Future of Public Health Training: What are the challenges? What might the solutions look like?

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Abstract

The Asia Pacific region has rapidly changing health needs. This reshaping of health priorities is directly impacting upon current and future public health education. This brief review focuses on foundational public health skills including epidemiology, biostatistics and health informatics. Epidemiological skills, in particular, are essential for policy makers and practitioners to identify the emergence of problems and to inform priority setting of public health efforts. Training needs to move beyond didactic, passive learning methods in class settings to approaches that engage and challenge students and academics in active, flexible learning and realistic problem-solving. We provide an overview of future trends in Public Health training in the Asia Pacific region, and illustrate the diversity of online training resources globally that can enrich staff and student skills and complement our active, class-based teaching.

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A major reshaping of the burden of disease in the Asia Pacific region is occurring as populations age, become more affluent and sedentary, and communicable diseases are more controlled. The nature of communities and their public health services are undergoing significant transformation. Although the broad goals of Public Health - to promote and protect the health and well-being of people and their communities – remain constant, the strategies and methods we apply must be contemporary and responsive to rapid social, economic and technological changes.

Public Health skills in the context of rapid change

Epidemiology, biostatistics and health information skills are core to the three domains of health protection, health improvement and health service quality improvement. Quantitative skills are essential for policymakers and practitioners to identify problems and to inform priority setting of public health efforts.

The population of Asia is now over four billion, accounting for 60% of the global population. The demographics of many countries in the region are changing inexorably. Countries such as Japan are on a clear trajectory for 2050 of having a very large proportion of aged persons. Many countries are experiencing increased prosperity and greater use of technology, but not everyone is benefiting and health inequalities are becoming more pronounced. Technological innovation is engineering physical activity out of the day to day life, resulting in higher rates of sedentary behaviour. Asia is now part of the global pandemic of physical inactivity and action is needed.

The ‘big three’ preventable noncommunicable diseases (NCDs) in Asia are Cardiovascular disease, Diabetes and Cancer. The main preventable causes for these three diseases have been identified as tobacco use, alcohol use, physical inactivity and an unhealthy diet. But it isn’t just these ‘big three’. Mental illness accounts globally for a huge burden, accounting for 32% of the years of life lived with disability. However, for most nations in the Asia-Pacific region, mental health remains a low priority. Even describing the scale of problems such as depression and anxiety remains limited, and consequently there are few evidence-informed services at the community level. Burden of disease studies also identify injury, especially from road traffic accidents, as a major problem.

Epidemiological skills are required to explore common but seemingly hidden, taboo health issues such as men’s reproductive problems. For example, a recent paper identified significant unmet service needs for men’s reproductive health in the Solomon Islands. The workforce requires refined epidemiological skills to support the UN sustainable development target of universal access to sexual and reproductive health services. Within countries, there are pronounced differences in disease epidemiology which training must address. In-country differences are most pronounced amongst Indigenous, First Nation’s Peoples. To illustrate, the burden of disease and injury study of Queensland Australia of Aboriginal and Torres Strait Islander Peoples identified that 80% of the years lived with disability (YLD) occur in people under fifty years of age. In contrast, for non-Indigenous people the YLD occur much later in life. The analysis also shows Indigenous people have on average 62 years in good health expectancy, a 12-year shortfall from that experienced by non-Indigenous people. Epidemiological interpretative skills within the broader public health paradigm enable more informed and equitable approach to address the health needs of the disadvantaged.

Epidemiology training for evidence-informed public health response

Future public health training will need to focus on the integration of quantitative research and evaluation skills with other core Public Health competencies for an effective response. For example, population aging is leading to the greater dependency of elderly people (age 65+) upon the shrinking working age population. In Japan, by 2025 30% of the population will be elderly. Within
this context, the maltreatment and neglect of older people (elder abuse) is expected to be elevated and result in increased human and economic costs\textsuperscript{12}. For elder abuse, epidemiological and informational skills should be integrated with enriched teaching on mental health, interpersonal violence and social change so that professionals can both articulate the problem and effectively identify relevant evidence to address it\textsuperscript{12}. Integrated epidemiology training enables health professionals to undertake evidence-informed decisions that improve and protect health and to evaluate health interventions implemented.

Over the last few years commentaries in key public health journals have debated future challenges facing public health and epidemiology. Numerous topics have been raised including: the rising rates of NCDs globally\textsuperscript{13}, climate change\textsuperscript{14}, emerging infectious diseases\textsuperscript{15}, declining public health research funds, the increased focus on personalised precision medicine\textsuperscript{11}, the methodological debate about whether to focus on causal modelling or on implementation and impact in the real world\textsuperscript{16}, the rapid changes in technology, and the emerging use of ‘big data’\textsuperscript{16,17}. In 2015, an eminent group of USA based epidemiologists\textsuperscript{10,18} identified 12 future trends that will impact on public health and epidemiological education and practice. Table 1 identifies 10 of the 12 trends that are having a significant impact on public health in the Asia-Pacific. These priorities should help to focus efforts to improve public health training and professional practice.

\textit{<Insert Table 1 here>}

### Addressing challenges in learning and teaching in epidemiology

Although epidemiology and the skills of evidence-informed practice are critical for public health practice, learning them has been seen as ‘dull and boring’\textsuperscript{19} or difficult\textsuperscript{20}. Many students experience difficulties acquiring epidemiological skills, and this may be due to the often passive environments that have been created in the classroom. Simply attending didactic lectures may be unhelpful for learning epidemiology and developing critical thinking skills. Why can’t epidemiology be an exciting and fun subject to learn? We suggest that it can. One example is a using a 2-hour lecture to conduct a mock controlled trial to teach study design and the principals on critical appraisal\textsuperscript{21}. In this example, the candy ‘Smarties’ is used rather than active medication to ascertain the effects on an intervention. The approach uses audience response technology such as ‘clickers’ to engage students in active learning. Recent research shows there is a greater potential for technology to support learning and teaching in epidemiology, and public health more broadly\textsuperscript{22}.

### Resources for public health

There are numerous solutions available that provide for flexible, off-campus and multi-modal learning for educational qualifications, specific employment-based training and to satisfy the curious life-long learner. In fact, the choices are so numerous it is difficult to navigate the multiple offerings and evaluate content and program quality. Massive Open Online Courses (MOOCs), through providers such as Coursera, edX and FutureLearn provide students and academics access to many top universities worldwide, including members of the Asia-Pacific Academic eConsortium for Public Health (APACPH). Table 2 lists examples of courses that are relevant to public health. Access to MOOCs are frequently free (auditing) although many are now fee-paying (certificate of completion, or bundled as Micro-degree programs). The evidence of educational benefit of MOOCs for public health training is very limited\textsuperscript{23}, publications have mostly focussed on student satisfaction or curricular development\textsuperscript{24}. To date, one rapid evidence review\textsuperscript{25} assessed the impact on practice, however the six MOOCs reviewed were clinical not public health courses.
Online learning has considerable potential for the training and certification of public health practitioners, especially in LMICs; Masters level courses are available for free for people in certain countries through the People’s Open Access Education Initiative (http://peoples-unii.org); and e-Learning courses are available through The Global Health Network (https://globalhealthtrainingcentre.tghn.org/elearning/) and the US CDC (https://www.cdc.gov/learning/continuing-education/index.html). A number of MOOCs have been used to train PH staff for disease outbreaks\textsuperscript{27} or disaster response\textsuperscript{28}. Many people use these and similar resources provided by numerous organisations, NGOs and similar agencies for professional development. Academics frequently incorporate resources such as TED talks (https://www.ted.com/search?q=public+health), and Professor Hans Rosling (https://www.gapminder.org/) videos, or NGOs such as the Sustainable Sanitation Alliance (https://www.susana.org/en/knowledge-hub/audio-visual-products; https://youtu.be/uZHQBqQ9JBY), among others, into course curricular. These resources help to challenge students, to generate debate and introduce diverse practice-based case studies that examine slowly emerging trends as well as ‘explosive hot topics’.

APACPH was an early provider of online training, mentoring programs (Early Career Network http://ecn.apacph.org/), and the accreditation of public health education programs delivered by the member institutions\textsuperscript{13}. Since 2004 APACPH has partnered with the Graduate School of Public Health at Yonsei University in Korea to deliver an online public health certificate program (http://icuh.aibhl.org/).

Conclusions

The changing health and disease landscape in the Asia-Pacific region will require a critical-thinking, media-aware workforce that understands facts, and ways to act upon facts. Practitioners need to integrate core quantitative public health skills with deep qualitative insights gained across health and social disciplines. Training solutions need to accommodate a variety of learning approaches including distance, off-campus and multi-modal learning. The training opportunities universities provide on-site and virtually should help students navigate multiple, often contradictory information sources. In the first decades of this century, where solid truth and facts about population health are too easily smothered with myths and lies, a core task in APACPH is to ensure our next generation of learners can tell the difference.

Conflict of interests

None to declare

Ethical committee approval

Not applicable. Use only of secondary publically availabe data.
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| Future trends                                                                 | Examples of practice and educational competencies                                                                                           |
|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Greater focus on the social determinants of health (upstream causes of disease) | - Assess cultural, environmental, and social justice influences on the health of communities.                                                |
|                                                                              | - Collection, linkage and analysis of social and demographic characteristics with routinely collected data (e.g., electronic health records) |
| 2. Rapidly changing health communication (social media, e-and m-health, ongoing challenges to science and evidenced-based communication) | - Using new technologies for epidemiologic studies, surveys, and surveillance (e.g., smart phone surveys, social media data analytics for outbreak surveillance, GPS tracking). |
|                                                                              | - Improved engagement and training with other disciplines, such as communication, marketing, information technology, and engineering      |
| 3. Shifting demographics                                                      | - Improved data collection tools and skills to assess and monitor current and emerging health disparities and sociocultural factors         |
|                                                                              | - Influence policies, programs, and services beyond the health sector                                                                      |
| 4. Global health and planetary health                                          | - Understand the global, cultural, and social context of health and the impact on conduct, interpretation, and dissemination of research and intervention studies |
| 5. “Omics’ revolution (the impact of emerging high-throughput technologies)    | - Explore how genetics, epigenetics and genomics affect disease processes, public health policy and practice                               |
|                                                                              | - Develop collaboration between epidemiologists, biostatisticians, and other scientists to improve methods to quantify the population-health risk and realistic predictive abilities of -omics. |
| 6. Growth of big data or informatics                                          | - Improved engagement and training in public health and with other disciplines in the techniques and use of big data sets and routinely collected data |
| 7. Knowledge translational or implementation sciences                         | - Continued development and improvement of analytic tools for systematic reviews and evidence synthesis                                   |
|                                                                              | - Focus on implementation and translation of knowledge to practice                                                                        |
| 8. Accountability and consumer (community) engagement                         | - Encourage a culture of research and interventions that respond to community needs and priorities.                                          |
|                                                                              | - Influence the health of populations through the sharing and translation of research and practice-based experience                    |
|                                                                              | - Data stewardship that improves the accessibility, useability and reporting of collected data                                           |
| 9. Challenging funding environment                                            | - Argue for the importance and impact of epidemiologic research                                                                          |
|                                                                              | - Improved links between training programs and research programs to enable the efficient use of resources                                 |
| 10. Growing centrality of team and transdisciplinary response                 | - Develop professional interpersonal, interdisciplinary, cross-disciplinary, and multidisciplinary communication and teaching and research collaborations. |
| Institution, Government or NGO provider | Example of content and links |
|----------------------------------------|-----------------------------|
| APACPH, International Cyber University for Health (ICUH) | • Online Certificate Program in Public Health (2 core, 1 elective unit) [http://icuh.aibhl.org/](http://icuh.aibhl.org/) |
| **Coursera (MOOC provider)** | |
| Yonsei University, South Korea | • Emerging Technologies: From Smartphones to IoT to Big Data Specialization  
• Spatial Data Science and Applications  
• Sustainable Development in 21C (Prof Ban Ki-moon) |
| National University of Singapore | • Effective Communication in the Globalised Workplace Specialization |
| Peking University, China | • Academic Writing and Research  
• Bioinformatics (Introduction and Methods) |
| University of Tokyo, Japan | • Global Health Policy |
| The Chinese University of Hong Kong | • Structural Equation Modelling and its applications |
| UNSW, Australia | • Learning to Teach Online |
| John Hopkins University, USA | • Epidemiology in Public Health Practice  
• System Thinking in Public Health  
• Understanding and Strengthening Health Systems |
| University of Copenhagen, Denmark | • Diabetes – a Global Challenge, Essential Facts  
• The Sustainable Development Goals (SDGs)  
• Air Pollution – a threat to Global health  
• NCDs in Humanitarian Settings |
| University of Geneva | • Drugs, drug use, drug policy and health  
• In the footsteps of Zika  
• Disease Screening in Public Health  
• Global Health series  
• Molecular Genetics |
| Manchester University | • Global Health and Humanitarianism |
| Utrecht University | • Clinical Epidemiology  
• Ebola essentials |
| EPFL, Switzerland | • Sanitation, Water and Solid Waste for Development series |
| **FutureLearn (MOOC provider)** | |
| Queensland University of Technology | • Big Data series |
| UNSW, Australia | • Disability and a Good Life series  
• Biosecurity and Bioterrorism  
• Teaching and Learning in Higher Education series |
| Monash University, Australia | • Food as Medicine series |
edX (MOOC provider)

Hong Kong University
- Epidemics

Seoul National University, South Korea
- Introductory Statistics

Curtin University, Australia
- Social Media, The Internet of Things
- Human Rights series
- Globalisation and Sustainable Development
- Environmental Studies

Karolinska Institutet, Sweden
- Pragmatic Randomised Controlled Trails in Health
- Introduction to Global Health
- eHealth – challenges

University of Queensland, Australia
- Climate Science and Policy
- The Science of Everyday Thinking
- Working in Teams

Massachusetts Institute of Technology, USA
- Measuring Health Outcomes in Field Surveys
- Global Health Informatics to Improve Quality of Care
- Evaluating Social Programs
- The Challenges of Global Poverty
- Foundations of Development Policy
- Molecular Biology

Harvard University
- MalariaX
- Data Science series
- Statistical Inference and Modelling series
- Lessons from Ebola
- Humanitarian Response to Conflict and Disaster
- Readings in Global Health