Public Health Education in Europe: Old and New Challenges

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ABSTRACT

The purpose of this article is to discuss some of the current challenges faced by European schools of public health. Perhaps most remarkable on the continent is the diversity, the magnitude, and the rapidity of the developments in public health education since the Second World War. This article discusses its evolution, its main characteristics and the underlying rationale with several examples. Further, it addresses specific aspects of the future development, namely the collaboration of academic schools with practice-oriented institutions, as well as the interactions between the constituent disciplines of public health. The Bologna process on post-graduate education in Europe has had an important impact on the overall design of most schools. There is a willingness to develop public health in each country of the European region and there is a need to develop common strategies to reach high standards in teaching, training and researching in all disciplines related to public health.

Key Words: Public health, education, training, research, practice, health policy.

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INTRODUCTION

According to current estimates,[1] there are about 450 schools of public health worldwide, not counting departments or units providing specific courses, or training devoted to epidemiology, social medicine, technology assessment, environmental medicine, etc. According to estimates from the European Association of Schools of Public Health (ASPHER), over 80 institutions in the European region qualify as schools of public health.[2]

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The purpose of this article is to discuss some of the current issues in the development of European schools of public health, to draw on lessons from the past, and to address the central, future challenges of academic public health in the European region.

DEFINITIONS AND AIMS OF PUBLIC HEALTH EDUCATION

Public health is defined here using Winslow's definition which says that "(public health is) the science and art of preventing disease, prolonging life, and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing service for the early diagnosis and preventive treatment of disease, and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health."[3] A shorter definition simply states that public health is about providing appropriate answers to the needs of the population.

Education and training are defined here as the formalized transmission of knowledge and skills related to the disciplines of public health, directed towards workforce involved in public health, provided by qualified teachers and senior practitioners, and following the standards of "best practices" from leading centres around the world. Where academic education and training is concerned, the transmission includes the latest advances from the research field, in which all academic teachers should be deeply involved. The main aim of education and training is to anchor the decisions made by public health practitioners in scientific evidence.

*The public health workforce is a part of the available human resources for health promo*tion and maintenance. This group is usually classified into two sections: those providing direct care for individuals and those providing non-personal health services.[4] The latter is a synonym for the public health workforce, i.e., workers whose prime responsibility is the provision of core, non-personal public health activities, irrespective of their organizational base (i.e., within or outside a public health institution).

Most of this workforce is involved in the *practice of public health,* defined as the appropriate use of available knowledge. A more complete definition states: "public health practice is the strategic, organized and interdisciplinary application of knowledge, skills and competencies necessary to perform essential public health services and other activities to improve the population's health."[5] This is close to the definition of the field epidemiologist provided by

the European Centre for Disease Prevention and Control: "(someone who) applies the science of epidemiology to the prevention and control of public health problems and works in intervention and response activities."[6]

These definitions do not truly reflect the strong *interactions between education, research and practice.* Astute observations in the field of public health can be an inspiring start for an increase in the analytic and deductive capacity of both practitioners and researchers to identify uncharted areas deserving further exploration. In fact, if the goal is evidence-based public health practice, it should be firmly anchored in the best available cumulative experience from research and practice.[7] Accordingly, a well-functioning public health system aims to maintain continuous interaction between education and training, research and development, and skilled practice.

DIVERSITY AND DYNAMISM

In Europe, and in the Western world in general, the development of schools of public health is related to the emergence of the modern states in the 19th century;[8] Great Britain was likely the first country to take key steps in the formal organization of public health, including the training of the workforce.[9] In the great imperial powers of that time, public health was also developed to cope with new problems related to colonization and had military purpose (e.g., the Institute of Tropical Medicine in Antwerp, established in 1906, or the London School of Hygiene and Tropical Medicine, established in 1924).[8,10]

In most European countries, education in public health has been traditionally integrated as a part of the medical curriculum. Thus, the schools of public health tended to be part of the faculties of medicine, and this is still the case in most European countries.[11] The faculties of medicine have been the dominant and most instrumental investors in academic public health. This was the case, for example, in Switzerland where an investment was made via the institutes of social and preventive medicine, one in each of the faculties of medicine in the five largest universities.

Therefore, Europe has developed public health as a specialized area of medicine. The single most important advantage of this situation is to offer a continuum between clinical and population medicine, i.e., linking responses to population health needs with the health needs of the individual. Such a unifying concept is not negligible in present times, i.e., an era dominated by chronic and degenerative diseases, which commands a close articulation between care and prevention, and between interventions at the individual and collective levels.

On the other hand, the detrimental consequences of the medicalisation of public health include some lack or delayed development of the non-medical dimensions of public health, i.e., psychosocial aspects of health, sociology, organization of health systems, health policy, and other topics not directly linked to the biomedical and clinical sciences. These topics are lagging behind in many European countries, with slow, and sometimes nonexistent, progress.

The main alternative, namely a stand-alone faculty of public health,[12] is common in the United States for reasons related to the local history of medicine and public health.[13] Since the early 20th century, US clinicians, who obtained stronger licensing laws and other means of controlling the market for their services, were doing well with the fee-for-service payment system[9] and therefore had little incentive to go into public health. As a result, recruitment came from a variety of other fields.[14] Several important schools started with independent faculties, such as in Baltimore with the Johns Hopkins School of Public Health, or in Boston with the Harvard School of Public Health. These schools were pioneers in setting the current standard of the US model for schools of public health. However, apart from the close relationship between public health and medicine, which is common to European countries, all the remaining aspects of schools of public health are remarkably diverse. The tasks, aims, internal structures, institutional affiliations, functional collaborations, links with ministries, etc., are often radically different, reflecting historical constraints and local opportunities. Table 1 presents part of the diversity.

Analyzing the future of schools of public health, de Leeuw proposed a systematic classification resulting in eight types of schools.[11] It is beyond the scope of this article to discuss this classification, or to develop a new framework. More modestly, Table 1 shows features of selected schools. It is not a representative sample of existing schools or programs in Europe, but illustrates some of the existing organizational structures.

Table 1 deserves a few remarks. The first notable point is the insertion into structures. Most schools belong to faculties of medicine, as mentioned above. However, there are examples of affiliation to the national health authorities (like the Nordic School of Public Health, which is owned by the Nordic countries and represented by the Nordic Council of Ministers) or to the local government (like the Andalusian School of Public Health in Granada). Such affiliations presumably optimize the balance between the needs of the government and the autonomy of academic schools. Furthermore, such an arrangement is likely to promote targeted research with appropriate funding.

Table 1

Selected examples of European schools of public health

Name	Affiliation	Degrees and Target Group	Year of Foundation
Netherlands School of Public and Occupational Health (NSPOH), Amsterdam www.nspoh.nl	Stand-alone school	Two post-graduate master programs: • Master of Public Health (is designed for (future) managers, policy advisors, executives, project managers and epidemiologists working in the broad field of public health) • Master of Occupational Health (is designed for ambitious professionals who work for a labor organization as (prospective) consultants, project leaders, policy advisors and other professionals working in the broad field of work and health)	Established in 2003 as a merger between the Netherlands School of Public Health and the Netherlands School of Occupational Health.
Institute of Tropical Medicine (ITM), Antwerp www.itg.be/itg/	Stand-alone school	Two post-graduate master programs in public health: • MPH - Health Systems Management and Policy (for health professionals working as managers or policy makers/ implementers in low- and middle-income countries) • MPH - Disease Control (for persons with a university degree in medicine, or health sciences, and two years or more of relevant experience related to tropical disease control or reproductive health in low- and middle-income countries)	Established in 1906.
Netherlands Institute for Health Sciences (Nihes), Rotterdam www.nihes.nl/site/	Stand-alone school	Post-graduate programs: • MSc in Epidemiology, Clinical Epidemiology, Genetic Epidemiology, or Public Health (must have a university bachelor's degree in a discipline related to clinical medicine and public health, but no research experience; preparation for a research, executive or advisory position in public health, clinical medicine, drug research or health-policy development)	Established in 1992 as an alliance between five renowned Dutch universities and research institutes that collaborate and share knowledge in quantitative medical and health research

Name	Affiliation	Degrees and Target Group	Year of Foundation
		• MSc in Health Sciences (for those with prior research experience and at least a university master's degree in a discipline related to clinical medicine and public health) • Research Master's (for Dutch medical students)	
Nordic School of Public Health, Göteborg www.nhv.se	Owned by the Nordic countries as represented by the Nordic Council of Ministers	Post-graduate programs: • Master of Public Health (the basic eligibility requirement is a higher-education degree equivalent to three years of full-time study at university level) • Doctor of Public Health (DrPH) (a Master's degree in Public Health Science or an equivalent degree of at least Master's level in a subject that can be tied to the knowledge area of Public Health Science)	Established in 1981.
Andalusian School of Public Health, Granada www.easp.es	Part of the Health Ministry of the Andalusia Regional Government	Post-graduate programs: • Master in Public Health and Health Management (for professionals, graduates and postgraduates who wish to obtain an education and training to perform the functions of public health in any field; part of the training program of resident physicians enrolled in the specialty in Preventive Medicine and Public Health) • European Master in Public Health (for professionals who wish to embark on a career in the field of public health)	Established in 1985.
Department of Public Health and Primary Health Care, Bergen www.uib.no/isf/en	Part of the Faculty of Medicine and Dentistry, University of Bergen	Pre-graduate program: • Bachelor in Public Health and Health Promotion	Established in 1990 when the Institute of Hygiene and Social Medicine and the Department of General Practice were merged - with the discipline of Geriatric Medicine and the Institute of Nursing Science.

Name	Affiliation	Degrees and Target Group	Year of Foundation
		Several Master of Philosophy programs, e.g.: • Master in International Health (a good Bachelor's degree level is required for admission; candidates are selected from graduates of schools of medicine or dentistry, and from graduates of related disciplines of science or social sciences such as public health, nursing, nutrition, human biology, medical technology, pharmacy, social and behavioural sciences and international health; primarily aimed at students from low- and middle-income countries; good knowledge of English) • Master in Health Promotion (applicants must be prepared academically at least at the baccalaureate level or have a combination of education and experience that is equally qualifying; intensive study in at least one of the fields or professions most relevant to health promotion, including but not limited to psychology, sociology, medicine, dentistry, public health, anthropology, economics, and education)	These units were combined into one department with common management, where the different disciplines were organized as sections. In 1994, Occupational Medicine incorporated into the department; in 1995, Physical Therapy Science; and in 1998, Medical Statistics.
School of Health and Population Sciences, Birmingham www.haps.bham.ac.uk/	Part of the College of Medical and Dental Sciences, University of Birmingham	Involved in undergraduate teaching (for MBChB and BMedSci courses) and postgraduate courses suitable for a wide range of people working in health and other occupations: • MPH (a 2:1 degree (or equivalent) in medicine, a life science or another relevant subject; an interest in public health or epidemiology; experience of working in public health, or a related field would be an advantage; recent graduates with limited relevant experience may apply if they can demonstrate an interest in public health	The latest structure was established in 2009. The school itself has existed, under different names, for several decades.

Name	Affiliation	Degrees and Target Group	Year of Foundation
		• Health Economics & Health Policy (good honours degree (upper tier or better) or an equivalent professional qualification is required) • Occupational Health (relevant first degree is required, although those with relevant work experience/ appropriate expertise will be considered)	
Faculty of Public Health, Bratislava www.szu.sk/	Part of the Slovak Medical University, Bratislava	BA, MPH, PhD (no further information available)	Founded in 2002 as the direct successor to the School of Public Health, established in 1991 under the auspices of the World Health Organization (WHO) as part of the Slovak Postgraduate Academy of Medicine.
Department of Public Health, Copenhagen publichealth.ku.dk/	Part of the Medical Faculty of the University of Copenhagen	Pre-graduate programs: • Bachelor in Public Health Science (BSc) Post-graduate programs: • Master programme in Public Health Science (MSc) • Professional Master of Public Health (aimed at educated people with years of relevant work experience who wish to improve their skills to perform tasks related to public health and prevention. The admission requirement is a diploma, a Bachelor's degree or a completed vocational higher education supplemented by documented training at academic level combined with a minimum of two years relevant work experience)	The school took its current structure in 1997. However, the department existed for the past 20 years under various names.

Name	Affiliation	Degrees and Target Group	Year of Foundation
		• Danish Graduate School in Public Health Science (PhD) is based in the Department (co-operation between 13 institutions, which comprises University of Copenhagen, University of Southern Denmark, University of Aarhus, government research institutes, hospital research units, and private research organizations. The graduate school is organizationally anchored in the Institute of Public Health, University of Copenhagen)	
Leeds Institute of Health Sciences, Leeds www.leeds.ac.uk/lihs/	Part of the Faculty of Medicine and Health, University of Leeds	Post-graduate programs: • MSc in International Health (degree in a health related discipline, or a diploma in a health related discipline with at least three years relevant experience) • MSc in Health Informatics (for students with a computing, science, engineering, business or healthcare background, who are keen to develop a career in the growing health technology sector) • MSc in Education in Primary Care & Primary Care (further development for professionals working and teaching in primary care in the UK) • MPH (graduates from social sciences such as psychology, sociology, law, or ethics interested in building on their previous degree(s) in the context of public health, health or public policy more generally with a view to a future career in research, policy or the health sector or local government; and/or research associates looking to develop their research skills and understanding of issues in health with a view to advancing their academic career or seeking jobs within health or public sector)	Re-established in 2005.

Name	Affiliation	Degrees and Target Group	Year of Foundation
School of Community Health Sciences, Nottingham www.nottingham.ac.uk/chs/index.aspx	Part of the Faculty of Medicine and Health Sciences, University of Nottingham	Post-graduate programs: • MSc in Public Health • MSc in Public Health (International Health) • MSc Applied Epidemiology • PhD in Epidemiology and Public Health	The School was formed in 1997, combining the strengths of established disciplines, and comprises the divisions of Epidemiology & Public Health, Primary Care, Psychiatry and Rehabilitation & Ageing. In 2010, they were joined by the Institute of Work, Health & Organisations (Applied Psychology)
Department (Institute) of Public Health, Odense www.sdu.dk/Om_SDU/Institutter_centre/Ist_sundhedstjenesteforsk	Part of the Faculty of Health Sciences, University of Southern Denmark, Odense	Pre-graduate programs: • BSc in Public Health Science Post-graduate programs: • MSc in Public Health Science (admission requires a bachelor's degree in the sciences area)	Established in 1999.
Department of Public Health Sciences, Stockholm ki.se/ki/jsp/polopoly.jsp?l=en&d=11934	Part of Karolinska Institutet (a Medical University), Stockholm	Post-graduate programs: • Master in Global Health (Professional and/or Bachelor's of 180 ECTS with 120 credits in behavioral sciences and at least two years after finishing school; it also requires knowledge of Swedish and English corresponding to Swedish B and English A with a minimum grade of Pass. Further requirements depending on specialization)	Established in 1996.

Name	Affiliation	Degrees and Target Group	Year of Foundation
		• Master in Work and Health (a Bachelor's degree or vocational qualification of at least 180 credits; it also requires knowledge of English equivalent to English B course with a minimum grade of Pass) • Master in Public Health Science (a Bachelor's degree or vocational qualification of at least 180 credits in public health, health care or relevant social science subject area; it also requires knowledge of English equivalent to English B with a minimum grade of Pass)	
Department of Public Health and Clinical Medicine, Umeå www.phmed.umu.se	Part of Faculty of Medicine, University of Umeå	Post-graduate programs: • Master in Work and Health (a Bachelor's degree or a professional degree of at least 180 credits) • Master Medicine in the main field of public health • MSc of Public Health (a Bachelor's degree (equivalent to a Swedish Kandidatexamen, 180 credits) from an internationally recognised university with a major in Public Health, Environmental Health, Medicine, Nursing, other Health specialisation or a relevant field in social science. Priority is given to students with at least two years of relevant work experience)	Established in 2001.
School of Health Care and Social Welfare, Mälardalen www.mdh.se/hvv	Part of Mälardalen University, *	Post-graduate education: • MSc in Caring, Nursing and Public Health (a Bachelor's degree from an institution of higher education of three years or more, equivalent to at least 180 credits (180 ECTS credits) within the fields of public health, caring, nursing or medical science)	Established in 2008.

* cooperates closely with the County Councils both in Västmanland and in Sörmland, with municipalities, private care providers and companies in the region

Name	Affiliation	Degrees and Target Group	Year of Foundation
Faculty of Health, Medicine and Life Sciences, Maastricht www.maastrichtuniversity.nl/web/Faculties/FHML.htm	Full faculty of Maastricht University	Pre-graduate programs: • BSc in European Public Health • BSc in Health Sciences Post-graduate programs: • MSc in European Public Health (a Bachelor's degree in a relevant field and ability to demonstrate proficiency in English, as well as having successfully completed a module on methodology and statistics; familiarity with the statistical software programme SPPS is strongly advised) • MSc in Global Health (a Bachelor's degree in a relevant field and ability to demonstrate proficiency in English, as well as competency in methodology and statistics) • MSc in Public Health with specialization in Epidemiology, or Health Education and Promotion, or Healthcare Policy, Innovation and Policy (a Bachelor's degree equivalent to at least 3 years of nominal study time (180 ECTS) in a relevant domain) • Research Master in Health Sciences (a Bachelor's degree in Health Sciences at Maastricht University or a Bachelor's degree (with a high qualification according to a list of grades) or a Master's degree (with distinction) issued by a Dutch or non-Dutch university in a relevant domain) • Graduate School for Public Health and Primary Care (CAPHIRI)	Established in 1976.

Another sort of affiliation is a school of public health as a part of a non-medical centre for higher education. Table 1 shows an example from Mälardalen (Sweden), with the Division of Public Health Sciences as a part of the School of Health Care and Social Welfare in a university. There are also some examples of stand-alone schools, such as the Institute of Tropical Medicine in Antwerp.

Therefore, although still predominant in Europe, the affiliation of schools of public health to faculties of medicine is unlikely to last forever. Issues related to affiliation, as well as to collaboration and to interaction between the many disciplines relevant for public health, are pervasive. Modern public health requires both specialized expertise and strong interdisciplinary cooperation. This is a daunting challenge.

However, interactions between public health and medicine will be increasingly important in the coming decade,[15] and therefore, the link between public health and medicine will stay relevant. Although most public health schools are part of faculties of medicine, this does not reflect the content or quality of the interaction between the departments, if any. In general, public health is taught to medical students at the pre-graduate level. Yet, it is unclear to what extent clinicians and public health specialists collaborate and how well both groups of professionals are trained to link population-based health with clinical care. A recent report published by a health workforce commission headed by Frenk and colleagues rightly emphasized the development of public health as part of the development of the whole health workforce: "all health professionals in all countries should be educated […] so that they are competent to participate in patient and population-centered health systems as members of locally responsive and globally connected teams."[1]

Health economics is another discipline highly relevant for public health. However, Table 1 shows that health economics is not always present in European programs or structures. It is probable that schools of public health, which are part of faculties of medicine, are less attractive for strong disciplines like economics than stand-alone schools.

Furthermore, professionals working in areas such as health care, urbanization, transport, migration, public policy, etc. use concepts and tools developed by public health, and therefore must be taught and trained to become key players in population health.

The schools are also diverse in their size, and this challenge is increasing in Europe with the emergence of small or very small countries (e.g., following the break-up of Yugoslavia into many republics in the early 1990s). The small size of many public health institutions does not allow a

critical mass of disciplines to be taught and researched. This situation promoted the development of collaborative arrangements between schools, or teaching institutions, across various countries like the Nordic School, in South Eastern Europe,[16] or within countries like Switzerland,[17,18] or Canada.[19] In all cases, this reinforced collaboration between schools, with more student and faculty exchanges, mutual degree recognition and successful international accreditation. As a matter of fact, many small schools have been launched and appear to be successful in conducting their MPH and, in some cases, PhD programs (see paper from Overall, et al. in this issue).

In terms of research and expertise, the efficacy of these different approaches remains to be seen. If education and training are to be appropriately delivered by a relatively loose network of teachers sharing a common list of aims in teaching, research and practice, professionals in public health need a closer interaction to elaborate new concepts and to develop new applications.

The rapid and prolific development of schools is another remarkable aspect of public health education in Europe.[11,20] The full history of this movement has yet to be examined to better understand the last 60 years. The first set of reasons is related to the expansion of health systems after the Second World War. In Europe, the socialization of health care took several forms (from generalization of health care insurance in a largely private system, to the full nationalization of the health care system), but always led to the establishment of structures devoted to providing universal health care access along with the management, funding and payment of medical and hospital care, prevention and rehabilitation services. The efforts to develop, maintain, and constantly reorganize the health system instigated a need for trained professionals addressing these new tasks. Such a move was, and still is, very visible in Eastern European countries. The socio-economic upheaval of the nineties was followed by a transformation of the health systems and, consequently, by a change in the education of the public health workforce.[21,22]

Everywhere in Europe, there is a need for well-trained health professionals to cope with, among others, the aging of the population, the high prevalence of chronic diseases, shortages of trained health workers, the reorganization of health care systems management, and public health interventions (e.g., reducing smoking).[23] Thus, the growth in health expenditure has promoted disease prevention as a strategic tool to reduce the demand for health care. This is associated with an increasing legitimacy of public health in helping to promote a rational allocation of resources and might be the single most important catalyst for the development of new schools in Europe.[9]

A second set of reasons for the rapid increase in schools of public health is epistemological, or related to structural changes in biomedical sciences. The contribution of quantitative methods and population-based approaches to medical research has increased substantially in etiological research. For example, population epidemiology provided conclusive evidence for important non-communicable conditions like cardiovascular disease (e.g., via the Framingham studies) or cancer (e.g., with the tobacco studies). Currently, genetic epidemiology plays an important role in genomic studies.

In fact, the epidemiological transition (i.e., the shift from population health status dominated by highly lethal infectious diseases to situations dominated by chronic and degenerative diseases) increases the visibility of epidemiology. Long incubation periods and multiple causal determinants are frequent characteristics of non-communicable diseases. They are better observed by comparing groups of individuals using both epidemiological methods and qualitative tools. Behavioral and environmental research (both physical and social) are now widely accepted as important parts of understanding causal pathways. The increase in legitimacy of population-based observations in medical research likely brought medicine and public health closer together[9] and partially closed a gap between population medicine, the psychosocial sciences, the clinical management of diseases, and the management of health systems.[24]

This evolution had some visible consequences in the tasks of medicine. In the early 2000s, an international committee presented the so-called "new professionalism", a set of three principles and ten commitments directed to medical doctors.[25] Interestingly, this chart includes themes related to public health (see, for example, the two commitments to improving access to care, and to a just distribution of finite resources).

A further consideration related to the epistemological change in medical sciences is the rise of clinical experimentation after the Second World War. This has established a central role of quantitative methods in clinical research with controlled trials (since the 1950s) and with meta-analysis (since 1980s). The development of epidemiological and statistical systems has contributed to an increase in the demand for appropriate skills in quantitative methods and thus, in the provision of resources to departments of public health where such specialists, in general, were located.

PUBLIC HEALTH WORKFORCE: NEEDS, RESPONSES AND GAPS

In the early period of public health specialization in the US, it was observed that "(those) who took posts in public health often had no public health training."[26] Surprisingly, even in the US, where there is a strong tradition in public health education, this is a persistent issue. A document published in 2002 by the Institute of Medicine[27] mentioned that, "a majority of governmental public health workers have little or no training in public health", despite the fact that "enhancing the knowledge and skills of governmental public health workers and non-governmental workers who perform public health functions is necessary to ensure that essential public health services are competently delivered".

Although not yet quantified, the proportion of undereducated professionals is likely to be similarly high in Europe (and probably worse in some countries compared to others), with severe shortages in some specialty areas. Overall, many professionals in the current workforce need further training to effectively assess health problems and to implement population-based strategies for improving health. Again, the enduring gap in the US (despite its substantial efforts) is important to keep in mind in Europe. Meeting these needs will take several decades with sustained effort and political support for the budgets. However, emerging European legislation on public health does not put the workforce or its education as a central piece of the development strategy.

Beyond the scope of public health practitioners without a formal education, there is also a problem with the appropriateness (or the lack) of education and training. For example, it is unclear how far issues relevant for the future are integrated into the training programs, e.g., the move from disease control to health promotion, the persisting impact of social inequities on health, the emerging managed care environment, or the public health implications of health care technologies.[28] The integration of new fields like genomics, communication or cultural competencies is a further fundamental challenge. This problem should be addressed via formal accreditation for the teaching programs and institutions delivering the programs.

A pivotal question is how far we should promote education through the development of an exclusive jurisdiction for public health professionals.[9] Exclusive jurisdiction will mean that only those with the proper credentials in public health will be allowed to do certain kinds of work and make certain kinds of decisions.[9] The current situation is almost the reverse, where a wide variety of educational backgrounds are considered adequate and legitimate preparation for professional public health positions.[9] The

exceptions in Europe are medical doctors: public health is a protected title for specialized medical doctors, but not for those with other disciplinary backgrounds. The problem is currently being addressed in some countries, as in the enhanced credentialing role of the Faculty of Public Health in the United Kingdom.[29,30]

This point may appear minor, but it is not. It is an important discussion for the future schools of public health, which must define a market for the graduates of their education and training programs. Moreover, the debate on the definition of the public health professional reflects difficulties in delineating the boundaries of the field. The result is such a vast jurisdiction for public health that it cannot possibly claim to be exclusive.[9] Such ambitions may explain why the development of public health, as a fully recognized profession, has been slow in most countries, including in the US.[31] Another method which emerged recently is to develop lists of competencies for various specialized professionals in public health, defined as the combination of knowledge, skills and abilities that a professional must demonstrate and that are critical to perform work effectively,[6] as expected by the society. These competencies include teamwork, ethical conduct, critical analysis, coping with uncertainty, scientific inquiry, anticipating and planning for the future, as well as and most importantly, leadership of effective health systems.[1] Such lists are currently developed in the US, and in Europe by ASPHER[32] or by practice-oriented institutions like the European Centre for Disease Prevention and Control.[6]

LINKING EDUCATION WITH PRACTICE AND RESEARCH

In most Western countries, the implementation and the maintenance of schools of public health have been thought of as the development of academic institutions, rather than professional schools.[26] This emphasized the "scientific" areas of public health,[33] typically epidemiology, which became, as suggested above, a significant part of biomedical and clinical research. This led to the relative neglect of other public health disciplines (e.g., health economics) and a lack of attention to emerging public health problems (e.g., chronic diseases in developing countries).[4] Another consequence has been the weakening of the link between academic- and practice-oriented institutions,[26] with too strong an emphasis on institution-based teaching and the lack of direct field experience.[4] The final stage of this process could well be the isolation of the schools, an evolution feared twenty years ago in the US.[34]

There are several possible remedies, which are not mutually exclusive. One is to set up, as a full part of a school of public health, a sector oriented towards practice. There are several examples of centers of public health practice integrated into academic schools, in the US[5,33,35-38] and in the Netherlands (e.g., Faculty of Health, Medicine and Life Sciences of the Maastricht University, see Table 1). In fact, many schools provide counselling to local or national bodies in charge of the population's health. However, setting up a structure with the explicit mission of linking practice, education and research gives a strong message to the public health authorities: there are practical skills and knowledge available in the academic centers, which are relevant to real life problems.

Another possibility is to develop joint appointments between practice-oriented and academic institutions. This allows the inclusion of senior practitioners as mentors or members of the teaching team. These experienced professionals can also act as role models.[4] This sort of arrangement is still rare in continental Europe (it is inhibited by the high standards of publication requirements of many academic medical centers), but there are several examples elsewhere (e.g., in Quebec).

Research in public health must be closely linked to education and training and, as a final aim, to public health practice. Linking active outputs coming from relevant scientific research with education seems obvious in academic centers. It is not, however. Anecdotal evidence suggests that, in several schools, two groups exist: teachers who are not researching and researchers who are not teaching. This situation does not contribute positively to the maintenance of public health as an academic discipline. Here, the main remedy should be to involve every teacher in public health research. This should be part of a school's evaluation and accreditation.

CONCLUDING REMARKS

The quantity and the quality of the public health workforce need to be improved in Europe in order to meet the current and future needs of population health. A strategic part of this improvement is the development of public health education and training,[39] because supporting the professionalization of the public health workforce is a required condition for an effective and efficient health system. This transformation depends largely on regional history and local constraints. However, it also depends on visions proposed by public health professionals across national borders, which reflect a growing interdependence in all health matters.

A joint initiative established by the European Public Health Association (EUPHA) and ASPHER, the Accreditation Agency (APHEA) was established in spring 2011 and will begin work shortly. This development, which has been in gestation for over a decade, could play a major role in the redeployment of public health in Europe, and in the related efforts for education and training. Accreditation can be an important civilizing process in the characterization of the core competencies of the public health workforce and in the improvement of cooperation between institutions.[1] In addition, including the above mentioned solutions (e.g., creation of centers of public health practice in schools and involving teachers in public health practice) into the accreditation criteria might help to shape the schools' future development.

Hopefully, this new agency will conduct an evaluation on the relevance of education for real-world public health, and not only on formal educational measurements. It has been argued that performance assessments have to include "some measure of their dedication to the public interest and their accountability to society."[40] We can be sure that promoting relevant education and training in Europe will require a daily effort from all professionals working both in academia and in public health practice.

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