**ABSTRACT**

This paper argues that concepts, methodologies and practices within public health need further development if they are to be sufficient to allow us to develop, undertake and evaluate interventions in the twenty-first century. The public health profession, and the disciplines that contribute to it, maintain the historical focus upon detailed micro analysis (individual and health sector) and not broader macro analysis (societal and system). This brief paper suggests why this is and outlines three challenges it poses: specifying and evaluating outcomes; specifying and understanding complex causal pathways in social interventions and the development of multisector evaluation, to meet information demands from multiple stakeholders. While there is general agreement that public health evaluation needs development, this paper argues that the focus needs to be more upon a broader evaluative space than is currently practiced. There is a need to move beyond primary and secondary health-related effects upon individuals, and focus more on evaluation of the wider range and distribution of direct and indirect effects upon individuals, communities and populations. That is, those involved in public health evaluation need to step back and first consider the wood before focusing in on specific trees.

**Keywords** economics, epidemiology, health services, health protection, public health

**Background: the broadening of the public health agenda**

Public health has a long and distinguished record in preventing disease and protecting health. Improvements in sanitation and clean water, developments in understanding the aetiology of disease and measures to secure the containment, and even eradication, of infectious disease, have been fundamental to improvements in global health. This record is continued today, with modern public health tackling, for instance, foot and mouth disease, sudden acute respiratory syndrome and influenza.¹,²

However, the contemporary public health agenda continues the recent move away from the focus on infectious disease, and into behavioural, environmental and socio-economic factors influencing health.³ For example, the analysis and evaluation of health-related effects of, and interventions related to, transport and the urban environment are illustrated in Boxes 1 and 2. These are undeniably important determinants of population health, but call upon very different forms of intervention, level of analysis and perhaps evaluation methodology.

We would suggest that a critical factor in the broadening of the public health agenda in this fashion, away from infectious disease and into far wider determinants of health, has been the interpretation of the term ‘public’. Within the public health arena this is often interpreted as ‘population’, and thus any factor impacting upon the health of a population (which, *in extremis*, is everything) is within the remit of public health. However, the other—and perhaps more historically germane—understanding was closer to the economist’s understanding of the term, referring to those areas of activity that the market will under or over provide, often due to aspects of ‘non-excludability’.⁴ For example, if no one can be excluded from receiving the benefits of

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sanitation, clean water and disease eradication, then they cannot be charged a price and hence the market will not be in a position to provide that 'good', and hence it will be under-provided from a social perspective.\(^5\) (Conversely, for example, failure to internalize the cost of resistance to antibiotics in their price means that there is an overproduction of antibiotics from a social perspective.\(^6\)) In this sense, there are very clear *public-good* attributes of communicable disease control.\(^4\)

However, the same cannot be said for many of the other forms of public health activity, which involve distinctly private goods, and ones where there are benefits to be traded against risks. For example, with respect to diet, food is a private good, has nutritional content that is a mix of elements beneficial and deleterious to health, and has multiple outcomes (e.g. in addition to nutrition, food often has a social or religious role, there is considerable employment in the food and hospitality industries, etc). Intervention, and hence evaluation, in this area is therefore extremely complex compared, say, to eradicating an infectious disease such as smallpox, where the outcome is unitary and universally agreed upon. Similarly for intervening in transport choices, alcohol consumption or sexual activities. Readers of this paper will no doubt all have engaged in some activity that they knew increased their risk of disease in some way, but traded this off against the benefits it brought at that time, even if merely crossing the road outside of a controlled pedestrian crossing zone.

**Our contention**

The suggestion here is that concepts, methodologies and practices within public health need further development if they are to be sufficient to allow us to develop, undertake and evaluate interventions in these non-infectious disease areas, because the public health profession, and the disciplines that contribute to it, have maintained the historical focus upon detailed micro (individual and health-sector) analysis and not broader macro (societal and system) analysis. In particular, current evaluation tends to emphasize (usually a small number of) primary and secondary health-related effects upon individuals, rather than the wider range and distribution of effects upon individuals, communities, populations and the spill-over effects of those interventions. That is, the focus has been very much upon the trees rather than upon the wood. In this brief paper we suggest why this is and the challenges it poses, and invite others to comment.
The central paradox: macro-level interventions evaluated using micro-level analysis

Typical public health evaluations, including clinical, epidemiological and economic, are based upon micro-analysis; for example, the effect of a health promotion educational intervention on individual behaviour and health outcomes, and the cost-effectiveness of such interventions from the health-sector perspective. Interventions, regardless of their specific characteristics, are largely implemented and evaluated in the same manner. For example, policy to increase condom use as an anti-HIV intervention is based on individual behaviour and evaluated from a health-sector perspective—the cost to the health service of providing the intervention and the effectiveness in terms of mortality or, at best, quality-adjusted life years (QALYs). This is the same intrinsic manner of assessment as applied to a surgical procedure or pharmaceutical intervention.

In contrast, a macro-approach would undertake to assess the full societal impact of the disease and intervention in question, including, for example, wider impacts on community empowerment, social capital and other sectors of the economy. Even within infectious disease there is evidence of far wider societal affects from individual behaviour than merely the epidemiology of disease and health outcomes. The restrictiveness of the traditional micro-level approach becomes even more evident when considering the likely affects of recent challenges to public health from socio-economic groups’. Yet, paradoxically, policy (often within the same documents) also calls for the need to develop micro-based cost-effectiveness analysis of public health (i.e. largely behavioural and complex) interventions, stating that ‘the major constraint to further progress on the implementation of public health interventions is the weakness of the evidence base regarding their effectiveness and cost-effectiveness across the majority of risk factors. Information is particularly scarce on which interventions can help reduce health inequalities due to, say, smoking or obesity, by differentially changing the behaviour of lower socio-economic groups’. Yet, paradoxically, policy (often within the same documents) also calls for the need to improve public health through promoting health through sectors other than the health sector, such as those indicated in Boxes 1 and 2. This paradox—a call for macro-level interventions but evaluated using micro-level analysis—is our core concern.

The reliance upon micro-based concepts, methods and applications poses significant challenges to the evaluation, and subsequent implementation, of public health measures and the advancement of population health. The three most pressing of these, we suggest, are as follows.

Specifying and evaluating outcomes

First, how one specifies and evaluates outcomes. Public health is overwhelmingly concerned with health as the primary (if not sole) objective. However, numerous studies demonstrate that, for the public, life is very much not all about health, but the balance of a number of aspects of life that yield welfare, or more recently ‘happiness’. Wider interventions, of the sort typified in Box 1, therefore need an approach which emphasizes—and, crucially, reconciles—the range of outcomes, or consequences, relevant to that intervention, which will likely be quite context dependent.

For example, as Box 1 illustrates, transport is increasingly seen as an important socio-economic determinant of health, and policies concerning transport are thus increasingly advocated by the public health profession. However, although transport interventions undoubtedly impact upon health, they also produce effects that extend well beyond direct health effects, including employment, journey times and pollution. However, public health evaluations rarely venture beyond a focus on individual-level effects on health, typically injuries and respiratory problems. In such circumstances identifying the full range of ‘primary’ and ‘secondary’ outcomes can be difficult, and a focus on the health of individuals may have a biasing effect. Traffic calming, for instance, may be ‘cost-effective’ in terms of its cost and health impacts to the health sector, but not beneficial from a societal perspective once other components are accounted for (e.g. increased fuel burnt by lorries, reflected in increasing pollution and prices of goods in shops). Alternatively, it may not be cost-effective simply in health-sector cost and health impact terms, but may be once a wider range of other costs and benefits are accounted for.

Specifying and understanding complex causal pathways in social interventions

Second, specifying and understanding the complex causal pathways in most social interventions, including a lack of consideration in typical outcome evaluations of ripple effects, spillovers and externalities. For example, public health interventions are complex not just because they have multiple components, outcomes and externalities, but also because they typically have the properties of complex
systems, which have emergent properties and undergo non-linear phase transitions. In these cases, the pathway emergent from an intervention may be lengthy, winding and far-reaching, yet current evaluation methods used in public health often do not even acknowledge these layers of complexity, let alone undertake to assess them, typically taking pathways as short, straight and narrow.

For example, as Box 2 illustrates, urban regeneration programmes consist of a complex range of components, but importantly have complex and multiple distal and proximal pathways of effect. Health is impacted through employment, education and housing, but these also generate their own direct beneficial effects and may further influence health indirectly through, for instance, the availability and affordability of food, alcohol and tobacco. However, many evaluations have not assessed the wider ripple effects, such as the effect of environmental improvement on individual health through changing crime rates.

The importance of considering such wider effects is underlined in the recent update of the UK Medical Research Council’s guidance on complex interventions. This emphasizes the importance of developing a good theoretical understanding of the intervention being evaluated, derived from careful development work, to help understand the processes, characterize complex causal pathways and select appropriate outcome measures (www.mrc.ac.uk/complexinterventionsguidance). The final report of the Measurement and Knowledge Network to the WHO Commission on the Social Determinants of Health also notes the importance of placing evaluation in a broader theoretical framework that link causes, determinants and outcomes. However this endeavour is made difficult by the lack of detail about the causal pathways for many social determinants (such as social policies).

**Multi-sector evaluation**

Third, development of multi-sector evaluation, to meet information demands from multiple stakeholders. It is increasingly the case that social interventions typical of public health involve, or at least affect, a wide range of stakeholders. For example, the WHO Commission on the Social Determinants of Health report on early child development states that education allows children to make ‘a positive contribution to the community—economically and socially’; it also improves health and affects health and child-care practices. In these cases it can be extremely difficult to operationalize terms such as ‘effectiveness’. Many social interventions are not easily characterized as ‘effective’ or ‘ineffective’ with respect to a single primary outcome. A primary outcome can (indeed needs to) be chosen for the

**Table 1** Some suggested key differences between micro- and macro-evaluation

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Micro-evaluation</th>
<th>Macro-evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcomes</td>
<td>Single (generally health) sector (quantity and quality)</td>
<td>Multiple (health and non-health) sectors (quantity and quality)</td>
</tr>
<tr>
<td>Process</td>
<td>Health professionals</td>
<td>Non-health (e.g. income, inflation)</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Patients</td>
<td>Health professionals, other government departments, industry, other members of population, multiple and diffuse</td>
</tr>
<tr>
<td>Methodologies</td>
<td>Single cause–effect, qualitative</td>
<td>Macro-economic techniques, including health economics, health psychology, medical anthropology, etc.</td>
</tr>
<tr>
<td>Disciplines</td>
<td>Health-related (including health economics, health psychology, medical anthropology, etc.)</td>
<td>Non-health (e.g. international relations, law, business)</td>
</tr>
</tbody>
</table>
purposes of evaluation but this may not be the outcome which all relevant stakeholders would prioritize. This is especially the case when the reality of how decisions are made in other sectors is not just on the basis of effectiveness or indeed on cost-effectiveness of interventions.20

Again, we can see this played out in the examples provided in Boxes 1 and 2. Both transport and urban regeneration policies will be a result of, and interest to, a wide range of (public and private) stakeholders. For instance, urban regeneration will be of interest to those responsible for education, employment and social services. Transport too will be of concern for those responsible for maintenance of roads, trade and industry, and of course to private industry themselves who may be affected positively or adversely by transport policies. Importantly, there will be a range of evaluation techniques brought to bear by these different stakeholders. For instance, in the UK, as in many countries, although the health-sector uses cost-effectiveness analysis (typically expressing the impact as cost per QALY gained), the transport sector uses cost–benefit analysis (expressing the impact as a net monetary figure), and whereas health may value a QALY at around £30 000, transport values a life at around £1.3 million. The scope of outcomes to be considered also varies in the evaluative traditions between sectors, further highlighting the need for new methodological approaches to multi-sector evaluation.

Conclusion: a suggested step forward

If public health evaluation is to remain relevant to the improvement of population health and the strengthening of health systems within the twenty-first century, it will require a greater development of the methods of analysing and evaluating complexity, as noted in the UK Medical Research Council guidance and elsewhere.17,21 as well as a greater engagement in forms of analysis—and the analysis of actors, institutions and structures—that are likely to be unfamiliar. This will include the use of familiar techniques in novel ways, and collaboration with untraditional bedfellows, such as in fields of anthropology, trade policy and international relations.

A first step within this, as indicated earlier, is to move away from the ‘one-size-fits-all’ approach adopted by many within public health, seeking to evaluate an expanding range of complex public health interventions in the same manner as more standard health technology. One practical suggestion here is to encourage those involved in evaluating more complex and multi-factoral public health interventions to consider utilizing a range of perspectives, methodologies and outcomes undertaken in evaluation. An example of the differences that may be engendered in this way is provided in Table 1. This is a first attempt, provided to stimulate discussion, of some of the key differences between what may be termed the traditional ‘micro-evaluation’ applied within public health and the more ‘macro-evaluation’ approach advocated in this paper.

Adopting different stakeholder perspectives, a range of outcomes and a number of methods within a single evaluation in this way will also enable a more direct assessment of where there are distinct complementarities and/or and disparities between them. In this way, we would suggest that the exploration of new methodologies, such as the use of ‘capabilities’ to encapsulate both narrow ‘health’ outcomes as well as wider aspects not commonly evaluated in public health evaluations, or the use of macro-economic assessment rather than the more traditional micro-economic evaluation (cost-effectiveness or cost–benefit analysis), will expand and enhance the public health evaluation toolkit, and assist in the development of a more comprehensive evaluative paradigm for the twenty-first century.22–24

Clearly there will be hurdles to be overcome in achieving this, such as networking those of very diverse methodological backgrounds, the development of new metrics for assessment or reconciliation of existing metrics and securing funding for such a broad approach to evaluation. In this latter respect, the view within this paper is that highlighting and advocating for the need to begin to engage in broader approaches to evaluation will serve to drive collaborative funding to undertake them. However, the element of circularity has to be acknowledged, that securing funding for such broad studies would similarly drive broader evaluations. In each respect, the funding is unlikely to come from a single source—perspective—but would require more ‘joined up’ funding and evaluation to capture more holistically the impact of specific issues and interventions. Related to this, there would need to be a clear assessment of the proportional cost of evaluation relative to the cost of intervention, although it could be suggested that multiple funders each contributing to a broad holistic evaluation may be more efficient than each doing it from their own perspective (rather like public utilities seeking to replace various pipes and cables simultaneously when a road has been excavated, rather than each excavate it independently). However, there would be scope for more work on looking at what may be an appropriate distribution between funding allocated to the intervention versus evaluation (which is a more general point concerning evaluation than just with respect to this paper of course).

In sum, we would suggest that while there is general agreement that public health evaluation needs development,
the focus needs to be more upon a broader evaluative space than is currently practised. There is a need to move beyond primary and secondary health-related effects upon individuals, and focus more on evaluation of the wider range and distribution of direct and indirect effects upon individuals, communities and populations. That is, those involved in public health evaluation need to step back and first consider the wood before focusing in on specific trees.

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