometimes seen for nursing and midwifery professionals. In most cases, the gender gap for teaching associate professionals roughly paralleled that for nursing and midwifery associate professionals.

Gender differences in average earnings tended to be less pronounced among science professionals than among nursing and midwifery professionals, according to the most recent survey findings for which data were available. No clear cross-national pattern was seen for the associate professional categories: differences for teaching compared to those for the nursing and midwifery specialization were lower in Denmark and the United States, but higher in the Netherlands and the United Kingdom.

Conclusions

This study examined trends and differentials in the profile of health occupations for selected countries with developed market and transitional economies participating in the Luxembourg Income Study. Considerable variations were observed in the share and occupational distribution of the health workforce. The roles of health workers can vary from country to country, and the professions can also have different national histories and cultures [20]. While some cross-national differences may be linked to varia-

tions in the roles and practises attributed to workers in the health sector, differences in the statistical sources and their quality may also be a factor in describing empirical patterns. At the same time, certain common tendencies emerged. In particular, increases in the share were found among most countries for which time-trend data were available. Due to demographic and epidemiological conditions, demands on health care services have been growing rapidly in many societies. It is thus reasonable to expect the same to have held for employment opportunities in this field.

Our analysis included descriptions of the health workforce for a number of demographic and socioeconomic indicators. Notably, an examination of the sex distribution revealed a health labour market characterized by a large presence of women. Further assessment of data from five countries helped to reveal the extent to which women and men may have equal opportunities in career choice. The evidence suggested that gender inequity in human resources for health remains an important shortcoming of many health systems. Large imbalances were seen in terms of occupational segregation and wage gap. It is difficult to establish the causal links of such imbalances, as the influences may be dynamic and multidirectional, related to both demand and supply factors. But it is important to point out that the gender inequity observed in the health field may be even more pronounced in some respects than for workers in other fields: there were greater wage gaps in some countries compared to other occupations in physical and engineering sciences or in teaching. Assuming that monetary incentives are important in labour participation decisions, such results suggest that recruitment and retention in health occupations, especially nursing and midwifery, might suffer in comparison with other non-health occupations that propose better earnings for a similar skill level.

The household-based survey data on labour force activities and occupational wages available through the LIS project presented both advantages and constraints in conducting international comparisons. Because of the discontinuous nature of the data collection procedures, performed by the various national statistical agencies with differing targets and interests, LIS undertakes variable harmonization to facilitate public use. In assessing the existing data, we found certain strengths and weaknesses. In many ways our analyses were guided as much by the character of the data as by the base required for formulating policy decisions.

The first challenge lay in defining health occupations themselves. In this article, the terms "health occupations" and "health workforce" were used interchangeably. Occupations were generally classified according to ISCO-88, which broadly groups occupations according to skill levels and specializations. We focused on selected professionals and associate professionals with a health care-related specialization. Since the survey data were nationally representative, they included those practising medicine and nursing in both public and private institutions, as well as those in administrative, research and industry positions. For example, findings from the Netherlands, United Kingdom and United States revealed that some 7% to 9% of physicians and 8% to 18% of nursing and midwifery professionals were engaged outside of the health services industry. Persons with health qualifications but not working in the public health sector are often excluded from national registries, for instance. On the other hand, our analyses did not consider those employed in the health system with non-health occupational backgrounds, such as managers, accountants, equipment operators, drivers and other support staff. Again for the same three countries, an estimated 36% to 48% of workers in health services had a vocation other than the selected health occupations.

Even when occupations were classified according to ISCO-88, comparability issues arose. In some cases, discrepancies were evident between mappings of national classifications with the international standard, particularly with regard to the nursing and midwifery specializations. In addition, the results did not enable distinguishing the different types of health activities: clinical, research and public health interventions; preventive and curative personal care; health systems planning and management; etc. Moreover, health-related specializations under ISCO-88 place veterinary occupations in the same minor (three-digit) groupings as human care occupations. WHO is currently collaborating with ILO and other interested parties to refine the descriptions for some categories of health and personal care occupations, in order to facilitate analyses of human resources for health. Such issues may grow increasingly important, because use of or mapping to ISCO-88 is expected to become more widespread across countries [11].

Other constraints included the sometimes small sample sizes of surveys (from which, for example, census data do not suffer) as well as occasional definitional inconsistencies among the selected indicators. Availability and comparability of certain types of information were dependent on the source. Education was a variable that posed problems, as the categories and details varied across countries. While in a few cases the variable captured the level of attainment, in others it was years of schooling and in yet others, age of completion. Some discrepancies might be related to the structure of national educational systems. To the extent possible, information was recoded for the present analysis to approximate education at the tertiary

level. We recommend the use in future data collection and processing of a cross-nationally comparable instrument for definitions of levels and fields of education, such as the International Standard Classification of Education [21].

Migration of skilled health workers has become a cause for global concern, as mass emigration of health professionals from less-developed countries can put great pressure on the health systems and workers remaining [22]. We found that, for instance, health professionals – and especially physicians – were over-represented among the foreign-born compared to the total labour force in the United Kingdom and the United States. But migration was an area covered somewhat inadequately in the surveys. There was generally no information on period of international migration, other aspects of mobility (such as rural exodus), or time-trends in the countries under observation. Moreover, data on emigration were notably lacking. WHO advocates better cooperation between the many agencies supporting processes for strengthening national health systems, with equitable geographical distribution as one of the core policy areas. Human resource constraints have been identified as a significant barrier to ensuring sustainability of health systems in many developing countries and to scaling up interventions on major health problems among the poor (see, for example, [23,24]). The promise of higher salaries and other incentives in one country may be met by outflows of labour from other countries, creating or exacerbating personnel shortages. Assessing the determinants and impacts of international migration across countries at different stages of development remains an important research domain.

Data collection systems are crucial tools for improving all aspects of health care, including health care workforce policy. A necessary prerequisite to the development of policy that is meaningful, realistic and effective is a solid foundation of accurate data about the numbers, distribution and service capacity of human resources in health [25]. Without information about these professions, policy-makers cannot effectively address issues of access, supply, cost and barriers to care. Availability of different types of data sources can also serve as a control for the common information they collect, offering means for triangulation [26]. The data used in this analysis from the LIS Project allowed the measurement of a number of sociodemographic and labour force indicators useful for profiling the health workforce and monitoring changes. The surveys presented examples of one valuable source that, in combination with other complementary information, can help provide the evidence base required for better understanding HRH as an input to health systems performance. Improved capacity to formulate and evaluate policy options will require political and technical dialogues among a diversified group representing research, service and academic institutions to harmonize not only data but also concepts and statistics about human resources for health.

Competing interests

None to declare.

Authors' contributions

N. Gupta and K. Diallo performed the statistical analyses. All authors participated in interpreting the results, and read and approved the final manuscript.

Acknowledgements

An earlier version of this article appeared as part of the Luxembourg Income Study Working Paper Series. The authors wish to thank the Luxembourg Income Study for having granted permission to use the information contained in the LIS/LES datasets for the present analysis. We are especially grateful to Paul Alkemade, David Jesuit and Teresa Munzi at the Luxembourg office for providing much technical support and expert advice during the course of our research, and to Eivind Hoffmann and André Medici for useful comments. Financial support for this research was provided by the World Health Organization. The opinions expressed here are those of the authors, and do not necessarily represent the views of WHO.

References

1. World Health Organization: **World Health Report 2000 – Health Systems: Improving Performance** *Geneva* 2000 [http://www.who.int/whr2001/2001/archives/2000/en/index.htm].
2. Narine L: **Impact of health system factors on changes in human resource and expenditures levels in OECD countries** *Journal of Health and Human Services Administration* 2000, **22(3):**292-307.
3. Saltman RB and Von Otter C: **Implementing Planned Markets in Health Care: Balancing Social and Economic Responsibility** *Buckingham: Open University Press* 1995.
4. Kolehamainen-Aiken RL: **Decentralization and human resources: implications and impact** *Human Resources for Health Development* 1997, **2(1):**1-14.
5. Buchan J and Dal Poz MR: **Skill mix in the health care workforce: reviewing the evidence** *Bulletin of the World Health Organization* 2002, **80(7):**575-580.
6. Anell A and Willis M: **International comparison of health care systems using resource profiles** *Bulletin of the World Health Organization* 2000, **78(6):**770-778.
7. Diallo K, Zurn P, Gupta N and Dal Poz M: **Monitoring and evaluation of human resources for health: an international perspective** *Human Resources for Health* 2003, **1:**3 [http://www.human-resources-health.com/content/1/1/3].
8. **Luxembourg Income Study** [http://www.lisproject.org]
9. Smeeding T: **The LIS/LES project: overview and recent developments** *Syracuse, NY: Syracuse University, Maxwell School of Citizenship and Public Affairs* 2002 [http://www.lisproject.org/publications/liswps/294.pdf]. [Luxembourg Income Study Working Paper Series, no. 294.]
10. International Labour Office: **International Standard Classification of Occupations: ISCO-88** *Geneva* 1990 [http://www.ilo.org/public/english/bureau/stat/class/isco.htm].
11. Hoffmann E: **International statistical comparisons of occupational and social structures: problems, possibilities and the role of ISCO-88** In *Advances in Cross National Comparison* Edited by: *Hoffmeyer-Zlotnik JHP, Wolf C. New York: Kluwer Plenum Publishers*; 2003:137-158.
12. Ganzeboom HBG and Treiman DJ: **Internationally comparable measures of occupational status for the 1988 International Standard Classification of Occupations** *Social Science Research* 1996, **25(3):**201-239.

13. Hojat M, Gonnella J and Xu G: **Gender comparisons of young physicians' perceptions of their medical education, professional life, and practice: a follow-up study of Jefferson Medical College graduates** *Academic Medicine* 1995, **70(4):**305-312.
14. Reamy J and Pong R: **Physician workforce composition by gender: the implications for managing physician supply** *Paper presented at the 4th FICOSSER General Conference, Cuernavaca, Mexico* . 28–30 July 1998
15. Higginbotham E: **Celebrating women in ophthalmology** *Archives of Ophthalmology* 1998, **116(9):**1227-1228.
16. SPSS Inc: **SPSS Base 11.0 user's guide** *Chicago* 2002.
17. Anker R: **Gender and jobs: Sex segregation of occupations in the world** *Geneva: International Labour Office* 1998.
18. Salvage J and Heijnen S: **Nursing in Europe: a resource for better health** *Geneva: World Health Organization Regional Publications* 1997. [WHO European Series no 74.]
19. Gornick JC: **Gender equality in the labour market: a comparison on the public and private sectors in six countries** *Syracuse, NY: Syracuse University, Maxwell School of Citizenship and Public Affairs* 1997. Luxembourg Employment Study Working Paper Series, no. 7.
20. Medici AC, Machado ME, Nogueira RP and Girardi SN: **El mercado de trabajo en salud: aspectos teoricos, conceptuales y metodologicos** *Educ Méd Salud* 1991, **25(1):**1-14.
21. United Nations Educational Scientific and Cultural Organization: **International Standard Classification of Education: ISCED 1997** *Paris* 1997 [http://portal.unesco.org/uis/TEMPLATE/pdf/isced/ISCED_A.pdf].
22. Bundred C: **Medical migration: Who are the real losers?** *Lancet* 2000, **356(9225):**245-246.
23. Hanson K, Ranson MK, Oliveira-Cruz V and Mills A: **Expanding access to priority health interventions: a framework for understanding the constraints to scaling-up** *Journal of International Development* 2003, **15(1):**1-14.
24. Global Alliance for Vaccines and Immunization: *Ninth GAVI board meeting: human resources for immunization* [http://www.vaccinealliance.org/home/Board/Board_Reports/9th_brd_immunizationHR.php].
25. Pew Health Professions Commission: **Critical Challenges: Revitalizing the Health Professions for the Twenty-First Century** *San Francisco, CA: University of California, Center for the Health Professions* 1995.
26. Galin P: **Guía para optimizar la utilización de la información disponible sobre empleo en el sector salud** In *Relaciones Laborales en el Sector Salud* Edited by: *Dal Poz M, Galin P, Novick M, Varella T. Quito: Organización Panamericana de la Salud*; 2000:19-89.