Evidence-based public health: what does it offer developing countries?

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Abstract

The global burden of disease and illness is primarily situated in developing countries. As developing countries have limited resources, it is particularly important to invest in public health and health promotion strategies that are effective. Systematic reviews are central to evidence-based public health and health promotion practice and policy. This paper discusses issues surrounding the relevance of evidence-based public health and systematic reviews to the health of developing countries. It argues that there is a lack of systematic reviews relevant to the health priorities of developing countries; many interventions reviewed cannot be implemented in resource-poor situations; and, a limited amount of primary research is conducted in developing countries.

The paper further argues that improvements in public health are determined not only by effective health services and interventions, but through an approach that includes other sectors and influences broader structural and systematic barriers to health. Given the social complexity of human development, and the inter-sections amongst different development goals, there is no question that gains in developing country public health are unlikely to emerge from systematic reviews alone, but will require decisions about inter-sectoral collaboration and social policy initiatives. Nonetheless, evidence around intervention effectiveness has an important role to play in addressing health priorities in developing countries and resource-poor areas. The public health evidence base urgently needs strengthening, with dedicated effort towards increasing the relevance of primary evidence and systematic reviews.

Keywords: developing countries, evidence-based public health, international health, systematic review

Background

More than 30,000 children die from preventable causes each day; every year more than 500,000 women die in pregnancy and childbirth; 38 million people are living with HIV/AIDS and 20 million have already died from the disease; 8 million people develop active tuberculosis each year of which 2 million die; malaria kills more than 1 million people a year, most of these children under 5 years old. This burden of disease and illness is primarily situated in developing countries, and offers a stark indication of the impact of global inequalities. The primary goals of public health are to identify priority health issues, develop feasible, acceptable and effective health policies, respond to public health emergencies, implement effective and appropriate interventions, evaluate the effect of interventions, and allocate human and financial resources. As developing countries have limited resources, it is particularly important to invest in public health and health promotion strategies that are effective.

Evidence-based public health refers to public health efforts in which there is an informed and explicit use of evidence. In particular, through the systematic appraisal of available research, public health practice draws directly on evidence that demonstrates the effectiveness of interventions. Systematic reviews are recognised as an important method for facilitating evidence-informed policy and practice because of their capacity to synthesise the results from multiple studies. They aim to minimize the likelihood of drawing incorrect or misleading conclusions through exhaustive search strategies for identifying all existing relevant primary studies, rigorous appraisal of these studies, and synthesis of study findings using quantitative or qualitative methods.

However, a key concern for those promoting evidence-based public health, and relying on systematic reviews of research to inform decisions about public health interventions, either from the Cochrane Library or those published elsewhere, is that often the available reviews are unable to provide guidance on effective interventions, particularly in relation to the health of developing countries. Some reasons why systematic reviews have had a limited role in providing evidence relevant to developing countries are: (1) there is a lack of systematic reviews that are relevant to the health priorities of developing countries; (2) many interventions that have been reviewed and shown to be effective can...
not be implemented in resource-poor situations; (3) there is a limited amount of primary research conducted in developing countries as compared to high-income countries. These issues limit the usefulness of currently available systematic reviews (and primary research) for decision-makers in developing countries. This paper discusses the above challenges, critically considering the role of evidence-based public health and the relevance of systematic reviews within the context of international health, and makes some suggestions as to how these challenges could be overcome.

**Systematic reviews and international health**

**Currently available systematic reviews do not reflect developing world priorities**

Systematic reviews have tended to reflect the priorities of developed countries rather than the global disease burden. Swingler et al. analysed nearly 3000 reviews from the Cochrane database of systematic reviews and the Database of Abstracts of Reviews of Effects (DARE) and assessed the correlation between the number of reviews and burden of disease. They found that few systematic reviews focus on diseases and aspects of health care affecting large numbers of the world’s population.

Two-fifths of the world’s population live in high mortality developing countries, where relatively few risk factors account for the high rates of disease and injury. The 10 leading factors threatening health globally are underweight, unsafe sex, high blood pressure, tobacco consumption, alcohol consumption, unsafe water, sanitation and hygiene, iron deficiency, indoor smoke from solid fuels, high cholesterol, and obesity. In high mortality developing regions, underweight, unsafe water, sanitation and hygiene, and indoor smoke from solid fuels are leading risks to health. Approximately one-sixth of the entire disease burden in these regions is attributable to underweight and micronutrient deficiencies, unsafe sex accounts for around one-tenth of all disease burden, and unsafe water for a further 4–5 per cent of the burden (Fig. 1).

For some areas of public health, primary research and systematic reviews have relevance for both developed and developing countries. In the case of HIV/AIDS, for example, there has been a rapid development and testing of a vaccine to combat specific strains of the AIDS virus. Furthermore, while traditionally associated with ‘Western’ countries, non-communicable diseases – including cardiovascular disease, diabetes, cancers and obesity-related conditions – are contributing to a growing burden of disease in low- and middle-income countries. Accordingly, systematic reviews relating to non-communicable diseases have increasing relevance to developing countries. However, there is a relative absence of reviews of many priority health issues in developing countries, such as child and maternal undernutrition and environmental risks (sanitation and hygiene) – which account for 3 million deaths a year.

While there are an increasing number of systematic reviews relevant to health care in developing countries, Cochrane reviews of treatment effectiveness have not yet addressed many common medical conditions in developing countries, such as umbilical hernia, gunshot wounds and the commonly used anaesthetic ketamine. It would also be extremely valuable for systematic reviews to address intervention costs so as to allow informed decision-making within the constraints of limited budgets in resource-poor settings, but cost-effectiveness is yet to be considered widely. For example, while there are number of Cochrane reviews and meta-analyses of the effectiveness of streptokinase in acute myocardial infarction, at a cost of approximately 250 USD per dose, aspirin, a less costly but potentially equally effective treatment, is yet to be reviewed.

A possible reason for the lack of review questions addressing priority issues for developing areas is that there is a discernible difference in output between reviewers from developing countries (or with significant developing world experience) and those from developed countries. A survey of the place of residence of Cochrane reviewers from 1997 to 2003 suggests that although the number of reviewers from developing countries has increased since the beginning of the period, the relative proportion of reviewers from developing countries compared to developed countries has declined from 16 per cent in 1997 to 8 per cent in 2003 (Fig. 2). This highlights the need for a programme of training and support for reviewers from developing countries.

The Cochrane Collaboration has recently embarked upon a ‘Developing Country Initiative’ that seeks to actively encourage the participation of reviewers from developing countries. In addition, through entities such as the Effective Practice and Organisation of Care Collaborative Review Group and the Health Promotion and Public Health Field, the Collaboration has begun to prioritize reviews focusing on macro-level determinants of health that are particularly pertinent to low- and middle-income countries. But these activities will have to be substantially increased in the years ahead to redress the current imbalances and to ensure that systematic reviews play a more prominent role in helping to achieve the millennium development goals set by the United Nations.

**Many interventions reviewed cannot be implemented in resource-poor situations**

Even where reviews are nominally relevant, the treatment and interventions advocated may be unavailable or inappropriate in low-income countries. For example, anti-retroviral (ARV) drugs have the potential to dramatically improve the health and extend the lives of some people with HIV/AIDS. Brocklehurst and Volmink’s Cochrane review of anti-retroviral treatment for reducing the risk of mother-to-child transmission of HIV infection concludes that antiretroviral therapy will have an immediate benefit for countries with the resources to adopt such treatment. In developed countries antiretroviral therapy is used frequently to reduce new HIV infections, and to reduce
occurrence of opportunistic infections and AIDS deaths. However, the high cost and demanding clinical infrastructure necessary to use these drugs put them out of reach of the vast majority of people with HIV. This problem is especially acute in developing countries, where HIV infection levels are high and public resources are extremely scarce. Brocklehurst and Volmink state that the search for effective, affordable, safe and acceptable alternatives to anti-retroviral therapy for use in resource-poor countries should remain on the research agenda. Meanwhile, policymakers in developing countries face mounting public pressure to pay for the expensive drugs that are currently available (at a cost of 175–993 USD per month).

**Limited amount of primary research is conducted in developing countries**

The local relevance of health research for developing countries is limited as most research is generated in developed countries. Captured in the expression ‘the 10/90 gap’, the Global Forum has highlighted the fact that of the 73 billion USD invested annually in global health research, less than 10 per cent is spent on research into the health problems that account for 90 per cent of the global disease burden. There is also a systematic bias in medical journals against diseases and health needs that dominate the least–developed regions. Furthermore, in developing countries, much knowledge is unpublished and consequently can not be included in systematic reviews. This cultural and geographical bias in the availability and relevance of published public health literature is a significant problem.

The evidence typically perceived to have the greatest credibility is the randomized controlled trial (RCT). Where an evidence-base exists for the effectiveness of interventions, it might be assumed that the challenge is to make the interventions available to poor populations in the developing world. However, the results of trials conducted in developed countries may not be transferable to different populations. Developing country populations differ from those recruited in typical clinical trials.
Third-world patients may have patho-physiological differences in response to treatment, often present late, may be self-medicating with ‘prescription’ drugs or traditional treatments, have co-morbidities (i.e. malnourishment, anaemia, malaria), may be unable or unwilling to adhere with treatment, have cultural, behavioural and attitudinal differences, and poor facilities and resources influence treatment effectiveness. In contrast, a typical patient in a RCT carried out in a high-income country experiences none of these problems. Further, there are many contextual factors that have a significant bearing on the effectiveness of an intervention and on which outcomes are most important, including social, cultural, infrastructure, health profile and economic characteristics. Accordingly, many interventions that have been shown to be efficacious in industrialized countries have not been similarly effective when delivered to people and populations in the developing world.

In comparison to developed countries, few RCTs are available from developing countries and efforts must be made to increase the number of RCTs conducted in developing countries and that ask relevant questions about effectiveness. While RCTs conducted in developing countries are in the main methodologically acceptable, the analysis carried out by Pienaar et al. of RCTs published in the South African Medical Journal between 1948 and 1997 found that there were a number of deficiencies in the quality of the trials. Initiatives are in place to increase the capacity of researchers in developing countries to carry out rigorous trials evaluating intervention. For example, PRACTIH (Pragmatic Randomized Controlled Trials in Health Care) is a European Union-funded initiative which provides tools and training to researchers in developing countries who are interested in designing and conducting pragmatic randomized controlled trials of healthcare interventions; the European Developing Country Partnership (EDCTP) funds trials of pharmaceutical treatments for malaria, tuberculosis and HIV/AIDS. Initiatives such as these are likely to significantly increase the number of RCTs relevant to decision-making about health care in developing countries.

However, evaluation studies need to explore more than intervention efficacy under trial conditions. In order for evidence to inform decision-making, it needs to address the prevailing problems, the complex pathways to health outcomes, and the effectiveness of interventions in local contexts. There is increasing recognition that, in addition to controlled trials that identify intervention efficacy, successful evaluation of public health interventions will necessarily entail the use of a range of research designs that are better placed to answer questions about other relevant outcomes, such as appropriateness and feasibility, and to provide evidence around implementation issues in particular settings and contexts. A recent publication by the NHS Centre for Reviews and Dissemination gives recognition to the diverse types of evidence that can contribute to systematic reviews. The recently published GRADE guidelines and the draft ‘Guidelines for systematic reviews of health promotion and public health interventions’ also provide frameworks for inclusion and analysis of study designs that extend beyond the RCT. The growing acknowledgement of the role of other study designs, in addition to RCTs, provides scope for the inclusion of a greater number and range of studies of relevance to developing countries. This development might also allow developed countries to benefit from the vast experience developing countries have in implementing low-cost community-based programs.
Case study: systematic reviews of malaria treatment and prevention

The challenges of preventing and treating malaria provide an example of the disjuncture between evidence-based public health and its relevance to developed countries. The Roll Back Malaria campaign, launched in 1998, aims to halve the burden of disease by the year 2010. The focus is on sub-Saharan Africa, and it is proposed to implement effective and cost-effective control strategies. However, the annual number of deaths worldwide from malaria is higher now than in 1998.

A recent analysis of the Cochrane Library identified 13 systematic reviews that focus on the effectiveness of drugs for treating malaria and associated conditions and 1 review focusing on insecticide–treated bed nets and curtains for prevention of malaria. Dans notes that malaria treatment protocols vary depending on drug resistance patterns which alter response to treatment, and this can limit the applicability of trial results. While effective treatments are a pivotal component of malaria control, other public health priorities – such as inter-sectoral collaboration, education and social policy – have not been addressed in systematic reviews. In order to ‘roll back malaria’, it is necessary to determine not only which drugs and bed-nets effectively prevent and treat malaria, but also how to improve health systems capacity, resources and infrastructure; increase advocacy, inter-sectoral collaboration and community partnerships; improve technical capacity and management in relation to surveillance, diagnosis and treatment; respond to and address natural disasters, migration, urban growth and poverty. Furthermore, the evidence-base around cost-effectiveness of malaria prevention and treatment is limited, and its potential to inform policy is limited by lack of information on the costs and effects of many interventions, and the problems of comparing studies that relate to specific settings and outcome measures.

This case example illustrates that there is a need for more systematic reviews of priority global health issues, and which use evidence drawn from local settings. In order to contribute to international health efforts, reviews should focus not only on primary prevention and treatment, but also on macro-level determinants of health, such as increasing the capacity of health services.

Increasing the potential for systematic reviews to contribute to the health of people in developing countries

The Cochrane Handbook states that ‘while [reviewers] cannot be expected to be aware of the myriad differences in circumstances around the world, they can address differences of known importance to many people’. Differences of known importance to public health interventions include the burden of disease and illness, availability of resources, characteristics of health and political systems, cultural and economic settings, and the physical environment. Accordingly, there are different possibilities for increasing the relevance of systematic reviews and evidence-based public health to developing countries.

One approach is to address priority topics by carrying out systematic reviews of public health topics of global importance. As published previously, the Cochrane Collaboration’s Health Promotion and Public Health Field has recommended priority systematic reviews of public health topics of global importance and of particular relevance to developing countries. Criteria for priority selection included burden of disease, magnitude of the problem, urgency, importance to developing countries, and opportunity for action. Examples of recommendations include systematic reviews of: community-building interventions to improve physical, social and mental health; interventions that use a combination of environmental, social and educational strategies to prevent infectious diseases such as malaria; non-testing dependent prevention of mother to child transmission of HIV. Other alternatives include subgroup analysis of primary research and evaluation in every review to distinguish rich/poor country evidence, involving more people from developing countries or with developing country experience in the review process, and explicit acknowledgement of contextual heterogeneity in relation to implementation of interventions.

Opportunities exist for improving the evidence-base for public health and health promotion in developing countries. As Horton notes, however, health policymaking involves an uneasy balance of science, economics and politics. Many deaths in developing countries are preventable through treatments and interventions such as use of bed nets, affordable antibiotics, and basic hygiene and health education. But there is common agreement that improvements in public health are determined not only by effective health services and interventions, but through an approach that includes other sectors and influences broader structural and systemic barriers to health. The UN ‘Millennium Development Goals’ – eradication of extreme poverty and hunger, universal primary education, promotion of gender equality, reduction of child mortality, improvements to maternal health, combating HIV/AIDS, malaria and other disease, ensuring environmental sustainability, and developing a global partnership for development – complement each other, with gains in one area contributing to better outcomes in the others. For example, gender equality will increase girls’ access to education which allows them to engage in economic activity outside the home, facilitates use of medical services for themselves and their children, and promotes better family planning. This improves livelihoods and health outcomes, and decreases child mortality. While an evidence-base for effective public interventions is critical, gains in health may best be achieved through frameworks that focus on the links between health, education, gender equality and poverty reduction.
Conclusion
Evidence-based public health promotes use of the best available evidence on the effectiveness and lack of effectiveness of interventions. Significant efforts are required, however, to increase the relevance of systematic reviews to public health priorities in developing countries and resource-poor areas: the questions and scope need to consider heterogeneous contexts to ensure relevance, and difficult decisions need to be made about the availability and adequacy of the primary research to address the question. Given the social complexity of human development, and the inter-sections amongst different development goals, there is no question that gains in developing country public health are unlikely to emerge from systematic reviews alone, but will require decisions about inter-sectoral collaboration and social policy initiatives. However, evidence around intervention effectiveness has an important role to play in efforts to improve developing country health, as it can distinguish what is a worthwhile intervention and what are the relative costs, benefits and anticipated outcomes. The public health evidence base urgently needs strengthening, and requires international collaboration and dedicated effort towards understanding and improving the factors which influence the relevance of primary evidence and systematic reviews to international health.

Update of Cochrane protocols and reviews of relevance
Below are new health promotion and public health oriented reviews and protocols from Issue 3, 2004 of The Cochrane Library.

New reviews
- Community-based interventions for the prevention of burns and scalds in children
- Effect of longer-term modest salt reduction on blood pressure
- Soy formula for prevention of allergy and food intolerance in infants
- Interventions for smokeless tobacco use cessation
- Face washing promotion for preventing active trachoma

New protocols
- Multiple-micronutrient supplementation for women during pregnancy
- Drugs for treating uncomplicated malaria in pregnant women
- Fertility awareness-based methods for contraception
- Motorcycle helmet legislation for preventing injuries in motorcyclists
- Vaccines for preventing influenza in the elderly
- Vaccines for preventing smallpox
- Weight loss for improving fertility in overweight women

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