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EDUCATION OF HEALTH PROFESSIONALS FOR THE 21ST CENTURY: A GLOBAL INDEPENDENT COMMISSION

Health professionals for a new century: transforming education to strengthen health systems in an interdependent world

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Executive summary

Problem statement

100 years ago, a series of studies about the education of health professionals, led by the 1910 Flexner report, sparked groundbreaking reforms. Through integration of modern science into the curricula at university-based schools, the reforms equipped health professionals with the knowledge that contributed to the doubling of life span during the 20th century.

By the beginning of the 21st century, however, all is not well. Glaring gaps and inequities in health persist both within and between countries, underscoring our collective failure to share the dramatic health advances equitably. At the same time, fresh health challenges loom. New infectious, environmental, and behavioural risks, at a time of rapid demographic and epidemiological transitions, threaten health security of all. Health systems worldwide are struggling to keep up, as they become more complex and costly, placing additional demands on health workers.

Professional education has not kept pace with these challenges, largely because of fragmented, outdated, and static curricula that produce ill-equipped graduates. The problems are systemic: mismatch of competencies to patient and population needs; poor teamwork; persistent gender stratification of professional status; narrow technical focus without broader contextual understanding; episodic encounters rather than continuous care; predominant hospital orientation at the expense of primary care; quantitative and qualitative imbalances in the professional labour market; and weak leadership to improve health-system performance. Laudable efforts to address these deficiencies have mostly floundered, partly because of the so-called tribalism of the professions—ie, the tendency of the various professions to act in isolation from or even in competition with each other.

Redesign of professional health education is necessary and timely, in view of the opportunities for mutual learning and joint solutions offered by global interdependence due to acceleration of flows of knowledge, technologies, and financing across borders, and the migration of both professionals and patients. What is clearly needed is a thorough and authoritative re-examination of health professional education, matching the ambitious work of a century ago.

That is why this Commission, consisting of 20 professional and academic leaders from diverse countries, came together to develop a shared vision and a common strategy for postsecondary education in medicine, nursing, and public health that reaches beyond the confines of national borders and the silos of individual professions. The Commission adopted a global outlook, a multiprofessional perspective, and a systems approach. This comprehensive framework considers the connections between education and health systems. It is centred on people as co-producers and as drivers of needs and demands in both systems. By interaction through the labour market, the provision of educational services generates the supply of an educated workforce to meet the demand for professionals to work in the health system. To have a positive effect on health outcomes, the professional education subsystem must design new instructional and institutional strategies.

Major findings

Worldwide, 2420 medical schools, 467 schools or departments of public health, and an indeterminate number of postsecondary nursing educational institutions train about 1 million new doctors, nurses, midwives, and public health professionals every year. Severe institutional shortages are exacerbated by maldistribution, both between and within countries.

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Four countries (China, India, Brazil, and USA) each have more than 150 medical schools, whereas 36 countries have no medical schools at all. 26 countries in sub-Saharan Africa have one or no medical schools. In view of these imbalances, that medical school numbers do not align well with either country population size or national burden of disease is not surprising.

The total global expenditure for health professional education is about US$100 billion per year, again with great disparities between countries. This amount is less than 2% of health expenditures worldwide, which is pitifully modest for a labour-intensive and talent-driven industry. The average cost per graduate is $113 000 for medical students and $46 000 for nurses, with unit costs highest in North America and lowest in China. Stewardship, accreditation, and learning systems are weak and unevenly practised around the world. Our analysis has shown the scarcity of information and research about health professional education. Although many educational institutions in all regions have launched innovative initiatives, little robust evidence is available about the effectiveness of such reforms.

Reforms for a second century

Three generations of educational reforms characterise progress during the past century. The first generation, launched at the beginning of the 20th century, taught a science-based curriculum. Around the mid-century, the second generation introduced problem-based instructional innovations. A third generation is now needed that should be systems based to improve the performance of health systems by adapting core professional competencies to specific contexts, while drawing on global knowledge.

To advance third-generation reforms, the Commission puts forward a vision: all health professionals in all countries should be educated to mobilise knowledge and to engage in critical reasoning and ethical conduct so that they are competent to participate in patient and population-centred health systems as members of locally responsive and globally connected teams. The ultimate purpose is to assure universal coverage of the high-quality comprehensive services that are essential to advance opportunity for health equity within and between countries.

Realisation of this vision will require a series of instructional and institutional reforms, which should be guided by two proposed outcomes: transformative learning and interdependence in education. We regard transformative learning as the highest of three successive levels, moving from informative to formative to transformative learning. Informative learning is about acquiring knowledge and skills; its purpose is to produce experts. Formative learning is about socialising students around values; its purpose is to produce professionals. Transformative learning is about developing leadership attributes; its purpose is to produce enlightened change agents. Effective education builds each level on the previous one. As a valued outcome, transformative learning involves three fundamental shifts: from fact memorisation to searching, analysis, and synthesis of information for decision making; from seeking professional credentials to achieving core competencies for effective teamwork in health systems; and from non-critical adoption of educational models to creative adaptation of global resources to address local priorities.

Interdependence is a key element in a systems approach because it underscores the ways in which various components interact with each other. As a desirable outcome, interdependence in education also involves three fundamental shifts: from isolated to harmonised education and health systems; from stand-alone institutions to networks, alliances, and consortia; and from inward-looking institutional preoccupations to harnessing global flows of educational content, teaching resources, and innovations.

Transformative learning is the proposed outcome of instructional reforms; interdependence in education should result from institutional reforms. On the basis of these core notions, the Commission offers a series of specific recommendations to improve systems performance. Instructional reforms should: adopt competency-driven approaches to instructional design; adapt these competencies to rapidly changing local conditions drawing on global resources; promote interprofessional and transprofessional education that breaks down professional silos while enhancing collaborative and non-hierarchical relationships in effective teams; exploit the power of information technology for learning; strengthen educational resources, with special emphasis on faculty development; and promote a new professionalism that uses competencies as objective criteria for classification of health professionals and that develops a common set of values around social accountability. Institutional reforms should: establish in every country joint education and health planning mechanisms that take into account crucial dimensions, such as social origin, age distribution, and gender composition, of the health workforce; expand academic centres to academic systems encompassing networks of hospitals and primary care units; link together through global networks, alliances, and consortia; and nurture a culture of critical inquiry.

Pursuit of these reforms will encounter many barriers. Our recommendations, therefore, require a series of enabling actions. First, the broad engagement of leaders at all levels—local, national, and global—will be crucial to achieve the proposed reforms and outcomes. Leadership has to come from within the academic and professional communities, but it must be backed by political leaders in government and society. Second, present funding deficiencies must be overcome with a substantial expansion of investments in health professional education

from all sources: public, private, development aid, and foundations. Third, stewardship mechanisms, including socially accountable accreditation, should be strengthened to assure best possible results for any given level of funding. Lastly, shared learning by supporting metrics, evaluation, and research should be strengthened to build up the knowledge base about which innovations work under which circumstances.

Health professionals have made enormous contributions to health and development over the past century, but complacency will only perpetuate the ineffective application of 20th century educational strategies that are unfit to tackle 21st century challenges. Therefore, we call for a global social movement of all stakeholders—educators, students and young health workers, professional bodies, universities, non-governmental organisations, international agencies, donors, and foundations—that can propel action on this vision and these recommendations to promote a new century of transformative professional education. The result will be more equitable and better performing health systems than at present, with consequent benefits for patients and populations everywhere in our interdependent world.

Section 1: problem statement

Background and rationale

Complex challenges

Health is all about people. Beyond the glittering surface of modern technology, the core space of every health system is occupied by the unique encounter between one set of people who need services and another who have been entrusted to deliver them. This trust is earned through a special blend of technical competence and service orientation, steered by ethical commitment and social accountability, which forms the essence of professional work. Developing such a blend requires a lengthy period of education and a substantial investment by both student and society. Through a chain of events flowing from effective learning to high-quality services to improved health, professional education at its best makes an essential contribution to the wellbeing of individuals, families, and communities.

Yet, the context, content, and conditions of the social effort to educate competent, caring, and committed health professionals are rapidly changing across time and space. The startling doubling of life expectancy during the 20th century was attributable to improvements in living standards and to advances in knowledge.[1] Abundant evidence suggests that good health is at least partly knowledge based and socially driven.[2,3] Scientific knowledge not only produces new technologies but also empowers citizens to adopt healthy lifestyles, improve care-seeking behaviour, and become proactive citizens who are conscious of their rights. Additionally, knowledge translated into evidence can guide practice and policy. Health systems are socially driven differentiated institutions with the primary intent to improve health,

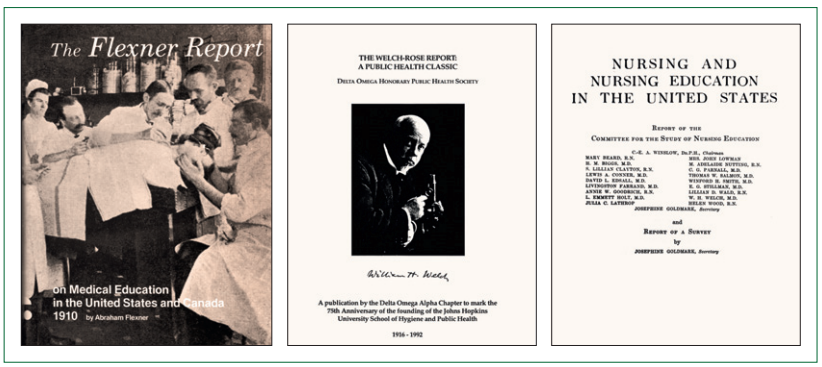

Figure 1: **Flexner, Welch-Rose, and Goldmark reports**

complementing the importance of social determinants and social movements in health. In these endeavours, professionals play the crucial mediating role of applying knowledge to improve health. Much evidence suggests that coverage and numbers of health professionals have a direct effect on health outcomes.[4] Health professionals are the service providers who link people to technology, information, and knowledge. They are also caregivers, communicators and educators, team members, managers, leaders, and policy makers.[5–12] As knowledge brokers, health workers are the human faces of the health system.

Arguably, dramatic reforms in the education of health professionals helped to catalyse health gains in the past century. After the discovery of the germ theory in Europe, the beginning of the 20th century witnessed widespread reforms in professional education around the world. In the USA early in the 20th century, such reports as by Flexner,[13] Welch-Rose,[14] and Goldmark[15] transformed postsecondary education of physicians, public health workers, and nurses, respectively (figure 1). These efforts to imbed a scientific foundation into the education of health professionals extended into other health fields.[16]

However, in the first decade of the 21st century, glaring gaps and striking inequities in health persist both between and within countries.[17–20] A large proportion of the 7 billion people who inhabit out planet are trapped in health conditions of a century earlier. Many face conflict and violence. Health gains have been reversed by the collapse of average life expectancy in some countries, which in sub-Saharan Africa is attributable to the HIV/AIDS pandemic.[21,22] Poor people in developing countries continue to have common infections, malnutrition, and maternity-related health risks, which have long been controlled in more affluent populations.[23] For those left behind, the spectacular advances in health worldwide are an indictment of our collective failure to ensure the equitable sharing of health progress.[24]

At the same time, health security is being challenged by new infectious, environmental, and behavioural threats superimposed upon rapid demographic and epidemiological transitions.[25–27] Health systems are struggling to keep up and are becoming more complex and costly, placing additional demands on health workers.

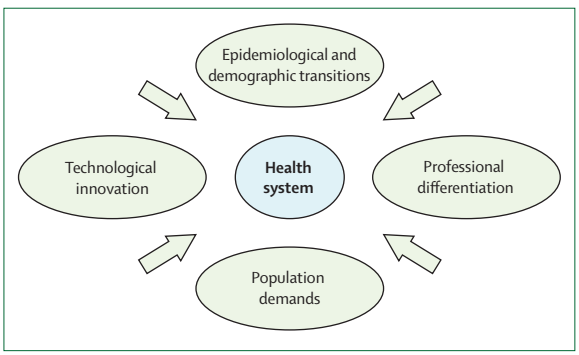

Figure 2: **Emerging challenges to health systems**

In many countries, professionals are encountering more socially diverse patients with chronic conditions, who are more proactive in their health-seeking behaviour.[28–31] Patient management requires coordinated care across time and space, demanding unprecedented teamwork.[5–11] Professionals have to integrate the explosive growth of knowledge and technologies while grappling with expanding functions—super-specialisation, prevention, and complex care management in many sites, including different types of facilities alongside home-based and community-based care (figure 2).[7–12]

Consequently, a slow-burning crisis is emerging in the mismatch of professional competencies to patient and population priorities because of fragmentary, outdated, and static curricula producing ill-equipped graduates from underfinanced institutions.[5–12,18–20] In almost all countries, the education of health professionals has failed to overcome dysfunctional and inequitable health systems because of curricula rigidities, professional silos, static pedagogy (ie, the science of teaching), insufficient adaptation to local contexts, and commercialism in the professions. Breakdown is especially noteworthy within primary care, in both poor and rich countries. The failings are systemic—professionals are unable to keep pace, becoming mere technology managers, and exacerbating protracted difficulties such as a reluctance to serve marginalised rural communities.[32,33] Professionals are falling short on appropriate competencies for effective teamwork, and they are not exercising effective leadership to transform health systems.

Poor and rich countries both have workforce shortages, skill-mix imbalances, and maldistribution of professionals.[7,32–35] In neither rich nor poor countries is professional education generating high value for money. Difficult to design and slow to implement, educational reforms in rich countries are attempting to develop professional competencies that are responsive to changing health needs, overcome professional silos through interprofessional education, harness information technology (IT)-empowered learning, enhance cognitive skills for critical inquiry, and strengthen professional identity and values for health leadership.[36–40] Reforms are especially challenging in poor countries, which are constrained by severely scarce resources.[38,40,41] Many countries are attempting to extend essential services through the deployment of basic health workers, even as millions of people resort to providers without credentials, both traditional and modern.[42] In an effort to achieve health goals, many poor countries are channelling external donor funding towards implementation of disease-targeted initiatives. Consequently, in many countries, postsecondary professional education is absent from the policy agenda and is overtaken by emergency or urgent action projects and is regarded as too costly, irrelevant, or long term.

A renaissance to a new professionalism—patient-centred and team-based—has been much discussed,[37,43–47] but it has lacked the leadership, incentives, and power to deliver on its promise. Some attempts to redefine the future roles and responsibilities of health professionals have floundered amid the rigid so-called tribalism that afflicts them. Advocacy for specific practitioner groups has been strong, but without an overall strategy for the broader health professional community to work together to meet individual and population health needs. Several well meaning recent efforts have attempted to address these fractures, but they have fallen short.

Fresh opportunities

Opportunities are opening for a new round of reforms to craft professional education for the 21st century, spurred by mutual learning due to health interdependence, changes in educational pedagogy, the public prominence of health, and the growing recognition of the imperative for change. Paradoxically, despite glaring disparities, interdependence in health is growing and the opportunities for mutual learning and shared progress have greatly expanded.[1,24] Global movements of people, pathogens, technologies, financing, information, and knowledge underlie the international transfer of health risks and opportunities, and flows across national borders are accelerating.[48] We are increasingly interdependent in terms of key health resources, especially skilled workers.[24]

Alongside the rapid pace of change in health, there is a parallel revolution in education. The explosive increase not only in total volume of information, but also in ease of access to it, means that the role of universities and other educational institutions needs to be rethought.[49] Learning, of course, has always been experienced outside formal instruction through all types of interactions, but the informational content and learning potential are today without precedent. In this rapidly evolving context, universities and educational institutions are broadening their traditional role as places where people go to obtain information (eg, by consulting books in libraries or listening to expert faculty members) to incorporate novel forms of learning that transcend the confines of the classroom. The next generation of learners needs the capacity to discriminate vast amounts of information and extract and synthesise knowledge that is necessary

for clinical and population-based decision making. These developments point toward new opportunities for the methods, means, and meaning of education.[5–12,18–20]

Like never before, the public prominence of health in general and global health in particular has generated an environment that is propitious for change. Health affects the most pressing global issues of our time: socioeconomic development, national and human security, and the global movement for human rights. We now understand that good health is not only a result of but also a condition for development, security, and rights. At the same time, access to high-quality health care with financial protection for all has become one of the major domestic political priorities worldwide.

A full and authoritative examination and redesign of the education of health professionals is warranted to match the ambition of reformers a century ago. Such a review would necessarily be globally inclusive and multiprofessional, spanning borders and constituencies. Reform for the 21st century is timely because of the imperative to align professional competencies to changing contexts, growing public engagement in health, and global interdependence, including the shared aspiration of equity in health.

Commission work

The Commission on education of health professionals for the 21st century was launched in January, 2010. This independent initiative, led by a diverse group of 20 commissioners from around the world, adopted a global perspective seeking to advance health by recommending instructional and institutional innovations to nurture a new generation of health professionals who would be best equipped to address present and future health challenges. Webappendix pp 1–5 lists the members of the Commission and its advisory bodies. We pursued research, undertook deliberations, and promoted consultations during 1 year. The brevity of time constrained the scope and depth of consultations, data compilation, and analyses. Our aim was to develop a fresh vision with practical recommendations of specific actions that might catalyse steps towards the transformation of health professional education in all countries, both rich and poor. The work of the Commission is intended to mark the centennial of the 1910 Flexner report, which has powerfully shaped medical education throughout the world.

Integrative framework

The Commission began by defining its object of study—health professional education. The present division of labour between the various health professions is a social construction resulting from complex historical processes around scientific progress, technological development, economic relations, political interests, and cultural schemes of values and beliefs. The dynamic nature of professional boundaries is underscored by the continuous struggles between different professional groups to delimit their respective spheres of practice. The division of labour at any specific time and in any specific society is much more the result of these social forces than of any inherent attribute of health-related work.

In most of this report we continue to refer to the health professions in a conventional manner. We focus on health workers who have completed postsecondary education—typically in universities or other institutions of higher learning that are legally allowed to certify educational attainment by issuing a formal degree. Although this definition does not include most ancillary and community health workers and there has been substantial growth of new occupational categories or specialisations, we focus mostly on the conventional professions, with special emphasis on medicine, nursing-midwifery, and public health. Our analyses and recommendations are directed at all health professions. However boundaries between health professions are delineated, all are subject to educational processes aimed at developing knowledge, skills, and values to improve the health of patients and populations. There is, therefore, a fundamental linkage between professional education, on the one hand, and health conditions, on the other. For this reason, the Commission developed a framework aimed at understanding of the complex interactions between two systems: education and health (figure 3).

By contrast with other frameworks, in which the population is exogenous to health or education systems, ours conceives of the population as the base and the driver of these systems. People generate needs in both education and health, which in turn may be translated into demand for educational and health services. The provision of educational services generates the supply of an educated workforce to meet the demand for professionals to work in the health system. Of course, people are not only recipients of services but actual coproducers of their own education and health.

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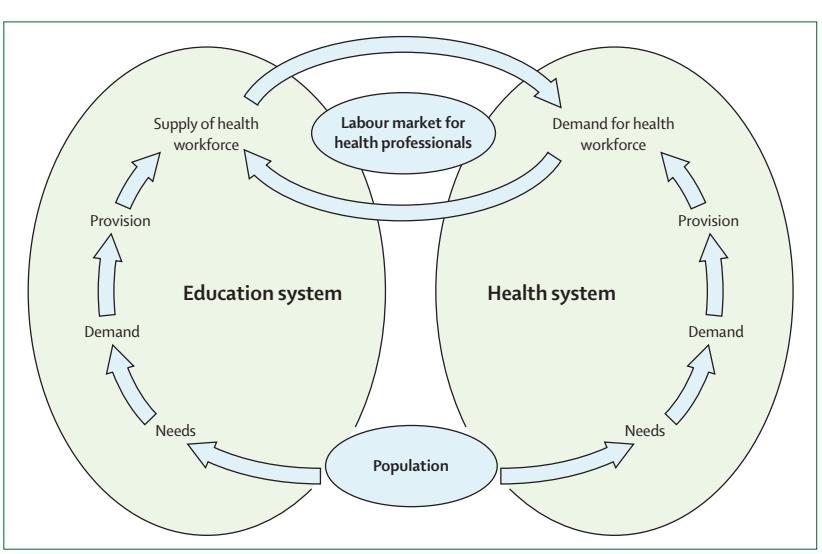

Figure 3: **Systems framework**

In this system approach, the interdependence of the health and education sectors is paramount. Balance between the two systems is crucial for efficiency, effectiveness, and equity. Every country has its own unique history, and legacies of the past shape both the present and the future. There are two crucial junctures in the framework. The first is the labour market, which governs the fit or misfit between the supply and demand of health professionals, and the second is the weak capacity of many populations, especially poor people, to translate their health and educational needs into effective demand for the respective services. In optimum circumstances, there is a balance between population needs, health-system demand for professionals, and supply thereof by the educational system. Educational institutions determine how many of what type of professionals are produced. Ideally they do so in response to labour market signals generated by health institutions, and these signals should correctly respond to the needs of the population.

However, in reality the labour market for health professionals is often characterised by multiple imbalances,[50] the most important of which are undersupply, unemployment, and underemployment, which can be quantitative (less than full-time work) or qualitative (suboptimum use of skills). To avoid these imbalances, the educational system must respond to the requirements of the health system. However, this tenet does not imply a subordinate position of the education system. We see educational institutions as crucial to transform health systems. Through their research and leadership functions, universities and other institutions of higher learning generate evidence about the shortcomings of the health system, and about potential solutions. Through their educational function, they produce professionals who can implement change in the organisations in which they work.

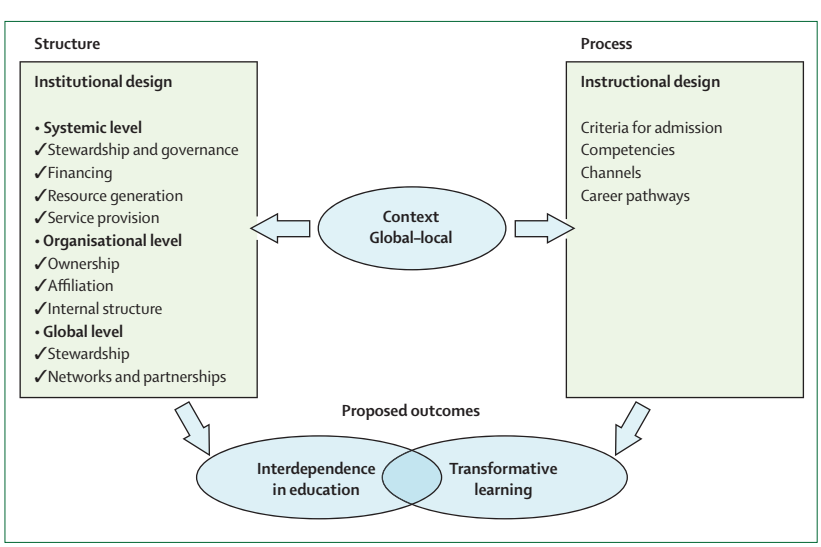

Figure 4: **Key components of the educational system**

In addition to labour market linkages, the education and health systems share what could be thought of as a joint subsystem—namely, the health professional education subsystem. Whereas in a few countries schools for health professionals are ascribed to the health ministry, in others they are under the jurisdiction of the education ministry. Irrespective of this administrative issue, the health professional education subsystem has its own dynamic, resulting from its location at the intersection of two major societal systems. After all, health-care spaces are also educational spaces, in which the in-service education of future professionals takes place.

The linkage between the education and the health systems should also address the delivery models that determine the skill mix of health workers and the scope for task shifting. In addition to the managerial aspects, there is a political dimension, since health professionals do not act in isolation but are usually organised as interest groups. Furthermore, governments very often influence the supply of health professionals in response to political situation more than to market rationality or epidemiological reality. Lastly, labour markets for health professionals are not only national but also global. In professionals with internationally recognised credentials, migration is a growing occurrence.

After specification of the linkages between the health and educational spheres, our framework identifies three key dimensions of education: institutional design (which specifies the structure and functions of the education system), instructional design (which focuses on processes), and educational outcomes (which deal with the desired results; figure 4). Aspects of both institutional and instructional design were already present in the original reports of the 20th century,[13–15] which sought to answer not only the question of what and how to teach, but also where to teach—ie, the type of organisation that should undertake the programmes of instruction. However, by contrast with the reports of a century ago, ours considers institutions not only as individual organisations, but also as part of an inter-related set of organisations that implement the diverse functions of an educational system.

By adaptation of a framework that was originally formulated to understand health-system performance,[51] we can think of four crucial functions that also apply to educational systems: (1) stewardship and governance, which encompass instruments such as norms and policies, evidence for decision making, and assessment of performance to provide strategic guidance for the various components of the educational system; (2) financing, which entails the aggregate allocation of resources to educational institutions from both public and private sources, and the specific modalities for determining resource flows to each educational organisation, with the ensuing set of incentives; (3) resource generation, most importantly faculty development; and (4) service provision, which refers to the actual delivery of the educational service and as such reflects instructional design.

The way that the four functions are structured defines the systemic level shown in figure 4. Within a system, individual organisations will vary according to ownership (eg, public, private non-profit, or private for profit), affiliation (eg, freestanding, part of a health sciences complex, or part of a comprehensive university), and internal structure (eg, departmental or otherwise). These are all important aspects of institutional design. Equally important is the global level. The stewardship function that should be done nationally has a global counterpart, especially with respect to normative definitions about common core competencies that all health professions should have in every country. An emerging development globally refers to new forms of organisation, such as networks and partnerships, which take advantage of information and communication technologies.

To have a positive effect on the functioning of health systems and ultimately on health outcomes of patients and populations, educational institutions have to be designed to generate an optimum instructional process. Instructional design involves what can be presented as four Cs: (1) criteria for admission, which include both achievement variables, such as previous academic performance, and adscription variables, such as social origin, race or ethnic origin, sex, and nationality; (2) competencies, as they are defined in the process of designing the curriculum; (3) channels of instruction, by which we mean the set of didactic methods, teaching technologies, and communication media; and (4) career pathways, which are the options that graduates have on completion of their professional studies, as a result of the knowledge and skills that they have attained, the process of professional socialisation to which they have been exposed as students, and their perceptions of opportunities in local or global labour markets (figure 4).

Different configurations of institutional and instructional design will lead to varying educational outcomes. Making the desired results explicit is an essential element in assessment of the performance of any system. In the case of our Commission, two outcomes were proposed for the health professional education system—transformative learning and interdependence in education. Transformative learning is the proposed outcome of improvements in instructional design; interdependence in education should result from institutional reforms (figure 4). Because they are the guiding notions of our recommendations, they will be discussed in the final section of this report.

A final component of our framework, shown in figure 4, is that all aspects of the educational system are deeply affected by both local and global contexts. Although many commonalities might be shared globally, there is local distinctiveness and richness. Such diversity provides opportunities for shared learning across countries at all levels of economic development.

Data and methods

The conceptual framework was used to guide the Commission's research, consultations, and report writing. Webappendix pp 6–10 provides detailed data and methods for this work. The data consisted of a review of published work, quantitative estimations, qualitative case studies, and commissioned papers, supplemented by consultations with experts and young professionals. We searched all published articles indexed in PubMed and Medline relevant to postsecondary education in medicine, nursing, and public health. Undergraduate medical educational institutions were compiled by combining two major databases: Foundation for the Advancement of International Medical Education and Research (FAIMER) and Avicenna, updated by recent regional and country data. We estimated public health institutional counts from regional association websites, but nursing-midwifery did not have comparable international data. Because of definitional ambiguity, estimation of public health and nursing institutions was incomplete.

The numbers of graduates of medicine and nursing-midwifery were derived from both direct reports (eg, from the Organization for Economic Cooperation and Development [OECD]) and estimates of yearly flows from the modelling of nursing stock reported by WHO. We did not estimate the number of public health graduates because of data and definitional restrictions. Financing estimations were calculated through both microapproaches and macroapproaches. Microapproaches to estimating the financing of medical and nursing education were based on unit costs of undergraduate education multiplied by number of graduates. We compared these results with macroapproaches that calculated the share of tertiary educational financing devoted to medical and nursing education. Although not precise, the convergence of microapproaches and macroapproaches provides some assurance that the broad order of magnitude of our estimations is robust.

Section 2: major findings

The Commission's major findings are presented in four subsections. The first describes a century of educational reforms, grouped into three generations. The next two subsections present our diagnosis based on the major categories of the conceptual framework. Analysis of institutional design relies mainly on quantitative data to present a global analysis of institutions, graduates, and financing, followed by key stewardship functions such as accreditation, academic systems, faculty development, and collaboration for shared learning. We then examine instructional design, focusing on the purpose, content, method, and outcomes of the learning process. Challenges are categorised according to the four Cs explained in the conceptual framework: criteria for admission, competencies, channels, and career pathways. In the final subsection we cut across institutions and instruction by examining the challenges of local

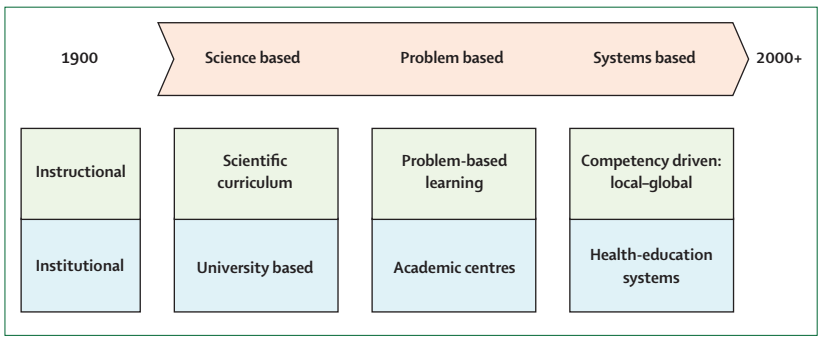

Figure 5: **Three generations of reform**

Panel 1: The Flexner, Rose-Welch, and Goldmark reports

Three seminal US reports (Flexner, Welch-Rose, and Goldmark) had powerful effects in professional health education in North America, and arguably by extension around the world. All the reports recommended major instructional reforms to integrate modern medical sciences into the core curriculum, and institutional reforms to link education to research and the basing of professional education in comprehensive universities.

Flexner report 1910[13]

The report introduced the modern sciences as foundational for the medical curriculum into two successive phases: 2 years of basic biomedical sciences, based in universities, followed by 2 years of clinical training, based in academic medical hospitals and centres. Research was to be viewed not as an end in itself but as a link to improved patient care and clinical training. Flexner also changed the doctor's education from an apprenticeship model to an academic model, and his report created the conditions for the birth of academic medical centres, ushering in a hitherto unknown era of discovery. In 1912, Flexner extended his study of medical education to a group of key European countries.[63] Although the Flexner model of professional education was widely adopted outside the USA and Canada, it has often not been sufficiently adapted to address health in vastly different societal contexts.

Welch-Rose report 1915[14]

This report offered two competing visions of public health professional education. Rose's plan was for a national system of public health training with central national schools acting as the focus for a network of state schools, both emphasising public health practice. By contrast, Welch's plan called for institutes of hygiene, following the German model, with increased emphasis on scientific research and connections to a medical school in comprehensive universities. Welch's plan was financed by the Rockefeller Foundation to create the Johns Hopkins School of Public Health and Hygiene in 1916, and the Harvard School of Public Health in 1922. Most schools of public health in the USA followed the Welch model as independent faculties in universities. Outside the USA and Canada, both institutional models described by Rose and Welch were implemented and co-exist to this day.

Goldmark report 1923[16]

This report advocated for university-based schools of nursing, citing the inadequacies of existing educational facilities for training skilled nurses. The report put nursing on the same academic trajectory as medicine and public health in the USA, albeit a little later in time. Although major health burdens prevailing at the time—such as infant mortality and tuberculosis—had greatly decreased, the importance of an improved trained nursing workforce remains, including high standards of nursing educational attainment.

adaptability in an interdependent globalising world. In view of the huge diversity of health and educational systems, we address the question, how can instructional and institutional design achieve effectiveness in diverse contexts while at the same time harnessing the power of global pools and flows of knowledge and other resources?

Century of reforms

To capture historical developments in the past century, we defined three generations of reforms (figure 5). We recognise that, as with all classification schemes, this one simplifies multidimensional realities, so our categories are broad and to some extent arbitrary. Yet, they are informed by historical analyses, and we believe that they have heuristic value. The word generation conveys the notion that this development is not a linear succession of clear-cut reforms. Instead, elements of each generation persist in the subsequent ones, in a complex and dynamic pattern of change. The first generation, launched at the beginning of the 20th century, instilled a science-based curriculum. Around mid-century, the second generation introduced problem-based instructional innovations. A third generation is now needed that should be systems based.

Most countries and professional institutions have mixed patterns of these reforms. In some countries, most schools are entirely confined to the first generation, with traditional and stagnant curricula and teaching methods and with an inability, or even resistance, to change.[18,19] Many countries are incorporating second-generation reforms, and a few are moving into the third generation.[52–55] No country seems to have all schools in the third generation.

Although the three generations are bounded in the 20th century, we recognise that innovation in medical learning has long and deep historical roots worldwide. Early systems of medical education were reported in India around 6th century BC in a classical text called Susruta Samhita,[56] and in China with lectureships in Chinese medicine at the Imperial Academy in 624 AD.[57] Arab and north African civilisations had flourishing medical learning systems, as did the Greeks and the Mesoamerican civilisations.[58,59] In the UK, the Royal College of Physicians started in the 17th century.[60]

Educational reforms in the 20th century share roots going back to social movements and the development of the medical sciences in the 19th century. In the mid-1800s, Florence Nightingale[61] campaigned that good nursing care saved lives, and good nursing care depended on educated nurses. The first nursing education programme began in London in 1859, as 2-year hospital-based training that soon spread quickly in the UK, the USA, Germany, and Scandinavian countries.[62] The roots of modern medicine and public health go back similarly to the mid-1800s, propelled by discoveries that proved the germ theory. By the beginning of the 20th century, the fields of medicine and public health had been left behind

by scientific advances, with no rigorous standards of education and practice based on modern foundations.

After developments in western Europe, the first generation of 20th century reforms in North America were sparked by such reports as Flexner (1910),[13] Welch-Rose (1915),[14] Goldmark (1923),[15] and Gies (1926),[16] which launched modern health sciences into classrooms and laboratories in medicine, public health, nursing, and dentistry, respectively (panel 1). These reforms, which were usually sequencing education in the biomedical sciences followed by training in clinical and public health practice, were joined by similar efforts in other regions. Curricular reform was linked to institutional transformation—university bases, academic hospitals linked to universities, closure of low-quality proprietary schools, and the bringing together of research and education. The goals were to advance scientifically based professionalism with high technical and ethical standards.

American philanthropy, led by the Rockefeller Foundation, the Carnegie Foundation for the Advancement of Teaching, and other similar organisations, promoted these educational reforms by financing the establishment of dozens of new schools of medicine and public health in the USA and elsewhere.[64] 2 years after the publication of his original report, which focused on the USA and Canada, Flexner[63] extended his study of medical education to the German Empire, Austria, France, England, and Scotland. But the influence went beyond nations in western Europe. The so-called Flexner model was translated into action through the establishment of new medical schools, the earliest and most prominent being the Peking Union Medical College founded in China by the Rockefeller Foundation and implemented by its China Medical Board in 1917.[63,65]

In public health, the earlier experiences at the London School of Tropical Medicine, Tulane University,[66] and the Harvard-MIT School for Health Officers were affected by the Welch-Rose report,[14] which paved the way for a major growth in new schools starting with the Johns Hopkins School of Hygiene and Public Health (1916), the Harvard School of Public Health (1922), the School of Public Health of Mexico (1922), a renewed London School of Hygiene and Tropical Medicine (1924), and the University of Toronto School of Public Health (1927). The Welch-Rose model was also exported through Rockefeller's funding of 35 new schools of public health overseas, as exemplified by the School of Public Health of Mexico, which was established in 1922 as part of the Federal Department of Health.

This mass-scale export and adoption had mixed outcomes, with useful results in some countries but also severe misfits in others. In 1987, the pioneering Mexican school underwent major reform when it merged with the Centre for Public Health Research and the Centre for Infectious Disease Research to form the National Institute of Public Health—one of the leading institutions of its type in the developing world.[67] Many other innovative examples, including several in the Arabian countries and south Asia, show the capacity of public health academic institutions to respond to diverse and rapidly changing local requirements (panel 2).

In parallel with the increasing engagement of national governments in health affairs, a second generation of reforms began after World War 2 both in industrialised and in developing nations, many of which had just gained independence from colonialism.[71] School and university

For more on the **Public Health Foundation of India** see http://www.phfi.org/

For the **BRAC University's School of Public Health** see http://www.bracuniversity.net/I&S/sph/

***Panel 2:* Adaptation of public health education and research to local priorities**

Several public health institutes have developed over recent decades in response to very diverse local contexts. We present innovations in three regions: Arabian countries, Mexico, and south Asia.

Institute of Community and Public Health, Birzeit University, occupied Palestinian territory, is one of three independent schools of public health linked to leading universities in the Arab region; the High Institute of Public Health (HIPH) at the University of Alexandria in Egypt is a large institution founded in 1956; and the Faculty of Health Sciences, American University of Beirut (AUB), Lebanon, was established as separate from AUB's medical school in 1954 and achieved accreditation of its graduate public health programme from the US Council on Education for Public Health in 2006. All were uniquely shaped by national contexts, ranging from a strong state in Egypt to civil conflict in Lebanon, to absent state structures in the occupied Palestinian territory. All have adopted different approaches to public health: application of evidence-based interventions to improve health-care delivery and environmental health in Egypt; expansion of multisectoral developmental public health practice in Lebanon; and focus on social determinants of health necessitating actions inside and outside the health sector in the occupied Palestinian territory.[68]

National Institute of Public Health of Mexico (NIPH),[69] founded in 1987, responded to rapid national economic and social change, striving to balance excellence in its research and educational mission with relevance to decision making through proactive translation of knowledge into evidence for policy and practice. The Institute widely disseminated a conceptual base around the essential attributes of public health; developed educational programmes across diverse areas of concentration; implemented a wide range of innovative educational approaches, from short courses to doctoral programmes; and developed sound evidence that supported the design, implementation, and evaluation of the ongoing health reform initiative for universal coverage. The success of the NIPH underscores the crucial importance of national and international networking to withstand local difficulties by sharing of experiences to build a strong health-research system that is able to tackle a vast array of local and global health challenges.

The Public Health Foundation of India is a unique private–public partnership to energise public health by bringing together pooled resources from the Indian Government and private philanthropy to address India's priority health challenges. The Foundation is crafting partnerships with four state governments to create eight training institutes of public health in the country.[70] The BRAC University's School of Public Health, named after UNICEF's visionary leader James P Grant, was launched by the world's largest non-governmental organisation and offers an innovative 12-month curriculum for masters in public health that begins with 6 months on its Savar rural campus acquiring basic public health skills in the context of rural health action, followed by the remaining 6 months of thematic and research training. These two public health initiatives in south Asia were based on the legacy of British colonialism, which focused exclusively on medical rather than public health schools. Importantly, both these schools are developing new curricula shaped to national and global priorities, and neither is adopting wholesale the Welch-Rose model of public health education.

development was accompanied by expansion of tertiary hospitals and academic health centres that trained health professionals, did research, and provided care, thereby integrating these three areas of activity. Pioneered in the 1950s was the idea of graduate medical education as postgraduate training, which was similar to an apprenticeship, through residency programmes in hospital-based academic centres.[72]

The major instructional breakthroughs from the second generation of reforms were problem-based learning and disciplinarily integrated curricula. In the 1960s, McMaster University in Canada pioneered student-centred learning based on small groups as an alternative to didactic lecture-style teaching.[73] Simultaneously, an integrated rather than discipline-bound curriculum was experimentally developed in Newcastle in the UK and Case Western Reserve in the USA.[74,75] Other curricular innovations included standardised patients—ie, individuals who are trained to act as a real patient to simulate a set of symptoms or problems—to assess students on practice,[76] strengthening doctor–patient relationships through facilitated group discussions,[77] and broadening the continuum from classroom to clinical training through earlier student exposure to patients and an expansion of training sites from hospitals to communities.[78–81] In public health, disciplines expanded along with multidisciplinary work, and in nursing there was accelerated integration of schools into universities, with advanced graduate programmes at the master and doctoral levels.

Panel 3: Women and nursing in Islamic societies

Women and nursing in Islamic societies has a long and rich history. In the Middle East and north Africa, higher education in nursing started in 1955 when the first Higher Institute of Nursing in the region was established in the Faculty of Medicine of the Egyptian University of Alexandria. Endorsed by WHO, the Institute offered a bachelor of nursing degree. The Institute became an autonomous faculty affiliated to the University in 1994, offering both masters and doctoral degrees in nursing sciences. During the past 50 years, the faculty of nursing has produced more than 6000 graduates, many assuming leadership in the region.

Another pioneer is the Aga Khan University School of Nursing, which was established in Pakistan in 1980, and which began offering a bachelor of science in nursing in 1997 and the masters of science in 2001.[83] The school has devised a unique curriculum adapted to local contexts but based on the curriculum recommended by the American Association of Colleges of Nursing's Essentials of Master's Education in Advanced Nursing (1996).[84] Aga Khan University has also expanded the bachelors and masters nursing programmes to its campus in east Africa.[83] In addition to training nurses, these advanced degree programmes attract high-quality candidates in Islamic society, showing societal prestige and value for women entering the nursing profession.

For the **Faculty of Nursing at the University of Alexandria** see: http://www.alexnursing.edu.eg

Before the centennial of the Flexner report, a series of initiatives have once again heightened national and global attention about the future of education of health professionals. We summarise four sets of major reports that focus on education of the global health workforce, nursing education, public health education, and medical education. Recommendations in these reports are increasingly coalescing into a third generation of reforms that emphasise patient and population centredness, competency-based curriculum, interprofessional and team-based education, IT-empowered learning, and policy and management leadership skills. These areas, we believe, provide a strong base for formulation of reform initiatives into the 21st century.

Global workforce education has witnessed a major resurgence of policy attention, partly driven by imperatives to achieve national and global health objectives as set out by the Millennium Development Goals (MDGs). Three major reports are noteworthy in terms of education and training of the workforce: *Task Force on Scaling-Up and Saving Lives*,[20] *World Health Report*,[19] and the *Joint Learning Initiative*.[18] These reports all underscore the centrality of the workforce to well performing health systems to achieve national and global health goals. All the reports draw attention to the global crisis of workforce shortages estimated worldwide at 2·4 million doctors and nurses in 57 crisis countries. The crisis is most severe in the world's poorest nations that are struggling to achieve the MDGs, particularly in sub-Saharan Africa. The shortages also emphasise associated issues, including imbalances of skill mix, negative work environment, and maldistribution of health workers. The reports cite imbalanced labour market dynamics that are failing to ensure adequate rural coverage while generating unemployed professionals in capital cities, and the international migration of professionals from poor to rich countries.

These reports recommend vastly increasing investment in education and training. They concentrate on basic workers because of the importance of primary health care and the long time lag and high costs of postsecondary education. Consequently, health professionals, although acknowledged, do not receive much attention. These reports, however, are sparking growing interest in task shifting and task sharing—a process of delegating practical tasks from scarce professionals to basic health workers. All reports propose increased investment, sharing of resources, and partnerships within and across countries.

Nursing education is the focus of three major reports in 2010: *Radical transformation,* by the Carnegie Foundation; *Frontline care*,[9] a UK Prime Minister commission;[12] and the *Robert Wood Johnson Foundation Initiative on the future of nursing*, at the US Institute of Medicine.[82] The Carnegie report concluded that although nursing has been effective in promotion of professional identity and ethical comportment, the challenge remains of anticipating changing demands of practice through strengthening of scientific education and integration of classroom and

clinical teaching. The UK Commission identifies the requisite core competencies, skills, and support systems for nursing. For the National Health Service it recommends mainstreaming nursing into national service planning, development, and delivery. Pioneering work in nursing education is also being pursued in other regions—eg, in China and Islamic countries (panel 3).

Public health education is the subject of two major reports by the US Institute of Medicine in 2002 and 2003, both focusing on the future of public health in the 21st century.[5,6] The reports recommend that the core curriculum adopt transdisciplinary and multischool approaches, and instil a culture of lifelong learning. They also urge that public health skills and concepts be better integrated into medicine, nursing, and other allied health fields, become more engaged with local communities and policy makers, and be disseminated to other practitioners, researchers, educators, and leaders. Importantly, the reports argue in favour of expanding federal funding for public health development.

Medical education has received great attention, as shown by a series of four selected recent reports: *Future of medical education*, by the Associations of Faculties of Medicine of Canada;[11] *Tomorrow's doctors*, by the General Medical Council of the UK;[8] *Reform in educating physicians*, by the Carnegie Foundation;[10] and *Revisiting medical education at a time of expansion*, by the Macy Foundation.[7] An additional report was issued by the Association of American Medical Colleges: *A snapshot of medical student education in the USA and Canada*.[85] All reports concur that health professionals in the USA, the UK, and Canada are not being adequately prepared in undergraduate, postgraduate, or continuing education to address challenges introduced by ageing, changing patient populations, cultural diversity, chronic diseases, care-seeking behaviour, and heightened public expectations.

The focus of these reports is on core competencies beyond the command of knowledge and facts. Rather, the competencies to be developed include patient-centred care, interdisciplinary teams, evidence-based practice, continuous quality improvement, use of new informatics, and integration of public health. Research skills are valued, as are competencies in policy, law, management, and leadership. Undergraduate education should prepare graduates for lifelong learning. Curriculum reforms include outcome-based programmes tracked by assessment, capacity to integrate knowledge and experiences, flexible individualisation of the learning process to include student-selected components, and development of a culture of critical inquiry—all for equipping physicians with a renewed sense of socially responsible professionalism.

The perspectives of these major initiatives between rich and poor countries, and between the professions, are very different. These differences reflect the huge diversity of conditions between countries at various stages of educational and health development and the core competencies of different professions. At the same time, they underscore the opportunities for mutual learning across diverse countries.[24] Taken together, they form a base of convergence around a third generation of reforms that promise to address gaps and opportunities in a globalising world.

Institutional design

In this subsection, we focus on institutions of postsecondary education that offer professional degrees in medicine, public health, or nursing. Such educational institutions might be extraordinarily diverse. They might be independent or linked to government, part of a university or freestanding, fully accredited, or even informally established. Their facilities might range from rudimentary field training sites to highly sophisticated campuses. And each country, of course, has its own unique legacy because institution building is a long-term, path-dependent development process.

One major distinction is between public versus private ownership, with a wide range of patterns in between. Although some are autonomous, many publicly owned institutions are also publicly operated, usually under the oversight of the ministry of education or the ministry of health. In decentralised countries, state or provincial governments might be especially engaged. The oversight between these ministries and departments often falls predominantly to one or the other, and coordination might not be strong because of preoccupation of competing priorities.

Private institutions might be non-profit or for-profit. Historically, religious and missionary movements have established many non-profit hospitals and some medical and nursing schools. Non-profit institutions have also been created by philanthropy, charitable organisations, and corporations as part of their social endeavours. In many countries, proprietary for-profit schools are increasing, especially to produce doctors and nurses to exploit opportunities in the global labour market.[35,86,87] Most institutions possess mixed patterns of public and private governance. Private institutions often depend heavily on public subsidies for research, scholarships, and services, whereas publicly owned and operated institutions often have distinguished private individuals serving in leadership and governance roles.

In our study, all such institutions have degree-granting authority. There is a multiplicity of degrees, and the same degree could be acquired with highly variable curricular content, duration of study, quality of education, and competency achieved. Globally, and even nationally, there is little uniformity with respect to qualification and competency of degree holders. Medical doctors in China, for example, might obtain professional practice degrees with 3, 5, 7, or 8 years of postsecondary education.[88] These graduates are the credentialled practitioners, compared with the nearly 1 million additional village doctors who mostly have only vocational training.[89] In public health,

bachelor degree holders constitute a large proportion of professionals worldwide. Many postgraduate degree holders have attended independent public health schools, but many attended medical school departments or subunits. Postgraduate public health degree holders come from multiple professions—clinical medicine, nursing, dentistry, pharmacy—or other fields such as social sciences, law, humanities, biology, and social policy. Nursing produces postsecondary graduates with a bachelor of science in a nursing degree. An increasing number of nurses are continuing on to masters or doctoral training.[9] However, substantial numbers, perhaps even the bulk of nurses, have vocational or on-the-job training.

Our study undertook a quantitative assessment of educational institutions in medicine, nursing, and public health. To our knowledge, this is the first-ever mapping of health professional education around the world. After showing the patterns of institutions, graduates, and financing, we discuss frontier challenges as key drivers for institutional improvement—accreditation, academic centres, collaboration, faculty development, and learning.

Global perspective

Because of restricted data availability, our global perspective focuses on medical education, but when data are available we cite comparable information about nursing, public health, dentistry, pharmacy, and community health workers. Not surprisingly, we recorded large global diversity in medical institutions, with abundance and scarcity across countries. Scarcity is associated with low national income, especially affecting sub-Saharan Africa; however, abundance is not concentrated only in wealthy countries. Indeed, several middle-income countries have increased the number of institutions to deliberately export professionals, because many wealthy countries have chronic deficits since they underproduce below national requirements. Not surprisingly, the number and pattern of medical institutions do not match well with national population size, gross national product, or burden of disease.

We estimate about 2420 medical schools producing around 389 000 medical graduates every year for a world population of 7 billion people (table 1). Noteworthy are the large number of medical schools in India, China, western Europe, and Latin America and the Caribbean, by contrast with the scarcity of schools in central Asia, central and eastern Europe, and sub-Saharan Africa. We also estimate 467 schools or departments of public health, which is 20% of the number of medical schools. Our count of public health schools is hampered by variability in definition. We aggregated degree-granting public health institutions with medical school departments or subunits offering varying degree titles such as community medicine, preventive medicine, or public health. We estimate that about 541 000 nurses graduate every year, which is nearly double the number of medical graduates. Counts of nursing schools are not straightforward because of few data and ambiguous definitions. Although nursing has many postgraduate programmes, there are also many certificate programmes in vocational schools. Many are traditional or informal practitioners with

	Population (millions)	Estimated number of schools		Estimated graduates per year (thousands)		Workforce (thousands)	
		Medical	Public health	Doctors	Nurses/midwives	Doctors	Nurses/midwives
Asia							
China	1371	188	72	175	29	1861	1259
India	1230	300	4	30	36	646	1372
Other	1075	241	33	18	55	494	1300
Central	82	51	2	6	15	235	603
High-income Asia-Pacific	227	168	26	10	56	409	1543
Europe							
Central	122	64	19	8	28	281	670
Eastern	212	100	15	22	48	840	1798
Western	435	282	52	42	119	1350	3379
Americas							
North America	361	173	65	19	74	793	2997
Latin America/Caribbean	602	513	82	35	33	827	1099
Africa							
North Africa/Middle East	450	206	46	17	22	540	925
Sub-Saharan Africa	868	134	51	6	26	125	739
World	7036	2420	467	389	541	8401	17 684

Webappendix pp 6–11 shows data sources and regional distribution.

Table 1: **Institutions, graduates, and workforce by region (2008)**

on-the-job training without formal degrees. The cutoff between pre-secondary and postsecondary schooling is difficult to navigate.

Figure 6 shows the density of medical schools by major regions. The most abundant regions are western Europe, north Africa and the Middle East, and Latin America and

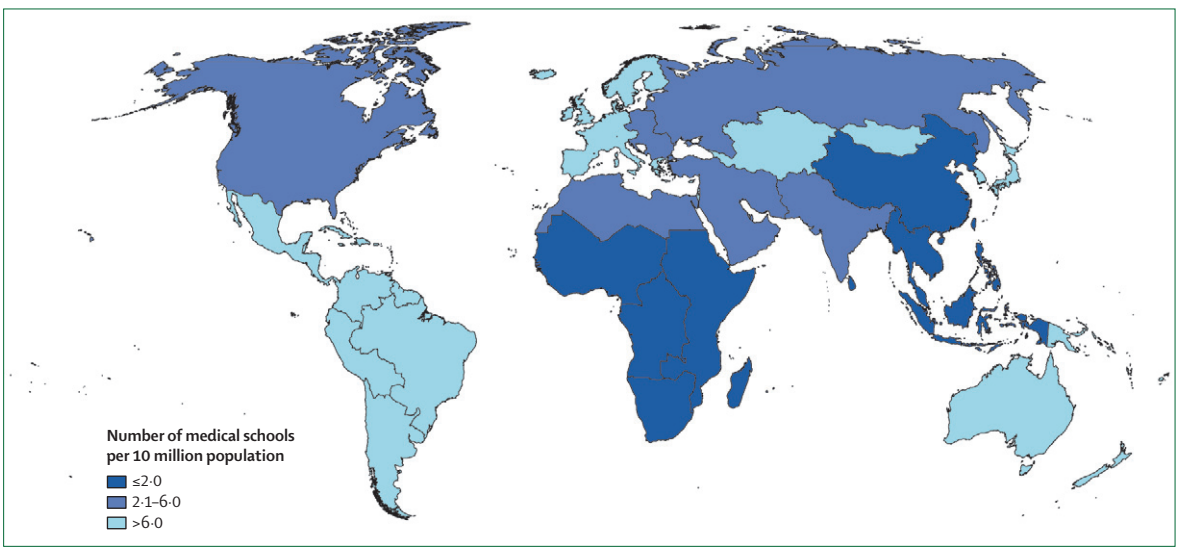

***Figure 6*: Density of medical schools by region**
Data sources are shown in webappendix pp 6–11.

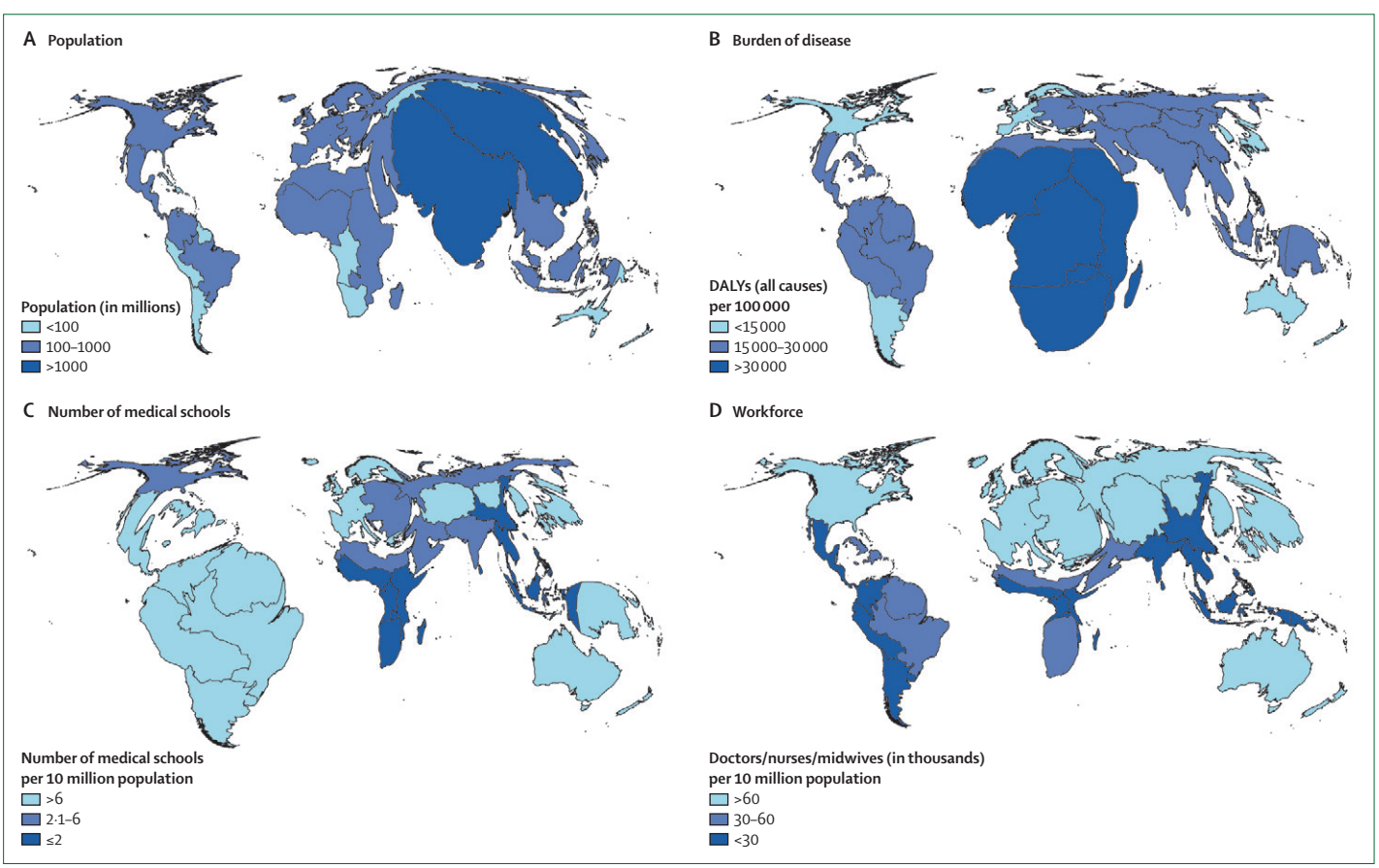

***Figure 7*: World maps resized by population (A), burden of disease (B), density of medical schools (C), and density of workforce (D)**
Data sources are shown in webappendix pp 6–11. DALY=disability-adjusted life-years.

	Doctors			Nurses/midwives		
	Estimated number of graduates per year (thousands)	Estimated expenditure per graduate (US$ thousands)	Total expenditure (US$ billions)	Estimated number of graduates per year (thousands)	Estimated expenditure per graduate (US$ thousands)	Total expenditure (US$ billions)
Asia						
China	175	14	2·5	29	3	0·1
India	30	35	1·0	36	7	0·2
Other	18	85	1·6	55	20	1·1
Central	6	74	0·4	15	13	0·2
High-income Asia-Pacific	10	381	3·8	56	75	4·2
Europe						
Central	8	181	1·4	28	39	1·1
Eastern	22	151	3·4	48	29	1·4
Western	42	400	17·0	119	82	9·8
America						
North America	19	497	9·7	74	101	7·5
Latin America/Caribbean	35	132	4·6	33	26	0·9
Africa						
North Africa/Middle East	17	113	1·9	22	24	0·5
Sub-Saharan Africa	6	52	0·3	26	11	0·3
World	389	122	47·6	541	50	27·2

Webappendix pp 6–11 shows data sources and regional distribution.

Table 2: **Financing of medical and nursing graduates by region (2008)**

the Caribbean, whereas sub-Saharan Africa and parts of southeast Asia have fewer schools. Distribution of medical institutions is highly skewed between nations. India, China, Brazil, and the USA—each having more than 150 schools—make up 35% of world's total. 31 countries have no medical school whatsoever, nine of which are in sub-Saharan Africa. 44 countries have only one medical school, 17 of which are in sub-Saharan Africa. Nearly half of countries worldwide have either one or no medical school.

The global distribution of medical schools and the world distribution of population and burden of disease is not well matched (figure 7). Whereas world population is weighted towards Asia, the global burden of disease, as measured in disability-adjusted life-years (DALYs), is heavily concentrated in Africa. The distribution of medical schools does not correspond well to either country population size or national disease burden.

Furthermore, the number of medical schools does not match well with the number of medical graduates. One possible explanation is different class sizes, which is shown by a comparison of India and China (table 2). India's 300 medical schools are estimated to graduate about 30 000 doctors every year, suggesting an average grade size of 100 students. By contrast, China's 188 medical schools are estimated to graduate 175 000 doctors every year, suggesting an average grade size of 1000 students.

Surprisingly, there is not a strongly positive relation between the number of medical graduates and the stock of doctors, nor is there such a relation between the number of nursing graduates and the stock of nurses. A possible explanation is unemployment in graduates when labour markets are imbalanced. Another explanation is that non-degree holders might be doing some medical and nursing jobs. Different rates of attrition could provide additional insights, the most prominent of which is international migration. Purposeful exporting countries would be expected to have lower doctor workforce for its medical graduate production than would others. Indian doctors are the most numerous of all nationalities of foreign doctors emigrating to the USA.[90] Many nurses in the Philippines and the Caribbean are trained in private schools especially for transfer to wealthier countries.[86,91,92] Cuba has an explicit policy of medical education for sharing with other countries.[93] Conversely, chronically deficient countries, such as the USA and nations in western Europe and the Middle East, would be expected to have higher workforce stock for the size of their graduating cohorts because of the number of health professionals moving to these countries.

Financing

By contrast with its immense importance, we have few data for the financing of health professional education. To gain preliminary insights, we commissioned a special study to estimate the financing of medical and nursing education worldwide. Details of the method used are described in webappendix pp 6–11. This work

provides possibly the first ever global estimate of the financial size of the health professional education industry (table 2). Although the figures are crude, they nevertheless provide an initial approximation that will hopefully encourage much needed research. We adopt two approaches to financial estimation. A microapproach calculates financing by multiplication of the number of medical and nursing graduates by the unit costs of education. A macroapproach examines the total turnover of tertiary education and assigns a proportion to professional health education. The fact that the microapproaches and macroapproaches generated similar orders of magnitude provides assurances about the robustness of the data.

Total yearly expenditures in health professional education is estimated at about US$100 billion for medicine, nursing, public health, and allied health professions. Education of medical graduates is estimated at $47·6 billion and nursing graduates at $27·2 billion. The figures for these individual professions are roughly inflated, in the absence of detailed information, to $100 billion by inclusion of public health and other related professions. In total, we estimated a unit cost of $122 000 per medical graduate, and a unit cost of $50 000 per nursing graduate.These costs are for education only, not the total turnover of health institutions. One Canadian study[94] reported that whereas the average cost of educating a medical graduate was about Ca$286 000, the costs would escalate to Ca$787 000 if research and clinical service turnovers were included in the estimations. The American Association of Medical Colleges reported that the median financial turnover of medical schools in the USA was US$440 million in the 2008 financial year.[10] With 126 medical colleges (and with the assumption that the median is near the mean value), this cost aggregates to about $55 billion for education, research, and clinical services for all medical schools. Our narrower medical education estimate for the USA, by contrast, is about $8·7 billion. Extrapolation of these ratios globally is inappropriate since many medical schools in the USA receive major research funding, and medical school faculties tend to be linked to clinical services of large tertiary hospitals.[10]

The global distribution of medical and nursing graduates is diverse. There is robust production of physicians in China, India, western Europe, and Latin America and the Caribbean, whereas production is fairly modest in central Asia, central Europe, and sub-Saharan Africa. Similar patterns apply to nursing graduates. The unit cost differs greatly between countries and regions. Western European costs are similar to those in north America, but are much lower for China, India, other parts of Asia, and central Europe. For example, the average cost of a medical graduate in China is estimated to be $14 000. Surprisingly, unit costs in sub-Saharan Africa were moderate at $52 000 per graduate, presumably because of the small size of graduating cohorts. Similar differences but at lower unit costs are recorded for nursing graduates.

Investments in professional education seem to be exceedingly modest in view of its importance to health-system performance. In the USA, for example, even the highest estimate of $55 billion for all activities by medical schools is barely 2% of the $2·5 trillion spent in 2009.[95] Our more restricted estimate of only educational activities represents a mere 0·3% of total health expenditures. American investment in professional education is remarkably meagre compared with expenditures of $34 billion on yoga, massage, meditation, and natural products, and $23 billion spent on dietary and vitamin supplements.[96] This alarming picture is even more apparent globally, where investments in health professional education represent less than 2% of a global health-care industry turning over an estimated $5·5 trillion yearly.

Budgets of national governments and development assistance donors infrequently separate out funding for health professional education. In a review of global health funding,[41] little information was provided about donor support to professional education. Some fragmentary information could be obtained from individual foundations or agencies. Partly because of policy advocacy to strengthen human resources for health to achieve the MDGs, some donor funding has begun to flow for basic health-worker training in a few developing countries.[97,98] But policy acknowledgment far surpasses actual resource flows. Donors rarely finance medical education as part of their health development assistance.

The rising cost of medical education is a growing challenge in all countries.[7,99] Increased costs not only impose hardship on student families but can also exclude access by poor people. Loan-based financing of medical education causes additional drawbacks. In the USA, the average debt of graduating students is now about $200 000,[100] which severely burdens them with obligations that can hinder them from pursuing socially important but less lucrative careers.[101]

Private investments in professional education might be increasing. Although this funding is welcomed, it generates concerns about quality and social purpose.[35] Analysis of new medical schools in India and Brazil show a spurt of new private establishments (figure 8). In India, the growth of private medical schools raises concerns about the quality and transparency of one of the world's largest medical educational systems. The Indian press has reported illegal payments by new private schools seeking accreditation from the Medical Council of India, an independent body that originated during the colonial era.[102,103] This report has triggered a takeover by the Indian Government to reform the accreditation system.[103] Of 191 new Indian schools in the past three decades, 147 are private. These schools, moreover, are heavily concentrated in metropolitan centres and in wealthier states, exacerbating geographic imbalance.

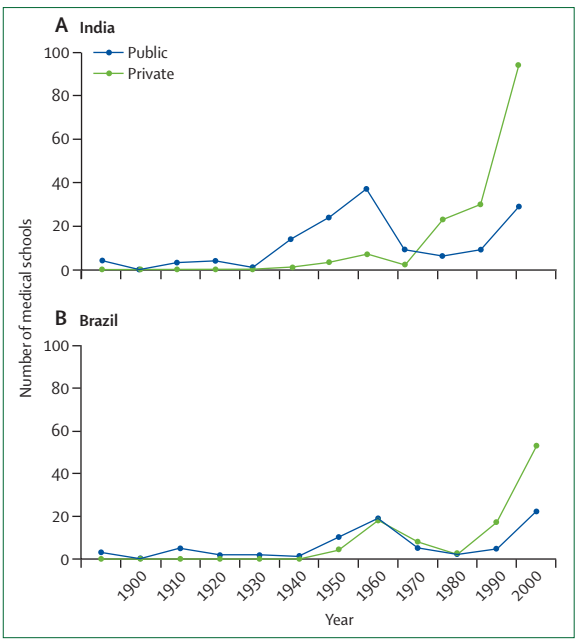

Figure 8: **New medical schools (public and private) in India (A) and Brazil (B)**

The India case also shows that profit status might be less important than social purpose, since most new Indian private schools are listed as non-profit but actually generate large income streams.[103,104] Not all increases are attributable to private funding, since China's recent substantial growth in medical schools is due to expansion of public financing.[40] Driven by global workforce shortages and growing market demand for health services, a large increase in unplanned and unregulated medical schools could generate the very same type of low-quality proprietary schools that Flexner visited, criticised, and successfully closed. A so-called de-Flexnerisation process is underway in which low-quality professional schools might be proliferating once again on the centennial of the Flexner report.

Accreditation

Accreditation is the formal legitimisation of an institution to grant degrees, enabling its graduates to achieve licensing and certification for professional practice. The process of accreditation is usually based on external, peer, or self review, whereby an institution is assessed for its compliance with predetermined standards of structure, process, and achievement. The aim is to ensure an acceptable quality of graduates to meet the health needs of patients and populations. Accreditation is therefore central to the professional education institutions linking their instructional activities to their societal purpose. Although there is no systematic assessment of accreditation practices worldwide, we can assume that great global diversity exists. In most countries, government performs the function and has ultimate authority, although in many nations accreditation is done by professional councils or associations.[105] WHO has reported that accreditation mechanisms "exist in three quarters of Eastern Mediterranean countries, just under half of the countries in Southeast Asia, and only about a third of African countries. Furthermore, private medical schools are less likely than publicly funded ones to undergo accreditation procedures".[106] Regional institutions, such as the Conférence Africaine des Doyens des Facultés de Médecine d'Expression Française (African Conference of Deans of French-speaking Medical Schools, CADMEF), have the authority but infrequently undertake accreditation exercises.[107] Survey work has identified many additional African medical schools, and most are outside accreditation systems.[108] Even in rich regions such as Europe, concerns have been expressed about the geographical variation in accreditation. "Although medical schools in the 25 countries of the European Union (EU) have to comply with EU standards, no such regional standards apply in Eastern Europe."[107]

Enforcement of accreditation can be variable across countries. China has about 1 million village doctors, and India has about 1 million rural medical practitioners who are not graduates of accredited schools. Although not of the same scale, similar gaps in accreditation and credentials exist in almost all countries. The difficulty of insufficient information is exacerbated by a set of unanswered questions. What are the purposes of accreditation? Who has the authority to mandate the system? How transparent and accountable are the processes? And what are the roles of government, professional associations, and other stakeholders? Herein arise two major challenges. The first refers to the ultimate purposes and incentives driving accreditation processes; the second has to do with harmonisation of global principles versus local specificity.

Accreditation should represent the institutional embodiment of professionalism entrusted by society and reflect the aspirations of professionals. The term social accountability has been advanced to underscore the health objectives of institutional accreditation. WHO has defined social accountability of accreditation as "directing education, research and service activities towards addressing the priority health concerns of the community, region, and/or nation they have the mandate to service".[109] The imposition of greater social accountability into accreditation could be instrumental in production of a professional workforce that is well aligned with societal health goals, including equity, quality, and efficiency (panel 4). Accreditation could expand the social scope of the system to include upstream criteria such as social equity in admissions, scholarships for disadvantaged students, and curricular exposure to work with disadvantaged communities, and downstream criteria such as policies that promote graduates to serve in marginalised areas. Broadening of participation to all stakeholders would also help in generation of socially responsive criteria for accreditation.

But not all institutions have been established for social accountability. Although for-profit schools might seek to produce quality graduates since they would enhance its market appeal, they necessarily have to seek financial returns. Of course, for-profit schools might also produce high-quality and socially motivated professionals, but this advantage might not be the driving purpose for its efforts to meet accreditation standards. Differing social purposes should not be interpreted to translate automatically to the social worthiness of various institutional forms. The most crucial bottleneck to achieve social accountability is the harmony or discord between social purposes, driving incentives, content of education, competencies generated, and actual community needs.

Another challenge is harmonisation of global standards with local adaptability to diverse contexts. There are no global standards for accreditation at present. Yet the importance of global principles with context specificity is ever more relevant for professional education in our mobile and interdependent world. Global principles would bring consistency, transparency, and open accountability to the accreditation process, while easing the emergence of communities of knowledge and practice. Uniformity across countries could have, however, the unintended consequences of helping with professional migration across national boundaries. Local adaptation would be necessary to adjust and implement global trends in specific settings for clinical practice, pedagogy, gaining of credentials, and evaluation, while maintaining sufficient flexibility for innovation and reform.

Achievement of some global–local balance is a priority, indeed a necessity, as institutional interdependence grows. Many international bodies (WHO; UN Educational, Scientific and Cultural Organisation; the World Trade Organisation; and regional organisations) are setting standards for professional education either to deal with transnational threats such as pandemics or to harmonise international labour markets.[115–118] The Association of Southeast Asian Nations (ASEAN) has steadily advanced its mutual recognition processes to harmonise standardisation of professional degrees in nursing and medicine. The International Institute of Medical Education (IIME) launched a global minimum essential requirement (GMER) initiative for adaptation by some medical schools in China to assess institutional performance on the basis of student achievements in several core domains of medical competencies.[119] The World Federation for Medical Education (WFME) has collaborated with WHO to propose a global consensus development process between national stakeholders.[107] Nationally, the US Institute of Medicine has recommended summits every 2 years for leaders to take stock, note trends, identify gaps, and develop future plans aiming to harmonise different oversight bodies and to show greater transparency and accountability.[120] The recommendation called for engaging presidents, deans, department chairs, and residency directors in a process of aligning competencies and curriculum to more socially accountable accreditation criteria.

Panel 4: Networking for equity

"Until the great mass of the people shall be filled with the sense of responsibility for each other's welfare, social justice can never be attained."[110] That is why networking between like-minded socially-committed individuals and groups have been key drivers for social equity through reform of professional education. Three socially driven initiatives are described here.

Social accountability and accreditation

How well do accreditation bodies—national, regional, and global—align, measure, and incentivise professional educational institutions to meet the social needs of society? This is the ambitious yet crucial agenda proposed by Boelen and Woollard,[111] who have launched a set of interactive processes to achieve a global consensus on the role of accreditation in ensuring the social accountability of medical schools. This consensus is the basis of an action plan to engage the major national and international bodies in bringing it to life. They propose a model of interdependence between health education and health systems such that the conceptualisation, production, and usability of medical school graduates reflects the priority health needs of society. They argue that accreditation systems for medical schools should measure the competency of the graduates and research production in meeting those needs. Initiatives of organisations such as International Francophone Society of Medical Education and International Organisation of Deans of Francophone Medical Schools, along with some other examples, were recognised as encouraging efforts to reform the accreditation system to bring about an era of health professionals with social sensitivity and global connectivity to meet the health-care needs of the real world.[111,112] They propose a global consensus process to advance the integration of social accountability into all systems to create a future for medical education based on an adaptive commitment to explore and address the evolving health needs brought about through educational, research, and service innovations worldwide.

THEnet

Launched in 2008, THEnet is a network of collaborating medical schools experimenting with instructional and institutional innovations to attract, retain, and enhance the productivity of health professionals serving disadvantaged populations often in remote rural areas. The schools' training settings vary from remote aboriginal communities in Canada (Northern Ontario School of Medicine) to rural areas of Africa (Walter Sisulu University); and from the densely populated urban slums of Venezuela (Comprehensive Community Physician Training Programme) to the politically volatile areas of Mindanao in Philippines (Ateneo de Zamboanga University). The shared experiences are generating a systematic approach to successful staffing of previously deprived regions, and, contrary to popular perception of poor academic standards of rural or community-based institutions, students from THEnet schools have consistently scored higher than average in national examinations.[113]

The network: Towards Unity for Health (TUFH)

This network is an association of health professionals and academic organisations that are dedicated to creation of a global platform of equitable health care through community-based education, dynamic research, and dedicated rural service. TUFH has undertaken policy-based projects and case studies on issues of great importance, such as rural internship programmes (Brazil), promotion of healthy behaviours (Czech Republic), integrative participatory research (Kenya), family practice research in resource-poor settings (Greece), and international graduate programmes on pharmacy (Canada). In 2007, TUFH launched eEducation for health—an open-access electronic journal aimed at enhancing transnational exchange of knowledge and information.[114]

For the **Towards Unity for Health network** see http://www.the-networktufh.org/home/index.asp

Panel 5: Twinning for capacity development in Africa

Medical schools in all countries have benefited from twinning programmes that foster exchange, share resources, and undertake collaborative work for mutual advance. Several of sub-Saharan Africa's premier medical institutions have benefited from such twinning arrangements. Founded in 1948, Ibadan—possibly Nigeria's premier medical school—was started in collaboration with the University of London, UK. In Uganda, the prestigious Makarere health sciences schools have had many twinning programmes, including with Johns Hopkins, USA, in public health.

In Kenya, Moi University School of Medicine has pioneered a twinning arrangement with a consortium of north American universities led by Indiana. Building on customary focus of collaboration in education and research, the Moi twinning pioneer leads with care by engaging both partners directly in the delivery of services. The focus on practical application allows for the building in of appropriate education and research. Moi has also expanded the educational twinning to a triadic relation with three partners, including as partner the Kenyan Ministry of Health. Similarly, for two decades the state university of Indiana has undertaken a global health elective for its students in nearby Eldoret Kenya, who are mentored by local and visiting faculty.[15] The elective enables students to participate in health-care teams including clinical work, a journal, written narrative reflections, cultural acclimation, and ethical challenges.

Such models have helped to spark a new Medical Education Partnership Initiative between the National Institutes of Health and the US President's Emergency Plan for AIDS Relief (PEPFAR), launched in October, 2010. It will invest US$130 million over 5 years to increase the production of 140 000 health workers in Africa and transform African medical education through funding support to nearly a dozen African institutions that will, among other instruments, use twinning for capacity building.

For the **Medical Education Partnership Initiative** see http://www.fic.nih.gov/programs/training_grants/mepi/

Academic systems

Under academic systems, we discuss briefly a set of challenges, including hospital centres and primary care; institutional collaboration through networking; faculty development; and shared learning. Gradual expansion of clinical training to include formal internships and residencies in hospitals marked the first generation of institutional reforms. During the past 50 years, the second generation of reforms witnessed rapid growth of academic centres due to income from clinical services and research. The power and influence of these centres integrating the continuum of discovery-care-education correspondingly increased. An international association of academic health centres has been established to promote sharing of best practices, foster international relations, and enhance the missions of education, patient care, and research.[121]

Many efforts have been made to expand the educational options beyond tertiary hospitals through practical training at community health centres, sometimes situated in disadvantaged communities. Not only is the training worksite an issue but the balance of education compared with the powerful streams of clinical and research income could dampen educational priorities or even distort role-modelling of clinical and research faculty. Some have proposed a systems approach in which the centres not only create novel technologies but also test new ways of deploying cost-effective preventive and treatment strategies for patients and populations.[122] A systems approach would include not only tertiary hospital centres but also networks of secondary and primary health units, including community-based programmes. A systems approach would use instruments such as networking and partnerships to extend the education-care-research continuum locally and globally. However, in the poorest countries, academic systems might be very underdeveloped, sometimes with only one large tertiary facility usually in the capital city.

One danger is that tertiary academic centres would simply grow in power and funding without corresponding attention to balanced secondary and primary education. Because professional education is deeply affected by the available environment for clinical training, academic systems can either bias education towards specialised professional care in tertiary facilities or provide broader exposure to the range of practice environments at community, the home, and other sites, including in disadvantaged populations. The fact that many if not most academic centres are based in urban areas restricts their offering of clinical training to some remote sites, unless IT can be used to link them.

Primary health-care training should be seamlessly integrated into the overall health system, including the academic system. Professional education has to reinforce the primary function of assuring access to all high-quality services for a defined population through proactive strategies, favouring continuity of care, guaranteeing an explicit set of entitlements, and assuring universal social protection in health.[123] The challenges for academic systems is to provide a more balanced environment for the education of professionals through engagement with local communities, to proactively address population-based prevention, anticipate future health threats, and to lead in the overall design and management of the health system.

Collaboration, a potentially powerful instrument of academic systems, describes the opportunities to enhance educational quality and productivity through sharing of information, academic exchange, pursuit of joint work, and synergies between institutions.[124] Collaboration can serve many purposes, deploy several instruments, and take place at different levels. It ultimately involves the relationship between individuals, but it can be structured and sustained through formalised institutional arrangements that promote, finance, and sustain relationships over time. The institutional purposes in education, research, and service can be advanced through sharing of curricula, exchange of faculty and students, collaborative research, and other activities. Many organisational arrangements have been used to facilitate these synergies: networks, consortia, alliances, and partnerships. Especially noteworthy is capacity building through co-equal twinning arrangements to strengthen both institutions (panel 5).

Two types of institutional collaborations are worthy of consideration: between professional schools and between

educational and other types of institutions. Collaboration between schools mostly enhances capacity in key institutional functions such as education, research, and service. Collaboration between other types of institutions links educational institutions with partner organisations, such as government, non-governmental organisations, business, and the media, which can bring together complementary assets for mutual benefit. A third type of collaboration, although not really collaborative, is off-shore schools set up either alone or in partnership by brand-name schools in high-income countries in emerging economies, often with the aim of increasing revenues while lending out brand names. Cross-institutional collaborations can link educational centres to policies and practices while offering partner governments, non-governmental organisations, businesses, and media organisations complementary academic resources (panel 6). Students can be offered training, internships, or work-study experiences in such collaborating institutions, and the partner group can capitalise on the faculty resources of the educational institution. Executive training programmes might require teaching faculty who also have expertise in programme monitoring and evaluation.

There are real-time, talent, and financial costs of collaboration, so that its yields must outweigh investments. All forms of collaboration are being transformed by the IT revolution, with its potential for compressing distances, bridging borders, reducing costs, and expanding participation—all in real time. The solidarity developed from sharing mission, resources, knowledge, and experiences can strengthen and motivate all participating institutions.

Faculty members are the ultimate resource of all educational institutions. They are the teachers, stewards, agents of knowledge transmission, and most importantly role models for students—reproducing the profession by training the next generation of professionals. Faculty challenges in most countries consist of heavy teaching loads, shortage of teachers, competing demands for research and consultancy services, and the hazards of mid-career exhaustion.[125–128] In some systems, there is the dominance of research over teaching, not only on academic and clinical career paths, but also on power, money, and privileges. In many institutions, teaching is not accorded the status or priority of research. Knowledge generation is often seen as more imprtant than knowledge sharing and knowledge translation. Outstanding professionals might also be reluctant to accept full-time teaching roles because of more financially lucrative and socially rewarding opportunities in assuming senior positions in practice rather than in education.[129]

In poor countries, a major constraint is the scarcity of qualified teachers who are essential for training the next generation of professionals, including the training of basic health workers.[19] Indeed, to achieve an expansion of the workforce in poor countries without ramping up faculty teaching resources is difficult. Of the options that deserve exploration is the short-term placement of graduates from rich countries seeking opportunities to contribute in other countries that are severely deficient in faculty.[130] Such activities, however, should be part of a broader strategy for capacity strengthening in poor countries. IT can play a major part in this regard through the types of open educational resources.

Shared learning describes the use of metrics, evaluation, and research to build and disseminate the knowledge base of what works and what does not in professional education. In undertaking the Commission's mandate, we repeatedly encountered difficulties because of poor data quality.

Professional education as a field has insufficient information and a weak culture of monitoring and evaluation. For example, data for the number of professional health educational institutions are rare and mostly focused on a few countries, or are serving narrow national purposes such as licensing or certification of doctors and nurses. Accreditation criteria and assessments are also few. With the exception of data for medical schools in the USA and China, we were unable to find reliable information about sources of revenue of educational

***Panel 6:* Lusophone networking and Brazilian coordination**

The Community of Portugese-Speaking Countries (CPLP) has formulated a strategic plan to improve health systems in all affiliated countries for universal access to high-quality health services that includes the training of personnel and a network of projects to strengthen institutional capacity. Thus the CPLP has created a lusophone network of national institutes of health, technical health schools, schools of health governance, and centres for specialised medical training. The Brazilian Oswaldo Cruz Foundation (FIOCRUZ) is playing a key part in this network—eg, supporting the development in Mozambique of a public unit for the production of generic and essential drugs. Financing for the network's training and projects come from rich lusophone countries Portugal and Brazil, and from international agencies and private foundations.

In parallel with the network are innovations in some lusophone countries, such as the Pró-Saúde and PET-Saúde—Brazilian Programme of Reorientation of Health Professional Education. A long-standing problem in Brazil has been the mismatch between professional education and the human resource requirements of the National Unified Health System. The Ministry of Education and the Ministry of Health has therefore launched a new partnership for reform. All academic institutions are reorienting curriculum to shift training from hospitals to clinics and communities, to focus on prevention and social determinants, and to strengthen proactive, problem-based learning. More than 500 courses, 9000 fellowships, and the training in 14 health professions based in more than 80 institutions of higher education have received funding in this partnership between two key ministries.

institutions. Professional education does undertake measurement and evaluation for specific purposes. Testing of students is quite common both during their studies and after graduation to ensure achievement of competencies necessary for professional practice. Instruments include written examinations, faculty assessments, standard clinical examinations, simulations, workplace-based assessments, project reports, and national examinations. The GMER experiment expanded the use of individual testing as an indicator for overall institutional performance in developing core professional domains of competence.[131] Unfortunately, metrics are seldom used in accreditation.

Despite these limitations, there are opportunities for mutual learning in a global, multiprofessional approach. As with other fields, professional education needs to strengthen its knowledge base. The 200 different national systems for comparison provide new options for the comparative study of professional education. A global perspective can generate a full understanding of professional education in an interdependent world with one talent pool, and accelerate transnational flows of knowledge, patients, and services. To capitalise on these opportunities, a global learning community for continuous and progressive improvement needs to be developed.

Instructional design

Our review of publications about education identified 11 054 articles in medical, nursing, and public health education. The reports about education in medicine (73%) are more abundant than are those about nursing (25%) or public health (2%). More than half of articles (53%) focus on professional education in North America, a quarter (26%) on Europe, and the remainder (21%) on other regions. It is noteworthy that we recorded little evidence documenting the impact or effectiveness of educational innovations. Although there is movement towards greater analytical rigour in educational research, most studies were descriptive, drawing attention to the importance of strengthening capacity to generate sound evidence building in the field.[132] Challenges to instructional design can be examined systematically by considering the learning process of students from admission to graduation into the professions. We analyse these challenges through discussion of 4 Cs: criteria for admission, competencies, channels, and career pathways.

Criteria for admission

In most countries, the social competencies of graduates might not be aligned with the social, linguistic, and ethnic diversity of patients and populations. Health professional students are disproportionately admitted from the higher social classes and dominant ethnic groups.[7,11,19] This exclusion is partly because of selectivity of the candidate pool from earlier attrition processes, because drop-out rates are higher in poor and minority groups in early grades. Yet, there is growing recognition of the importance of sociocultural and linguistic compatibility in patient care and population health, and a growing appreciation that problems such as skewed coverage of remote areas is often due to urban-biased admissions policies.[33]

The gender composition in admissions has a major impact on health-system performance.[133] Gender stereotypes are strong between health professionals—eg, women and nursing. In many countries, there is a continuing so-called feminisation of the medical workforce. Not only would gender equity enhance a society's realisation of its full human potential, but gender might constitute an important aspect of patient-centredness—eg, female patients preferring female professionals in some societies. There are also health-system implications of feminisation, since women might have less time for work in view of the burden of home obligations. The distribution of the workforce by sex also has important implications for labour market dynamics, because women are more likely than men to follow flexible career paths, with multiple points of entry into and exit from the workforce. Female physicians and nurses can find it more difficult to be situated in remote regions because of family commitments and sometimes because of security considerations.

Many solutions have been proposed to achieve balanced admissions, but few have been successful. Schools can set the criteria for admission to match the national profile of social, linguistic, and ethnic diversity and assess key values and personal characteristics, such as communication, interpersonal and collaborative skills, and professional interests.[10] Affirmative action programmes can be developed that could extend remedial support to secondary education to enlarge the eligible pool of under-represented students. One proposal would be to have rural communities, potentially with government support, select their own candidates to recommend for admission, pay for their education, and hire them after graduation. Financing is important, because tuition costs can present barriers to entry for poor people or costs can be so high as to force students to incur large debts.[7,35] Another proposal is to locate educational institutions close to underserved communities to help with the recruitment of students and the retention of professionals from those areas,[33] although attention should be paid to the challenge of assuring a critical mass of educational resources in these institutions. If entering students have only urban backgrounds, the likelihood of an eventual rural work placement is very low. Even so, graduating students can be required to spend a period of social service in a rural community—a requirement that was pioneered at the medical school of the National University of Mexico in 1936, and has been adopted by many countries. Schools that have built strong social criteria into the admissions and placement processes include Escuela Latino-Americana de Medicina (ELAM) in Cuba; University of

Philippines School of Health Sciences in Leyte; and Northern Ontario School of Medicine in Canada.[113,134] Experience shows that the ultimate service placement of graduates is shaped by multiple factors, including school location, criteria for admissions, curricular exposure, appropriate incentives, and, most crucially, the values, commitment, and social goals of the graduating student.[33,135,136]

Ultimately, the criteria for admission are linked to and are indicative of institutional purpose. A purely competitive merit-based admissions policy might seek to recruit the best and brightest for professional and academic leadership. Proactive recruitment to obtain balanced rural, ethnic, and sociocultural composition might express and indicate the institutional purpose of advancing health equity.[33] These admission goals are not mutually incompatible. Indeed, many institutions attempt to harmonise allied purposes into a coherent admissions policy.[7] Leadership can come in many forms and for different purposes. Students from disadvantaged backgrounds can often excel in competitive assessments after they have been given the opportunity.[113]

Competencies

This subsection discusses a competency-based approach to curriculum and team-based learning. There is a strong movement to align the curriculum as an instrument of learning to achieve requisite competencies as the educational goal. Historically, the professions have set requirements to establish who can obtain membership based on completion of a prescribed course of instruction that academic or professional leaders might define. Curricula often become closely linked to historical legacy that codifies the traditions, priorities, and values of the faculty in that profession. Over time, the curriculum is rarely re-examined but is only slowly modified to accommodate new information. Not uncommonly, schools change the objectives to meet what the faculty want to teach so that the curriculum drives the objectives, rather than the wished for learning objectives driving the curriculum (figure 9).

A competency-based approach is a disciplined approach to specify the health problems to be addressed, identify the requisite competencies required of graduates for health-system performance, tailor the curriculum to achieve competencies, and assess achievements and shortfalls. Epstein and Hundert[137] have stated that: "Competency is the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and the community being served".

Competency-based education allows for a highly individualised learning process rather than the traditional, one-size-fits-all curriculum.[138] Ideally, students would have an opportunity to explore a range of choices in learning activities and methods that could allow them to achieve competency in variable periods.[10]

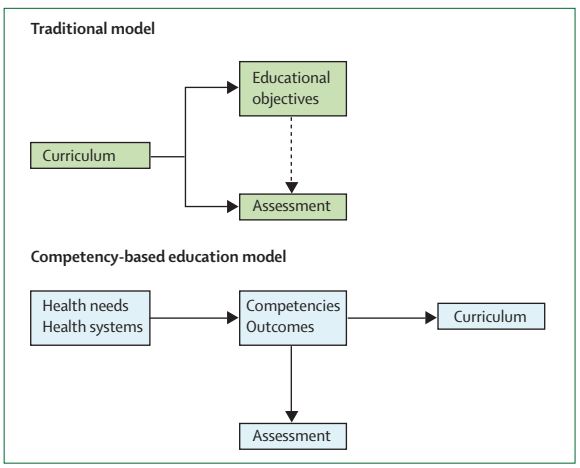

Figure 9: **Competency-based education**

By focusing on the outcomes of education, the approach is more transparent and therefore accountable to learners, policy makers, and stakeholders. Metrics and assessment with a wide variety of methods are integral to the competency-based approach, which depends on assessment of progress or shortcomings in achieving competencies.

A potentially transformative use of competencies would be to serve as an objective basis for classification of the various health professions, instead of the present arbitrary borders, which are indicative of the relative success of different occupational groups in mobilisation of the powers of the State to award credentials specifically to establish monopolies of practice.[50] Attainment of specific competencies, not time or academic turf protection, must be the defining feature of the education and evaluation of future health professionals. Once educators focus on professional competencies, new opportunities emerge for a more imaginative design of health systems. Roles and compensation can be better aligned. Traditional boundaries between professions can be reduced. The pervasive trend towards credential creep between professions—ie, the trend whereby the credentials required for a specific position are increasing—can be challenged.

For interprofessional education, health needs teamwork, and this necessity has grown in importance because of the transformation of health systems. The emergence of non-communicable diseases, for which patient care becomes a series of transitions from home to hospital to rehabilitation facilities and back to home again, necessarily engages a host of multidisciplinary professionals—social workers, nurses, therapists, doctors, counsellors, etc—who must work together to provide a seamless web of health services.[139] But beyond the emergence of non-communicable diseases, health has always been about teamwork. Dealing with infectious diseases also requires command and control teams involving surveillance, immunisation, containment,

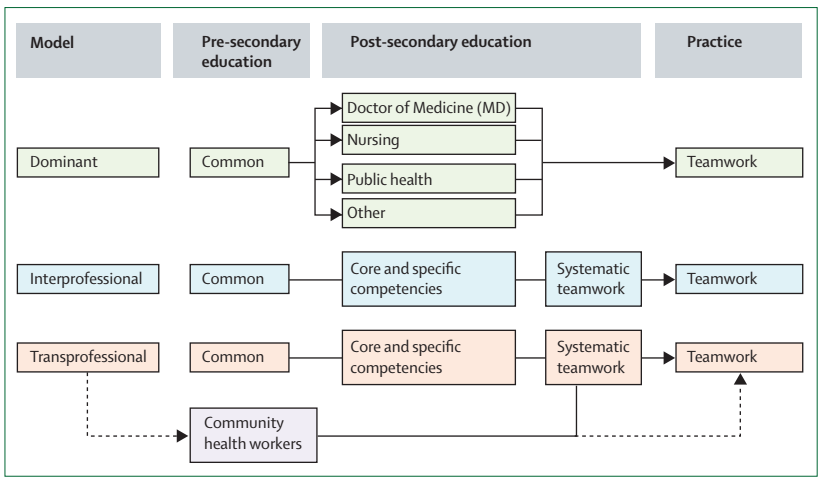

Figure 10: **Models of interprofessional and transprofessional education**

treatment, and interventions to modify social determinants such as absence of access to clean water and sanitation. Similarly, prevention and control of injuries depends on multidisciplinary interprofessional work of health staff collaborating with engineers, police, municipal officials, and other professionals.

Team-based learning is an instructional approach aimed at preparing students for effective, collaborative work within a cohesive group. Interprofessional education involves students of two or more professions learning together, especially about each other's roles, by interacting with each other on a common educational agenda. Although team-based learning has been practised successfully for more than 20 years in non-medical settings, it has only been proposed recently as an instructional tool in health professional education.[140] Although simple in concept, interprofessional education is difficult to implement. Large number of students, low teacher-to-student ratios, and cramped facilities drive many instructors to the lecture-based didactic method.[40] Team roles of individual health professionals have floundered amid the divided faculty and curricula of the different professions, the rigid tribalism that afflicts them, hyperspecialisation of some professionals, and overly rigid accreditation standards that restrict opportunities for collaboration.

In reality, however, teamwork has always been necessary and practised, and the question has been whether it is recognised, promoted, and prioritised. Importantly, team learning and interprofessional education cannot be confined only to the classroom. Reports suggest greater impact with ancillary modalities including shared seminars in which cross-profession dialogue, joint course work, joint professional volunteering, and interprofessional living-learning accommodations are promoted.[7,8,10,11] Furthermore, interprofessional undergraduate education should be integrated into socialisation and learning before and after graduation, as part of a continuum of learning. And it must be valued and made into an incentive so that it becomes embedded in the development of all health professionals.

Finally, it should be recognised that transprofessional teamwork that includes non-professional health workers might be of even greater importance for health-system performance, especially the teamwork of professionals with basic and ancillary health workers, administrators and managers, policy makers, and leaders of the local community. Figure 10 contrasts the present dominant model of isolated educational paths with different models for interprofessional and transprofessional education. Fundamentally, actual practice in increasingly complex health settings is based on teams. The more the educational experience includes competencies for that type of work, the better health professionals will be equipped to adapt to the teamwork that is imperative of good practice.

Channels

Good professional education programmes mobilise all learning channels to their full potential: didactic faculty lectures, small student learning groups, team-based education, early patient or population exposure, different worksite training bases, longitudinal relationship with patients and communities, and the use of IT. We focus on the transformative learning power of the IT revolution. The effect of electronic learning (e-learning) is likely to be revolutionary, although how precisely it will revamp professional education remains unknown. E-learning traditionally has consisted of computer-assisted instruction to ease the delivery of stand-alone multimedia packages and distance learning for delivering instruction in remote locations.[141] Explosive growth of the internet has brought power, speed, and versatility to both approaches.[49] The range of options available nowadays encompass internet-supplemented courses that might include online lectures, use of email, and linkages to online resources; internet-dependent courses that require students to use the resources of the web; and full online courses with little classroom or direct human interaction. Not all students, of course, have full access to IT resources. Furthermore, the digital divide extends to health professional education, so many schools face the challenges of weak IT infrastructure, high cost, and restricted access.

A global policy to overcome such unequal distribution of digital resources would go a long way towards closing gaps by empowering the poorest communities to accelerate or skip stages that developed nations transitioned through more slowly in the past. The transformative possibilities are huge. In many professional schools, students with handheld IT devices are able to double-check in real time the accuracy of a lecturer's presentation. Mobile phones promise to transform the use of portable devices as a central learning tool. With global platforms of knowledge on the internet,

there has been a shift from memorisation of facts to location of requisite information for synthesis, analysis, and decision making. The ubiquitous nature of information means that universities and similar institutions now have to emphasise in their educational efforts the ability to discriminate, interpret, and make use of information. IT is also expanding access to formal education by reducing geographical barriers. South Africa's National School of Public Health, for example, developed a distance IT programme that in 5 years produced more graduates than did all other schools in the country combined; however, the effectiveness of such programmes has not yet been fully assessed.[142]

As with all technologies, the drivers of constructive change are not the hardware or software by themselves, but rather the institutional transformation that the technologies enable, including what has been called humanware (ie, human beings who operate hardware and software). IT-empowered learning is already a reality for the younger generation in most countries, and in many cases, the uptake of new digital technologies has been faster and more widespread in poor than in rich countries. Educational institutions must now be re-engineered to adapt to this transformation, otherwise they risk becoming obsolete. Indeed, the use of IT might be the most important driver in transformative learning—one of the guiding notions for this report. A particularly promising aspect of the revolution in information and communication technologies is in the open education resources movement (panel 7), with its potential to expand global access to didactic materials.[147] Another exciting area of development is the application of information and communication technologies to build global consortia of educational institutions, to leverage their resources, realise synergies, and transform educational opportunity into a global public good. Although much more experimentation and evaluation are required, the most promising approaches seem to be those that combine full exploitation of digital resources with the human interaction that is the very essence of true education.

Just as IT has changed the relationships between learners and teachers, so too is it rapidly transforming the relationships between health professionals and the people they serve—be it individual patients or entire communities. The professionals' most important contribution is often finely-tuned judgment and decision-making skills rather than knowledge gradients. Thus, advanced information technology is important not only for more efficient education of health professionals; its existence also demands a change in expected competencies. Put simply, the education of health professionals in the 21st century must focus less on memorising and transmitting facts and more on promotion of the reasoning and communication skills that will enable the professional to be an effective partner, facilitator, adviser, and advocate.

Career pathways

Graduation signifies the passage from student status to member of one of the health professions. By joining, the novice professional should understand the duties and obligations of membership and undertake the commitment to professionalism code of conduct. But all professions, medical or otherwise, have positive and negative attributes. And all students, irrespective of their profession, have the potential to be transformed by the educational process to bring about change. As one archetype of professional work, medicine has been the subject of intense study in an effort to understand the essential attributes that distinguish professions from other occupations, and the forces that are transforming these attributes.[148] In his classical work, Freidson[149] explained the two meanings of the word profession as: "a special kind of occupation" and as "an avowal or promise". To fulfil such a promise, professionalism "signifies a set of values, behaviors, and relationships that underpin the trust" of the public.[43] Professional education, therefore, must inculcate responsible professionalism, not only through explicit knowledge and skills, but also by promotion of an identity, and adoption of the values, commitments, and disposition

For more on **Connexions** see http://cnx.org

For more on **SuperCourse** see http://www.pitt.edu/~super1/

***Panel 7:* Information technology and open education**

Advanced communication and information technology (IT) has assumed an increasingly central role in postsecondary education by revolutionising access, compilation, and flow of information and knowledge. Many innovations have been pioneered—downloading information, simulation learning, interactive teaching, distance learning, and measurement and testing.

OpenCourseWare (OCW) was first proposed by the Massachusetts Institute of Technology in 2001 and was defined as "free and open digital publication of high quality educational materials, organized as courses".[143] OCW has enabled many universities to share online their syllabi, lectures, assignments, and examinations free for others to download, modify, and use. By 2009, OCW had more than 200 member universities, with more than 6200 courses freely online attracting more than 2 million visits per month. Members include leading universities in the USA, China, Japan, Spain, Latin America, Korea, Turkey, and Vietnam, and regional networks adapted to local languages have been built in Latin America, China, and Japan.[144] Johns Hopkins University Bloomberg School of Public Health started its OCW project in 2005, and is now offering 60 graduate courses online with an average of 40 000 visits per month.[145] Tufts University now offers more than half its medical courses online.[146]

OCW is part of a broader movement for open-education resources that advocates "digitized materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research".[135] OCW has the potential to transform health professional education through provision of free and open access to all interested learners worldwide, including developing countries that are severely limited by educational resources. OCW can also promote content quality through sharing of materials for feedback and continuous improvement. In addition to organised movements, there are many grassroots efforts—eg, Connexions as open source textbooks and SuperCourse as an open-source library of lectures on global public health. Not surprisingly these non-for-profit movements face similar challenges—how to integrate the human face of learning with technology, adaptation to diverse contexts, intellectual property rights, reluctance over sharing, and financial sustainability.

of the profession.[10] Development of the fundamental attributes of professional behaviour, identity, and values is eased by appropriate role models, team interactions, coaching, instruction, assessment, and feedback. Included in this process is aligning the so-called hidden curriculum, so that the learning environment is made consistent with professional rhetoric and stated values.

"Professionalism was born of contradictory impulses. On the one hand, it belongs to the movement toward a democratic society and a free market economy. Professionalism promises to open careers to talent... On the other hand, professions are monopolistic...".[150] Health workers should understand the positive and negative sides of professionalism. Far from being an exclusionary force that raises artificial barriers to entry, protects privileges, and promotes practice monopolies through credential creep,[151] a new professionalism for the 21st century should promote quality, embrace teamwork, uphold a strong service ethic, and be centred around the interests of patients and populations.

Agency refers to the capacity of individuals to undertake purposeful action in a specific social context. A comprehensive instructional design should include efforts to endow professional students as change agents with the status, authority, and ability to promote enlightened transformation in society. How the graduate exercises this capacity is an individual prerogative. Not every professional graduate needs to be a social reformer, but artificial barriers should not be constructed to block the social agency of professionals. A case can be made that all students preparing to enter the health professions should be exposed to the humanities, ethics, social sciences, and notions of social justice to perform as professionals and to join in public reasoning as informed citizens.[152] Two examples are health equity and health and human rights.

One of the main challenges of the health professions is their urban bias and thus the reluctance of many of their members to work in remote rural areas among underprivileged populations.[32,153] Many innovative training programmes have been designed to address this imbalance. The 1943 Bhore report in India[154] mandated that every medical school should have a department of community or social health, including compulsory coverage of three adjacent rural districts. The Chinese barefoot doctors movement attempted to ensure access of remote rural populations to a skilled health worker.[155] Many countries have made more contemporary educational efforts. International networks have also been established to promote health equity through reorientation of professional education. Despite the unwillingness of most professionals to live and work in marginalised regions, there are many dedicated professionals who have exercised their choice and committed themselves to serving disadvantaged populations. This exercise of social agency represents the best of socially responsible professionalism, and signifies good citizenship, nationally and globally.

Another case is health and human rights. The first UN Special Rapporteur on the right to health underscored the present problem with medical education: "[T]here is no chance of operationalizing the right to health without the active engagement of many health professionals. Here, however, is a very major problem. To be blunt, most health professionals whom the Special Rapporteur meets have not even heard of the right to health. If they have heard of it, they usually have no idea what it means, either conceptually or operationally.... [I]f further progress is to be made towards the operationalization of the right to health, many more health professionals must begin to appreciate the human rights dimensions of their work."[156] He further argues that a rights-based approach to health can be an invaluable asset for professionals to devise more equitable policies and programmes, to promote important health issues on national and international agendas, to mobilise more funds, and to promote respect for the dignity of those who they serve.

Global and local health

Although in his 1910 report Flexner concentrated on one region, he recognised the worldwide basis and implications of his study, noting "While the work was undertaken in the desire to improve the conditions that now exist in the United States and in Canada, it has been written from the standpoint of the advancement of medical science throughout the world".[63] Flexner proceeded to pursue this global vision through his 1912 report on medical education in key countries of Europe, sparking a cascade in many medical schools worldwide that followed a so-called Flexner model of university-based professional education linking basic and clinical sciences.[63]

But context nowadays differs substantially from that of a century ago. The richness of diversity is not entirely new, but the pace, scale, and intensity of global interdependence have brought about many new risks and opened many new opportunities. Consider the extent of global inequality. In national income, the world's richest and poorest countries show a 100-times difference, but in per head health-care expenditures the gap between the richest and poorest nations is 1000-times. Differences of such magnitude profoundly affect the educational and health systems. Every country has its unique institutional legacies in professional education, and their health systems have to develop an appropriate skill mix of workers with requisite competencies for local effectiveness. The challenge for professional education is to adapt locally while harnessing the power of global flows of resources.

In view of the huge diversity of health and educational systems, the challenge is to adapt competency-based goals for local effectiveness rather than to adopt models from other contexts that might not be relevant. Local educational standards are all too often driven by the desire to fit into frameworks that are in place elsewhere.

Although seeking prestige and achievement of high global standards are important, the consequences of wholesale adoption are inappropriate competencies, inefficient investments in professional education, and the loss of graduates from the country because of international migration. In a competence-based approach, the obligatory attributes of a professional have to indicate the context in which she or he operates. The roles to be undertaken and competencies to be attained have to reflect the challenges to be addressed, the available resources, and the diagnostic and therapeutic instruments at the professional's disposal.[157]

Paradoxically, the imperatives for global health are driven partly by the necessity for local adaptation. The reasons are interdependence in health, global flows, and opportunities for mutual learning. Interdependence and globalisation have accelerated health-related flows across national boundaries. Some flows, such as knowledge and finance, might be beneficial for equity; others, such as transmissible diseases, could even threaten the human species. Many apparently local problems are generated or have consequences globally. Thus, a global perspective improves understanding of the causes and solutions to local problems. Understanding of global diversity improves local adaptive capacity because of mutual learning. Most importantly, young people see themselves as global health professionals and indeed as global citizens; many of them express an intense interest to learn and contribute in diverse contexts beyond their own countries. Increasing numbers of students and young professionals from developed and developing countries are moving in both directions, creating new networks of knowledge and practice.

Professionals offer the human link for translation of knowledge-related global public goods to the requirements of local realities. This crucial role makes it imperative for all countries to answer a fundamental question: how many institutions producing which type of health professionals should a country aspire to have? Professional schools produce graduates who enter a labour market ultimately contributing to a particular skill mix in a country. Skill mix describes the pattern of health workers in the health system, such as the ratio of doctors to nurses. In developing countries, the skill mix by necessity depends on many basic and ancillary health workers; this reality has important implications for professional education, both in quantitative terms with respect to the numbers of graduates and in qualitative terms with respect to competencies for transprofessional teamwork. Many developed countries have more mature health systems that are still challenged by poor teamwork across rigid professions. Developed countries also have chronic workforce shortages and are dependent on importation of foreign-trained professionals.

Making the most of scarce resources has led many developing countries to undertake expansion of their workforce through the training of basic and ancillary health workers. Ample evidence shows that such workers can add substantially to the efforts of improving the health of the population, especially in settings with the highest shortage of motivated and capable health professionals.[42,158] Basic workers can provide a wide range of primary health services, ranging from provision of safe delivery and counselling on breastfeeding to management of uncomplicated childhood illnesses; and from preventive health education on malaria, tuberculosis, non-communicable diseases, and HIV/AIDS, to rehabilitation of people suffering from common mental health problems. To accelerate achievement of the MDGs, many donors have invested in the massive training of basic health workers.[20] In these endeavours, many developing countries have displayed great creativity and imagination, with global lessons for all (panel 8). Técnicos de cirurgia in Mozambique, 88% of whom still work in rural areas 7 years after graduation, provide simple surgical services.[24] There are 100 000 Lady Health Workers deployed in Pakistan.[161] The Ethiopia health extension programme and Ugandan village health teams deploy community-based

Panel 8: Professionals in community health-worker systems

Sparked by bare foot doctors in China and the more formal *Behvarz* primary care health workers in Iran, there have been many efforts to develop community health workers (CHW) to strengthen the formal health sector in service delivery and health promotion. Much evidence shows the benefit of CHW-based programmes for delivery of a range of services in low-income and middle-income countries.[42,159] Medical and nursing professionals have played a key part in rolling out and supporting such strategies, although such partnerships are poorly documented. In a systematic review of the experience of CHW programmes addressing the Millennium Development Goals, 326 reports were identified of which only 21 (6%) had documented supervision and monitoring by trained physicians and nurses; of the reports that documented monitoring and evaluation, 21 (30%) had medical professionals in this role.[42]

Some of these programmes have been implemented at large scale, such as the Lady Health Workers programme in Pakistan, reaching more than three-quarters of its rural population. Such CHW programmes have spanned a range of services and training programmes and have focused mainly on low-cost, equitable, and easily accessible health care. Generally, such programmes have served to overcome gaps and crucial shortages in human resources for health and have served as an important bridge between communities and health services.

CHW programmes in some countries with weak formal health systems—eg, Pakistan's Lady's Health Worker programme, Ethiopia's health extension programme, Mozambique's agentes polivalentes elementares programme, and Haiti's health agents/accompagnateurs—are challenged by their roles in gap filling, which require strengthening linkages and support.[42] In other countries with strong formal systems—eg, Thailand's village health volunteers programme, Brazil's family health programme, Bangladesh's BRAC *shastho shebika* programme, and Uganda's village health teams—the linkages of supervision, referral, and support are fairly well developed.[42]

The shortage of surgeons and anaesthetists in fragile health systems can be overcome by training appropriate paraprofessionals.[160] There are many case of such success, but the ambitions are to greatly expand cost-effective interventions to save lives. In all contexts for primary care and surgical services, medical, surgical, and nursing-midwifery professionals have and will continue to play a crucial part in programme success.[42,147]

workers.[162,163] India's Accredited Social Health Activists (ASHAs) have been the spearhead of the recent national rural health mission.[164] BRAC, the world's largest non-governmental organisation, has deployed thousands of *shastho shebika* (female community health workers) throughout the villages of Bangladesh.[165] Major efforts have been launched to define, promote, and implement task shifting and task sharing. The priority has been to "…train and deploy people to do the tasks in hand and not purely for the professions".[166]

Under the pressure of these priorities, professional education has been overlooked in many countries. The neglect is to some extent understandable in view of the fact that professional education is expensive, time-consuming, and often not entirely attuned to the local disease burden. The negative aspects of professionalism have also diverted attention away from professional education. Especially troubling has been comparable credentials of doctors and nurses that has accelerated international migration with the loss of talent from poor countries. The scale of this type of loss is shown by the case of Ghana, where 61% of the 489 physicians graduating between 1985 and 1994, had migrated from the country by 1997.[167]

Yet abundant evidence shows that the effectiveness and long-term sustainability of basic health workers depend critically on an appropriate balance and strong collaborative linkages with professional cadres.[168] Many community health worker programmes have failed because they did not successfully incorporate professionals into the workforce mix.[24,42,158] Professionals invariably are the leaders, planners, and policy makers of health systems. They are also an invaluable resource for the training of community workers. "(Evidence) shows that these community worker programmes are most effective where they are integrated into the wider health system, they can refer on to more trained health workers, and they have the opportunity for refresher or further training and supervision."[169]

But what types of competencies should professionals acquire for constructive collaboration with community health workers? Clearly one clinical specialist working in isolation would not substantially strengthen the basic system. A competency-driven approach would identify key requisite skills. In expansion of coverage through basic workers, we should recognise that only postsecondary education can endow professionals to perform complex reasoning, deal with uncertainty, anticipate and plan impending changes, and undertake many other functions that are essential for health-system performance and sustainability. Although leadership can emerge from all levels, almost all the most successful leaders of the health sector are professionals with postsecondary education. Complementary requisite skills for these professionals should include key health-system functions such as planning, policy, and management. Especially useful is national leadership to manage the increasingly complex relationship with international agencies and donors. Equally important is the competency to train and supervise basic workers through collaborative and respectful relationships.

Transprofessional education might be as important as interprofessional education. An examination of the skill mix in selected countries of sub-Saharan African underscores the importance of professionals learning to work with non-professionals in health teams. In Ethiopia, Nigeria, and South Africa, the ratio of community health workers to doctors ranges from 10 to 0·24, and the ratio of community health workers to nurses ranges from about 2 to 0·05.[19] In many work sites, the doctor or nurse might be the only professional in a health team. Thus, a key professional competency is the ability to work with teams consisting largely of basic and ancillary health workers and supportive staff. This diverse skill mix moves education beyond interaction only between professionals to include all members of the health team.

Parallel to the expansion of basic training in poor countries is the recent movement towards expansion of medical education in rich countries. After decades of stability, the number of medical schools in the USA, for example, will grow to meet increasing demand.[7] As for most other wealthy countries, the USA has chronic shortages of physicians, suffers from imbalances in expertise (especially shortage of primary care physicians), and has maldistribution of professionals for coverage of disadvantaged populations. Medical school expansion provides an opportunity to revitalise professional education since many curricular innovations can be tested and disseminated.[7] One of these innovations is the integration of global perspectives in the revitalised curriculum. Education of professionals with intercultural sensitivities is important for increasingly diverse patient populations. The transnational flow of diseases, risks, technologies, and career opportunities also demands new competencies of professionals. These competencies should be advanced through curricular inclusion of global health, including cross-cultural and cross-national experiential exposure.

Courses in global health face the same challenge as do all other new fields—ie, finding the space and time to be added to an over-packed curriculum. Although having distinctive courses and training sessions in global health is important, the integration of a global perspective into all courses and exercises is even more important. Addressing infectious disease control, for example, can cite very different immunisation coverage around the world and compare successful and failed national experiences. Addressing chronic diseases should cite the growing epidemic of obesity in many developing countries and the unprecedented rates of smoking in many others. Mainstreaming a comparative global perspective can enrich existing curricula, thereby reducing the demand for extra time and space.

As a young field, the definition, content, and strategies of global health have by no means been fully settled. Some see global health as an added dimension to their respective professions. Others see it as equivalent to public health studied and practised from a worldwide perspective.[170] Consensus is growing about its key tenets—universalism, global perspectives in discovery and translation, inclusion of broad determinants of health, interdisciplinary approaches, and comprehensive framework. Its adoption and extension into all the major health professions is well underway.

Five features stand out in the globalisation of professional education. First is the realisation that we increasingly have one global pool of health professional talent. Because of global labour markets, professionals are on the move, crossing national borders and creating global communities of expertise. The World Health Assembly recently approved a code of conduct for the international migration of professionals.[118] In many wealthy countries, the import of foreign doctors and nurses to meet chronic shortages is likely to persist and could even increase.[171–174] About a quarter of physicians in the USA, Canada, and most countries of western Europe are trained overseas.[171,173] Many of the foreign-trained physicians are US citizens who have gone abroad for education, often subsidised by federal loans that amounted to $315 million per year.[175] Few of the innovations or reforms for medical education in these countries have incorporated the training needs of this proportion of the physician workforce. Instead, gaining credentials and licensing of foreign-educated professionals is assigned to objective examinations that focus on technical knowledge. These examinations are mostly devoid of the richness associated with medical education reform—such as enlightened professionalism through socialisation into professional values, attitudes, and behaviours; development of generic analytical, leadership, and communications skills; integration of knowledge with experience; and lifelong learning. A case can be made that professional education in richer countries should cover all physicians who are serving a nation's population, irrespective of their undergraduate training location.

Second is the universal aspiration and challenges of primary health care in very different contexts. Primary health care has often been seen from different perspectives according to the state of development of each country. In rich countries, primary care focuses on ensuring accessibility of professional doctors, nurse practitioners, and others to all people, especially those in disadvantaged communities. In poor countries, primary care often includes non-professional workers providing basic services. In these countries, such workers are often mobilised into campaigns to disseminate cost-effective technologies, such as vaccines and drugs, to achieve universal coverage. In both rich and poor countries, primary care constitutes a continuum, requiring adaptation of professional educational to substantially different contexts. In some cases, professionals are direct service providers; in others, professionals must assume training and supervisory roles to ensure the smooth functioning of the entire system. Issues of primary care include both demand and supply challenges. Training primary care professionals can only be effective if the health system generates an effective demand that attracts such trained professionals to rewarding jobs. A supply approach alone, although useful, cannot generate a strong primary care system. For example, primary care physicians are abundant in Japan because the reimbursement system rewards primary practice more than it does hospital-based specialisation. Indeed, a typical Japanese career progression is initial hospital specialisation followed by more lucrative private primary care practice.[176]

A third implication for professional education is underscored by our growing interdependence in all health matters. In addition to international migration of doctors and nurses, we are beginning to witness an acceleration of all types of health-related flows—international accreditation, financing, patient movements, and trade in health services. Long accepted in the most advanced medical centres in rich countries is the arrival of wealthy patients from low-income and middle-income countries seeking high quality, albeit expensive, medical care. Nowadays, many patients are travelling overseas for low-cost quality care in what has been called medical tourism. Low-cost services of particular attraction are dentistry, cosmetic surgery, and increasingly advanced medical and surgical procedures.[177,178] Facilities in some servicing countries are seeking to compete for foreign patients who have long waits for treatment or high costs.[177,179] In the sending countries, professionals will have to understand how to provide continuous management of such medical tourists at their home base. Medical services are also moving across national boundaries, such as reading of electrocardiograms, radiographs, diagnostic tests, and other services. This trade in services will intensify competition between professionals of different countries that have similar skills but operate with very different cost structures.

The fourth aspect in the globalisation of professional education is the movement abroad of schools in developed countries to establish affiliated campuses in emerging economies. Many variants of this export of brand-name professional schools are underway—export of technical expertise, joint ventures, and even overseas campuses. Some medical schools from high-income countries now have independent branches overseas, and others have stationed faculties in different countries worldwide. Others envision a genuinely global school in which physical location is less important than the quality of education from a leading institution. School exports seem to concentrate from brand-name universities in wealthy countries to emerging or natural-resource enriched countries, seeking to meet market demands for quality education in wealthy countries. However, the

sustainability and implications of these developments are uncertain.

Finally, global health as a field is expanding rapidly in professional education. Centres, institutes, units, and programmes in global health are being established worldwide; the University of Cape Town in South Africa, the Peking University Health Sciences Center in China, and the National Institute of Public Health in Mexico are some notable examples in developing countries. In the USA, a global health educational consortium was established in 1991, with more than 90 schools as members in the USA, Canada, Latin America, and the Caribbean. In 2008, several major US schools established a Consortium of Universities for Global Health that now includes more than 60 universities.[180]

The strategy for professional education in poor and rich countries is to optimise local problem solving while harnessing the benefits of transnational flows of knowledge and resources. Poor countries, although economically constrained, are compelled to search for low-cost solutions to achieve aims, and are less constrained by professional credentialling. Their innovations provide learning opportunities to all countries. Rich countries are integrating global perspectives into the core competencies of their graduates. The continuing and in-service education of foreign-trained professionals should be regarded as important as domestic education. Finally, we should recognise that many young professionals in both poor and rich countries are keen to offer their services overseas. Short-term visitors can be a burden, but, if action is properly organised in a Global Health Corps (a programme for sending young professionals for service abroad), many young professionals can join in development efforts or provide one of the most precious assets that poor communities require—ie, professional teachers to assist in the education of both professionals and basic health workers.[130] Active student exchange can strengthen the bonds of empathy and solidarity that an interdependent but highly inequitable world so greatly needs.

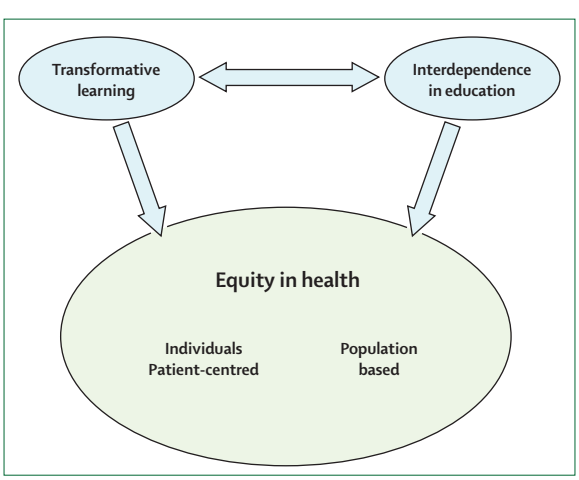

Figure 11: **Vision for a new era of professional education**

Section 3: reforms for a second century

Health is about people; thus, the core driving purpose of professional education must be to enhance the performance of health systems for meeting the needs of patients and populations in an equitable and efficient manner. Our Commission concluded that institutional and instructional shortcomings are leading to shortages, imbalances, and maldistribution of health professionals, both within and across countries. Institutions are not well aligned with burdens of disease or the requirements of health systems. Quantitative deficiencies are driving the growth of for-profit proprietary schools, thereby challenging accreditation and certification processes that are unevenly practised worldwide. Financing for professional education is very feeble in a talent-driven and labour-intensive industry. To make matters worse, investment in research and development for educational innovations is insufficient to build a sound knowledge base for education. Most institutions are not sufficiently outward looking to exploit the power of networking and connectivity for mutual strengthening. The breakdown is especially noteworthy for primary care, in both poor and rich countries. But opportunities are emerging. Instructional design might be at the threshold of a third generation of reforms that could enhance the performance of health systems through specifying competencies for teamwork empowered by new pedagogic instruments. Central to both institutional and instructional reform is adaptability to address changing local contexts while harnessing the power of transnational flows of information, knowledge, and resources.

For poor countries, the most pressing challenge is to tackle an unfinished agenda, so that the unacceptable gaps in health achievement can be overcome. A crucial factor in this endeavour will be the successful adaptation of professional education for local and national leadership in workforce teams that are capable of extending reach to all people. For rich countries, the challenge is to equip health professionals with competencies to tackle current problems while anticipating emerging problems. But beyond the unfinished agenda, poor countries must also grapple with newly emerging threats, and in addition to emerging problems, rich countries must also struggle with persisting internal inequalities in health. Challenges facing poor and rich countries are parts of a global continuum marked both by inequality that threatens social cohesion and by diversity that creates opportunity for shared learning.

Vision

All peoples and countries are tied together in an increasingly interdependent global health space, and the challenges in professional education reflect this interdependence. Although all countries have to address local problems through building their own professional workforce for their health system, many health workers participate in a common global pool of talent—with great

movement across national borders. That common pool reflects growing interdependence in all health matters, including expanding transfers of risks and knowledge, transnational movement of workers and patients, and growing trade in health services and products.

Of course, the common global pool of professionals and other health workers is divided by political borders and professional certification within nation states. Yet cross-border flow of professional workers, patients, and health services is already substantial and will grow to affect educational content, channels, and competencies in all countries. Individual professions might have distinctive and complementary skills that could be considered the core of their special niche. But there is an imperative for bringing such expertise together into teams for effective patient-centred and population-based health work. Moreover, the walls between task competencies of different professions are porous, allowing for task shifting and task sharing to produce practical health outputs that would not be possible with sealed competencies.

In this global pool, professionals with postsecondary education are especially privileged because their training commanded much time, effort, and investment by them, her or his family, and society, usually calling on substantial public financing. Professionals, therefore, have special obligations and responsibilities to acquire competencies and to undertake functions beyond purely technical tasks—such as teamwork, ethical conduct, critical analysis, coping with uncertainty, scientific inquiry, anticipating and planning for the future, and most importantly leadership of effective health systems.

Our vision calls for a new era of professional education that advances transformative learning and harnesses the power of interdependence in education. Just as reforms in the early 20th century were advanced by the germ theory and the establishment of the modern medical sciences, so too our Commission believes that the future will be shaped by adaptation of competencies to specific contexts drawing on the power of global flows of information and knowledge. Our Commission aspires to spark a second century of reforms in all countries and all professions facing new contexts and fresh challenges. Our vision is global rather than parochial, multi-professional and not confined to one group, committed to building sound evidence, encompassing of both individual and population-based approaches, and focused on instructional and institutional innovations.

Our goal is to encourage all health professionals, irrespective of nationality and specialty, to share a common global vision for the future. In this vision, all health professionals in all countries are educated to mobilise knowledge, and to engage in critical reasoning and ethical conduct, so that they are competent to participate in patient-centred and population-centred health systems as members of locally responsive and globally connected teams. The ultimate purpose is to

	Objectives	Outcome
Informative	Information, skills	Experts
Formative	Socialisation, values	Professionals
Transformative	Leadership attributes	Change agents

***Table 3*: Levels of learning**

Panel 9: Proposed reforms

Instructional reforms should encompass the entire range from admission to graduation, to generate a diverse student body with a competency-based curriculum that, through the creative use of information technology (IT), prepares students for the realities of teamwork, to develop flexible career paths that are based on the spirit and duty of a new professionalism.

1 Adoption of competency-based curricula that are responsive to rapidly changing needs rather than being dominated by static coursework. Competencies should be adapted to local contexts and be determined by national stakeholders, while harnessing global knowledge and experiences. Simultaneously, the present gaps should be filled in the range of competencies that are required to deal with 21st century challenges common to all countries—eg, the response to global health security threats or the management of increasingly complex health systems.
2 Promotion of interprofessional and transprofessional education that breaks down professional silos while enhancing collaborative and non-hierarchical relationships in effective teams. Alongside specific technical skills, interprofessional education should focus on cross-cutting generic competencies, such as analytical abilities (for effective use of both evidence and ethical deliberation in decision making), leadership and management capabilities (for efficient handling of scarce resources in conditions of uncertainty), and communication skills (for mobilisation of all stakeholders, including patients and populations).
3 Exploitation of the power of IT for learning through development of evidence, capacity for data collection and analysis, simulation and testing, distance learning, collaborative connectivity, and management of the increase in knowledge. Universities and similar institutions have to make the necessary adjustments to harness the new forms of transformative learning made possible by the IT revolution, moving beyond the traditional task of transmitting information to the more challenging role of developing the competencies to access, discriminate, analyse, and use knowledge. More than ever, these institutions have the duty of teaching students how to think creatively to master large flows of information in the search for solutions.
4 Adaptation locally but harnessing of resources globally in a way that confers capacity to flexibly address local challenges while using global knowledge, experience, and shared resources, including faculty, curriculum, didactic materials, and students linked internationally through exchange programmes.
5 Strengthening of educational resources, since faculty, syllabuses, didactic materials, and infrastructure are necessary instruments to achieve competencies. Many countries have severe deficits that require mobilising resources, both financial and didactic, including open access to journals and teaching materials. Faculty development needs special attention through increased investments in education of educators, stable and rewarding career paths, and constructive assessment linked to incentives for good performance.
6 Promote a new professionalism that uses competencies as the objective criterion for the classification of health professionals, transforming present conventional silos. A set of common attitudes, values, and behaviours should be developed as the foundation for preparation of a new generation of professionals to complement their learning of specialties of expertise with their roles as accountable change agents, competent managers of resources, and promoters of evidence-based policies.

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Institutional reforms should align national efforts through joint planning especially in the education and health sectors, engage all stakeholders in the reform process, extend academic learning sites into communities, develop global collaborative networks for mutual strengthening, and lead in promotion of the culture of critical inquiry and public reasoning.

7 Establishment of joint planning mechanisms in every country to engage key stakeholders, especially ministries of education and health, professional associations, and the academic community, to overcome fragmentation by assessment of national conditions, setting priorities, shaping policies, tracking change, and harmonising the supply of and demand for health professionals to meet the health needs of the population. In this planning process, special attention should be paid to sex and geography. As the proportion of women in the health workforce increases, equal opportunities need to be in place—eg, through more flexible working arrangements, career paths that accommodate temporary breaks, support to other social roles of women such as child care, and an active stance against any form of sex discrimination or subordination. With respect to geographical distribution, emphasis should be placed on recruitment of students from marginalised areas, offering financial and career incentives to providers serving these areas, and deploying the power of IT to ease professional isolation.

8 Expansion from academic centres to academic systems, extending the traditional discovery-care-education continuum in schools and hospitals into primary care settings and communities, strengthened through external collaboration as part of more responsive and dynamic professional education systems.

9 Linking together through networks, alliances, and consortia between educational institutions worldwide and across to allied actors, such as governments, civil society organisations, business, and media. In view of faculty shortages and other resource constraints, every developing country is unlikely to be able to train on its own the full complement of health professionals that is required. Therefore, regional and global consortia need to be established as a part of institutional design in the 21st century, taking advantage of information and communication technologies. The aim is to overcome the constraints of individual institutions and expand resources in knowledge, information, and solidarity for shared missions. These relations should be based on principles of non-exploitative and non-paternalistic equitable sharing of resources to generate mutual benefit and accountability.

10 Nurturing of a culture of critical inquiry as a central function of universities and other institutions of higher learning, which is crucial to mobilise scientific knowledge, ethical deliberation, and public reasoning and debate to generate enlightened social transformation.

assure universal coverage of high-quality comprehensive services that are essential to advancing opportunity for health equity within and between countries. The aspiration of good health commonly shared, we believe, resonates with young professionals who seek value and meaning in their work.

Undertaking of this vision requires a series of instructional and institutional reforms, which in our proposal are guided by the two outcomes suggested in section 1—ie, transformative learning and interdependence in education (figure 11). The notion of transformative learning derives from the work of several educational theorists, notably Freire[181] and Mezirow.[182] Although it has been used with different meanings,[183] we see it as the highest of three successive levels, moving from informative to formative to transformative learning (table 3). Informative learning is about acquiring knowledge and skills; its purpose is to produce experts. Formative learning is about socialising students around values; its purpose is to produce professionals. Transformative learning is about developing leadership attributes; its purpose is to produce enlightened change agents. Effective education builds each level on the previous one. As a valued outcome, transformative learning involves three fundamental shifts: from fact memorisation to critical reasoning that can guide the capacity to search, analyse, assess, and synthesise information for decision making; from seeking professional credentials to achieving core competencies for effective teamwork in health systems; and from non-critical adoption of educational models to creative adaptation of global resources to address local priorities.

Interdependence is a key element in a systemic approach because it underscores the ways in which various components interact with each other, without presupposing that they are equal. As a desirable outcome, interdependence in education also involves three shifts: from isolated to harmonised education and health systems; from stand-alone institutions to worldwide networks, alliances, and consortia; and from self-generated and self-controlled institutional assets to harnessing global flows of educational content, pedagogical resources, and innovations.

As explained in section 1, transformative learning and interdependence in education are the proposed outcomes of instructional and institutional reforms, respectively (panel 9).

Enabling actions

The ten major educational reforms in instruction and institution are prioritised and presented in panel 9. Six are in instruction and four are in institutional reforms. Pursuit of these reforms will encounter many barriers and require mobilisation, financing, policies, and incentives. Our recommendations, therefore, call for four immediate to long-term enabling actions to create an environment that is conducive to specific reforms (figure 12).

Mobilise leadership

A competent and enlightened professional workforce in health contributes to the larger national and global agendas for economic development and human security. Leadership in professional education should certainly come from within the academic and professional communities, but it should also be backed by political leadership in other parts of government and society when decisions affecting resource allocation to health are made. This broad engagement of leaders at all levels—local, national, and global—will be crucial to energise instructional and institutional reforms. As a start, we list some recommendations.

- Philanthropic leadership clearly sparked the breakthrough reforms of the 20th century and has the opportunity to do so again. The 20th century revolution in professional education and its effect on health were among the most lasting contributions of foundations such as Rockefeller, Carnegie, and others. Foundations have the capacity, agility, and venture catalytic financing that could spark a new wave of reforms in the second century.
- Ministerial summits hosted by the two key UN agencies responsible for leadership in this area—WHO and UNESCO—could bring together ministers of health and education to share perspectives, develop modalities for stronger intersectoral coordination, and launch country-based stakeholder consultations as a key component of joint planning mechanisms.
- National forums for professional education should be tested in interested countries as a way to bring together educational leaders from academia, professional associations, and governments to share perspectives on instructional and institutional reform.
- Academic summits could be considered to engage the support of the wider university leadership as a crucial factor for success of reform efforts in schools and departments that are directly responsible for health professional education.

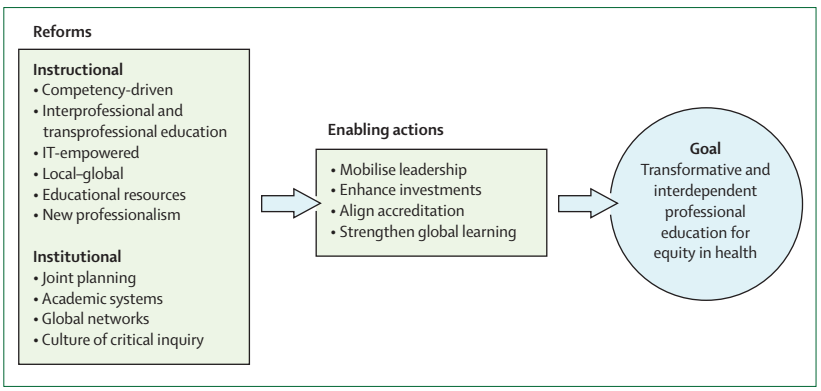

Figure 12: **Recommendations for reforms and enabling actions**

Enhancement of investments

By comparison with total health expenditures, estimated at $5·5 trillion for the world, investment levels in professional education, estimated by our Commission to be in the order of $100 billion per year, are plainly meagre. For a knowledge-driven system, investing less than 2% of total turnover in the development of its most skilled members is not only insufficient but unwise, putting the remaining 98% of expenditures at risk. Gross underfinancing explains much of the glaring educational deficiencies that do so much harm to health-system performance. In view of these realities, every country and agency should consider doubling its investments in professional education over the next 5 years as an indispensable contributor for effective and sustainable health systems. However, it is not only a matter of requesting more funding for professional education. At the same time, wastage and inefficiencies should be identified for best possible use of current allocations, and incentives should be introduced to advance quality and equity.

- Public financing is the most important source of sustainable funding in all countries, poor or rich. Such investments should be allocated to develop a skill mix that is appropriate to national contexts. Because of its importance, every effort should be made to increase not only the level but also the efficiency of public financing. In addition to aggregate financial estimates, the set of incentives generated need to be understood by the way in which investment flows and subsidies are allocated to each educational institution. All too often public subsidies are insensitive to performance. Performance-based financing through scholarships, vouchers or awards, and improved systems for quality monitoring and assurance, should be introduced and evaluated.
- Donor funding for professional education in developing countries should increase to become a significant share of development assistance. After decades of almost exclusive focus on primary education by the development community, new demographic, social, and economic realities make attention to secondary and postsecondary education in low-income countries imperative. The neglect by donors has been short-sighted, since it has not taken into account the human capacity that is needed for effective and sustainable health systems. Such neglect is remarkable since most decision makers in bilateral and multilateral agencies (and in recipient countries) have professional degrees themselves, because otherwise they would not be credible leaders of their respective organisations. We need to end this inconsistency and translate into sufficient investments the unavoidable fact that, especially in the most resource-constrained systems, high-quality professional leadership is crucial for progress.
- Private financing should be welcomed under a clear set of ground rules to optimise health returns. Private funding is necessary because public sources cannot meet all gaps and because professional education is at least partly a private investment on the part of students and their families. Private funding in the professional education marketplace, in view of global shortages, seems to be increasing, as shown by the explosive growth of proprietary nursing and medical schools for labour export. There are genuine hazards of a de-Flexnerisation process of unregulated, unaccredited, and low-quality schools, which calls for greater transparency and oversight—both nationally and globally.

Alignment of accreditation

All countries should progressively move to align accreditation, licensing, and certification with health goals through engaging relevant stakeholders in setting objectives, criteria, assessment, and tracking of accreditation processes. The engagement of government, professional bodies, and the academic community is essential. Accreditation should be based on both instructional and institutional criteria. Countries will vary in the extent to which various academic and social accountability factors are built into the accreditation process.

- National accreditation systems should develop criteria for assessment, define metrics of output, and shape the competencies of graduates to meet societal health needs.
- Global cooperation should be promoted by relevant bodies, including WHO, UNESCO, World Federation for Medical Education, International Council of Nurses, World Federation of Public Health Associations, and others, to help in setting standards that can function as global public goods, assist countries in developing the capacity for local adaptation and implementation, facilitate information exchange, and promote shared responsibilities for accreditation as required by the imperative of protecting patients and populations in the face of a globally mobile health workforce.

Strengthening of global learning

Learning systems on professional education are weak and underfinanced. Outlays for research and development in this field are very meagre, mostly financed in a fragmented manner by diverting resources from recurrent institutional expenditures. Yet innovation cannot flourish in the absence of research and development. Even at its relatively low levels, the turnover in health professional education should generate much larger investments in research and development than is the case at present. A century ago, enlightened foundations supported innovation in health professional education at a crucial time. The benefits of such investment were many. The 21st century requires once again visionary risk taking to lend support to the development of the professional workforce that our challenging times demand. There are three core areas in which communities of learning should be encouraged to generate knowledge-related global public goods.

- Metrics on professional education must be defined, gathered, assembled, analysed, and made widely available.
- Evaluation is central to shared learning about what has worked, what has not worked, and why—the knowledge foundation of all enterprises. Every reform effort, from the design phase to implementation, should be evaluated so that an evidence base on best practice can be disseminated and poor nations can be enabled to substantially advance in the adaptation of innovations.
- Research in professional education should be expanded so that the field steadily builds the knowledge required for continuous improvement.

The way forward

At this crucial time, on the centenary of major reforms, we invite all concerned stakeholders to join us in much needed rethinking for reforms of professional education in the 21st century. Health professionals have made huge contributions to health and socioeconomic development over the past century, but we cannot carry out 21st century health reforms with outdated or inadequate competencies. The extraordinary pace of global change is stretching the knowledge, skills, and values of all health professions. That is why we call for a new round of more agile and rapid adaptation of core competencies based on transnational, multiprofessional, and long-term perspectives to serve the needs of individuals and populations.

Ultimately, reform must begin with a change in the mindset that acknowledges challenges and seeks to solve them. No different than a century ago, educational reform is a long and difficult process that demands leadership and requires changing perspectives, work styles, and good relationships between all stakeholders. We therefore call on the most important constituencies to embrace the imperative for reform through dialogue, open exchange, discussion, and debate about these recommendations. Professional educators are key players since change will not be possible without their leadership and ownership. So too are students and young professionals, who have a stake in their own education and careers. Other major stakeholders include professional bodies, universities, non-governmental organisations, international agencies, and donors and foundations.

Most importantly, implementation of our recommendations can be propelled by a global social movement engaging all stakeholders as part of a concerted effort to strengthen health systems. The result would be an enlightened new professionalism that can lead to better services and consequent improvements in the health of patients and populations. In this way, professional education would become a crucial component in the shared effort to address the daunting health challenges of our times, and the world would move closer to new era of passionate and participatory action to achieve the universal aspiration for equitable progress in health. Of necessity, such progress will be fuelled by knowledge, giving professionals an essential role in the realisation of the value so aptly expressed by Louis Menand:

"The pursuit, production, dissemination, and preservation of knowledge are the central activities of a civilization. Knowledge is social memory, a connection to the past; and it is social hope, an investment in the future. The ability to create knowledge and put it to use is the adaptive characteristic of humans. It is how we reproduce ourselves as social beings and how we change—how we keep our feet on the ground and our heads in the clouds."[151]

Contributors
All commissioners contributed to the report concepts, recommendations, writing, and editing, with data gathered under the direction of the co-chairs and a supporting research team.

Conflicts of interest
We declare that we have no conflicts of interest.

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