Sustainability science: an integrated approach for health-programme planning

Russell L Gruen, Julian H Elliott, Monica L Nolan, Paul D Lawton, Anne Parkhill, Cameron J McLaren, John N Lavis

Planning for programme sustainability is a key contributor to health and development, especially in low-income and middle-income countries. A consensus evidence-based operational framework would facilitate policy and research advances in understanding, measuring, and improving programme sustainability. We did a systematic review of both conceptual frameworks and empirical studies about health-programme sustainability. On the basis of the review, we propose that sustainable health programmes are regarded as complex systems that encompass programmes, health problems targeted by programmes, and programmes’ drivers or key stakeholders, all of which interact dynamically within any given context. We show the usefulness of this approach with case studies drawn from the authors’ experience.

Introduction
Policy makers, donors, programme managers, and communities often face challenges in sustaining seemingly worthwhile health programmes, especially in low-income and middle-income countries. The Mexico Statement on Health Research called on national governments to pursue sustainable programmes to support public health and health-care delivery systems.1 Most concerns about sustainability are related to premature discontinuation of programmes after an initial period of support. In addition to the needs left unmet, discontinued programmes are wasteful of human, monetary, and technical start-up investments, and can diminish community trust and support for future programmes.2

Ministers of health and other key stakeholders wanting to optimise health-programme sustainability would benefit from a practical framework derived from empirical research to support their approach to programme planning. Many studies of health programmes in low-income and middle-income countries have sought to identify factors associated with sustainability, but these data have not been systematically reviewed. Furthermore, several divergent conceptual approaches exist but their basis in empirical research has not always been articulated.

We aimed to review existing perspectives and empirical research about health-programme sustainability; to draw on the review to derive a practical framework for understanding health-programme sustainability; and to use this framework to propose an approach to planning for health-programme sustainability and developing a strong evidence base to support refinements to and implementation of the approach.

Procedures
We did a systematic review of both conceptual frameworks and empirical studies about health-programme sustainability. We searched Medline (1980 to June 18, 2008), EmBase (1950 to June 18, 2008), and the Cochrane library.

For the search strategy framework, we used words and MeSH and EMTREE headings that encompass programme sustainability, including synonyms such as “continuation”, “institutionalisation”, “resilience”, “durability”, “viability”, “stability”, “persistence”, and “maintenance”. We then restricted the search to citations included under health-care organisation and community-care MeSH headers, and not included under the agriculture MeSH headers. After retrieving articles, we manually searched the bibliographies of all relevant references to identify further publications. We searched PubMed with the names of key authors to identify additional references, and we searched for related articles to all relevant references.

Two researchers independently screened title and abstracts of all citations identified from each search, and selected potentially relevant reviews, conceptual papers, and primary studies. Both researchers independently retrieved full-text articles, and examined them to exclude those that did not focus mainly on sustainability and health programmes.

We identified and described the main perspectives on sustainability in the included articles. We described articles that assessed a health programme over a defined period, and extracted factors that the investigators thought to be associated with sustainability of the programme, irrespective of whether or not a measure of sustainability was reported. We discussed any
discrepancies about inclusion, exclusion, data extraction, or classification until consensus was reached.

We synthesised the perspectives on sustainability and factors identified as being associated with programme sustainability into a conceptual framework using a consensus approach. Finally, the conceptual framework informed the development of an approach to planning for health-programme sustainability, which was illustrated with case studies drawn from the authors’ experience.

**Perspectives on health-programme sustainability**

Our search yielded 1506 citations, from which we identified 145 articles about health-programme sustainability.

The simplest definition of sustainability is the ‘capability of being maintained at a certain rate or level’. As Greenhalgh et al showed in their review of diffusion of innovations in service organisations, and Shediac-Rizkallah and Bone articulated in a model of sustainability, different research traditions and perspectives may view complex concepts such as sustainability differently (panel 1). For example, a health-promotion perspective has emphasised sustainability as the maintenance of health benefits over time. A focus on organisational change and innovation has instead led to a definition of sustainability as the ongoing delivery of health programmes, which may be measured by the longevity of independent projects, or how well programmes become institutionalised in organisations or health and social systems. A community development perspective has emphasised sustainability as the capacity of communities and individuals to maintain changes in behaviour. These diverse definitions of sustainability—sustained health outcomes, continued programme activities, or increased community capacity—have led to diverse approaches to planning for and monitoring sustainability, and prompted broadly inclusive multidimensional definitions from WHO and others.

In parallel with normative definitions, conceptual frameworks have sought to identify factors affecting sustainability (panel 1). These factors include aspects of programme design, attributes of organisations, and contextual factors, such as local health policy and social, cultural, and environmental characteristics. These factors are likely to interact, and evaluative frameworks need to be multifaceted, and programme, institution, and context-dependent. Other authors have taken the approach of defining targets for interventions or strategies to promote sustainability.

**Empirical assessments of health-programme sustainability**

We identified 84 empirical assessments of programme sustainability, two-thirds of which reported a measure of sustainability over a discrete time. 24 reports were from low-income and middle-income countries, or disadvantaged populations in high-income countries (table 1). Studies from high-income countries that were sustained for 2 years or more after initial funding ended are reported in table 2. Four reviews that address sustainability of several programmes are included in table 3.

We found that empirical studies have approached sustainability from various different perspectives, and have used various qualitative and quantitative research methods. A wide range of factors have been associated with sustainability.

Many fit well in the broad categories of programme design, organisational setting, or broad environment as proposed by Shediac-Rizkallah and Bone. Other identified factors, however, address interaction between the programme and key stakeholders (eg, tailoring an intervention to an issue, the context, and the providers, showing achievement of goals), or planning for evolution of these interactions over time (eg, integrating a programme into established structures, strengthening institutions, and ensuring adaptability). These dynamic
<table>
<thead>
<tr>
<th>Programme description</th>
<th>Assessment period</th>
<th>Measures of =sustainability</th>
<th>Factors thought to be associated with programme sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visruratna (1995)²²²</td>
<td>Improvement of sexual health in sex workers in Chiang Mai (Thailand) through free condom supply, small-group training, and education about condom use</td>
<td>1 year</td>
<td>Refusal rate of sex without a condom (CB)</td>
</tr>
<tr>
<td>Lee (1995)²²²</td>
<td>Improvement of nutrition in a remote Australian Aboriginal community by education of elderly people</td>
<td>4 years</td>
<td>Nutritional intake (H)</td>
</tr>
<tr>
<td>Lafond (1995)²²²</td>
<td>Save the Children Fund research on sustainability of health systems in Nepal, Uganda, Pakistan, Ghana, and Vietnam</td>
<td>Various</td>
<td>Health systems (S)</td>
</tr>
<tr>
<td>Knippenberg (1997)²³</td>
<td>Primary health care including expanded programme of immunisations in west Africa (the Bamako Initiative)</td>
<td>5 years</td>
<td>Primary-care services and immunisations (S)</td>
</tr>
<tr>
<td>Hii (1996)²³²</td>
<td>Control of malaria in rural Malaysia by training community volunteers, and provision of simple diagnostic and treatment kits</td>
<td>4 years</td>
<td>Number of slides obtained (S); malaria incidence and mortality (H)</td>
</tr>
<tr>
<td>Hoque (1996)²³²</td>
<td>Reduction of water-borne infectious diseases in rural Bangladesh by provision of water pumps, pit latrines, and hygiene education</td>
<td>5 years</td>
<td>Persistence of access to water pumps and latrines (S); knowledge related to disease transmission (CB); incidence of diarrhoeal diseases (H); quality of life (H)</td>
</tr>
<tr>
<td>Wong (1998)²³²</td>
<td>Improvement of sexual health in Singaporean sex workers by empowering them to refuse unprotected sex</td>
<td>2 years</td>
<td>Condom use; unprotected sex refusal (CB); gonorrhoea prevalence (H)</td>
</tr>
<tr>
<td>Eliaison (1999)²³²</td>
<td>Chronic disease prevention in northwest Cameroon by appointing a village health committee to distribute funds for community-led health priorities</td>
<td>17 years</td>
<td>Active status of village health committee (CB)</td>
</tr>
<tr>
<td>Rowley (2000)²³²</td>
<td>Chronic disease prevention in a remote Australian Aboriginal community by education, regular physical activity, and cooking classes</td>
<td>2 years</td>
<td>Health measures (body-mass index and impaired glucose tolerance) (H); percentage of people attempting dietary change (CB); and physical activity (CB)</td>
</tr>
<tr>
<td>McDermott (2003)²³²</td>
<td>Improved diabetes care in remote Australian Aboriginal communities by healthworker-run registers, recall and reminder systems, care plans, and specialist outreach</td>
<td>3 years</td>
<td>Care processes (S); clinical measures (H)</td>
</tr>
<tr>
<td>Gruen (2002)²³²</td>
<td>Improvement of access to specialist services in remote Australian Aboriginal communities by specialist outreach visits</td>
<td>3 years</td>
<td>Number of consultations (S)</td>
</tr>
<tr>
<td>Tannenbaum (2002)²³²</td>
<td>Case detection of tuberculosis in Ecuador by sputum-smear microscopy, and treatment with short-course chemotherapy, monitoring and assessment</td>
<td>3 years</td>
<td>Patient care (H), treatment completion (S)</td>
</tr>
<tr>
<td>Wong (2002)²³²</td>
<td>Reduction of scabies infections in a remote Australian Aboriginal community by education, mass screening, and treatment</td>
<td>15 months</td>
<td>Scabies prevalence (H)</td>
</tr>
<tr>
<td>Ah Kit (2003)²³²</td>
<td>Chronic disease prevention in a remote Australian Aboriginal community by promoting health-worker roles, extending preventive health programmes, education, and self-assessment</td>
<td>15 months</td>
<td>Service use (S); quality of life, clinical indicators (H)</td>
</tr>
<tr>
<td>Jana (2004)²³²</td>
<td>Improvement of sexual health in Indian sex workers by education outreach recognition, and treatment</td>
<td>12 years</td>
<td>HIV and sexually transmitted infections incidence (H); condom use (CB); unprotected sex refusal (CB); literacy programmes (CB)</td>
</tr>
</tbody>
</table>

(Continues on next page)
aspects seem to have been given less emphasis than structural characteristics in previous perspectives on sustainability.

### Putting it together: an integrated approach for health-programme sustainability

In 1990, Bossert considered the factors that promote sustainability of American aid projects in Central America and Africa (table 3). Since Shedia-Rizkallah and Bone’s aetiological model of programmatic, organisational, and environmental factors, Evashwick, Pluye, and Scheier have made important contributions on the basis of their reviews of empirical research, although none included programmes in low-income and middle-income countries (table 3). These reviews have also emphasised the importance of stakeholder interaction and programme evolution.

This theme is further developed by another set of articles identified in our search: those that drew parallels between global health challenges, of which sustaining successful health programmes is one, and challenges of environmental sustainability and sustainable human development. Endeavours to expand knowledge about sustainable development have been labelled sustainability science by the US National Research Council (panel 2).

Underpinning sustainability science is the concept of ecosystem, in which living organisms are continually engaged in a set of highly inter-related interactions with every other element constituting the environment in which they exist. Ecosystems are forms of complex systems, in which the organisation and interaction of components of the system are as important as the components themselves. Furthermore, in health-care systems such interactions are not static and constant. Rather, they are dynamic processes and components may adapt to new conditions.

Table 1: Empirical studies of programme sustainability for low-income and middle-income countries, and disadvantaged populations in high-income countries

<table>
<thead>
<tr>
<th>Programme description</th>
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</tr>
<tr>
<td>Wakerman (2005)</td>
<td>Chronic-disease management in remote Australian Aboriginal communities through community-based self-management education</td>
<td>26 months</td>
<td>Chronic disease self-management (CB)</td>
</tr>
<tr>
<td>Edwards (2006)</td>
<td>Improvement of maternal and child health in the Yunnan Province (China) by health-worker training, referral system, participatory monitoring, and assessment</td>
<td>6 years</td>
<td>Mortality rates (H); training of health workers (CB)</td>
</tr>
<tr>
<td>Amazigo (2007)</td>
<td>Prevention of river blindness in Cameroon, Uganda, Nigeria, and Tanzania by community-directed ivermectin treatment</td>
<td>3-5 years</td>
<td>Leadership, human resources (CB); drug supply, treatment coverage (S)</td>
</tr>
<tr>
<td>Gurtler (2007)</td>
<td>Chagas’ disease prevention in Argentinian rural villages by community-wide insecticide spraying</td>
<td>21 years</td>
<td>Continuance of spraying (S); domestic infestation, infection rates (H)</td>
</tr>
<tr>
<td>Israr (2006)</td>
<td>Improving primary health care in Pakistan by training, construction and repair of buildings, and procurement of equipment, medicine, furniture, and vehicles</td>
<td>6 years</td>
<td>Community participation and democratic decision-making (CB); institutionalisation of health teams (S)</td>
</tr>
<tr>
<td>Rosenberg (2008)</td>
<td>Improving child health in southern Africa by a programme addressing orphans and children made vulnerable by HIV/AIDS</td>
<td>Various</td>
<td>Programme services (S)</td>
</tr>
<tr>
<td>Sebota (2007)</td>
<td>Prevention of iodine deficiency in Lesotho by universal salt iodisation legislation</td>
<td>2 years</td>
<td>Prevalence of adequate iodine concentration (urine test) (H)</td>
</tr>
<tr>
<td>Toledo Romani (2007)</td>
<td>Dengue fever control in Santiago de Cuba by participatory action behaviour modification programmes</td>
<td>2 years</td>
<td>Maintenance of effects (H); level of institutionalisation (S); and continuity of activities through capacity building (CB)</td>
</tr>
<tr>
<td>Vernon (2007)</td>
<td>Improvement of access to vasectomy services in Guatemala by printed education materials, community education, training health teams</td>
<td>11 months</td>
<td>Provision of services after project completion (S); number of vasectomies done (H)</td>
</tr>
</tbody>
</table>

*S=services. H=health effects. CB=capacity building.
studies of programme sustainability, we developed a unifying model of health-programme sustainability that includes health concerns of a population, programmatic interventions implemented to address the identified health concerns, and the positive and negative drivers of these programmes (figure). The drivers have positive or negative effects on the programme’s implementation, effectiveness, and durability. They include the many

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</tr>
</thead>
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<tr>
<td>Goodman (1989)</td>
<td>Health promotion in the USA by community-based programmes addressing risk behaviours and health practices</td>
<td>3 years</td>
<td>Continued programme activities (S)</td>
</tr>
<tr>
<td>Bracht (1994)</td>
<td>Improvement of cardiovascular health in Minnesota (USA) through a heart health programme involving establishment of local boards, community organisation, training, and volunteers</td>
<td>3 years</td>
<td>Continuation of programmes post-funding (S)</td>
</tr>
<tr>
<td>Goodson (2001)</td>
<td>Institutionalisation of office-based tools for preventive services by primary-care providers in USA</td>
<td>6 years</td>
<td>Use of tools (S)</td>
</tr>
<tr>
<td>Plochg (2006)</td>
<td>Community-based integrated care initiatives in USA</td>
<td>30 years</td>
<td>Collaborative partnerships (CB)</td>
</tr>
<tr>
<td>Scheier (1990)</td>
<td>Improving dental hygiene in the USA by school-based fluoride mouth-rinse programme</td>
<td>6 years</td>
<td>Adoption of programme elements (S)</td>
</tr>
<tr>
<td>Whitford (2004)</td>
<td>Prevention of diabetic complications in UK general-practice clinics by a multifaceted, diabetes service in primary and secondary care</td>
<td>10 years</td>
<td>Documentation of clinical data (S); clinical indicators (H)</td>
</tr>
<tr>
<td>Barnett (2004)</td>
<td>Falls-related injury prevention in rural Australia by a multifaceted, community-based falls prevention programme</td>
<td>4 years</td>
<td>Awareness of programme, behaviour change (CB); health-staff practice changes (S)</td>
</tr>
<tr>
<td>Elder (1998)</td>
<td>Improving nutrition in a Latino community in California, USA, by a behaviour change programme</td>
<td>4 years</td>
<td>Institutionalisation of project interventions (S)</td>
</tr>
<tr>
<td>Nilsen (2005)</td>
<td>Reducing injury-related harm in Sweden by community-based prevention programmes</td>
<td>9–28 years</td>
<td>Continuity of programme (S)</td>
</tr>
<tr>
<td>Baum (2006)</td>
<td>Improvement of population health in Adelaide (Australia) by a multibarocellar, multilevel, multifaceted initiative (WHO healthy cities)</td>
<td>18 years</td>
<td>Programme activities (S)</td>
</tr>
<tr>
<td>Blasinsky (2006)</td>
<td>Detection and treatment of late-life depression in US primary-care clinics by joint case management</td>
<td>12 years</td>
<td>Continuation of all or part of the multifaceted depression-care model (S)</td>
</tr>
<tr>
<td>Lodl (2002)</td>
<td>Reducing youth at risk in rural midwestern USA by development of coalitions within local communities</td>
<td>5 years</td>
<td>Continuation of coalition (CB)</td>
</tr>
<tr>
<td>Stroul (2007)</td>
<td>Improved care to children and adolescents with emotional disorders in USA by development of federally-funded systems of care</td>
<td>10 years</td>
<td>Sustained systems of care (CB)</td>
</tr>
<tr>
<td>O’Loughlin (1998)</td>
<td>Community-based cardiovascular disease risk-factor reduction programmes in Canada</td>
<td>10 years</td>
<td>Permanence of the programme (S)</td>
</tr>
<tr>
<td>Lee (2007)</td>
<td>Treatment of depression in US primary-care clinics by care managers in primary care supervised by specialist</td>
<td>3 years</td>
<td>Access to care (S)</td>
</tr>
</tbody>
</table>

*S-services. H-health effects. CB-capacity building.

Table 2: Empirical studies of programme sustainability in high-income countries sustained for 2 years or more after the initial funding period
Panel 2: Sustainability science

Sustainability science encompasses scientific endeavours with a common focus on: (i) dynamic interactions between nature and society, recognising that one shapes the other and that understanding individual components of nature-society systems provides insufficient knowledge about the behaviour of the systems themselves; (ii) being issue-driven, with the goal of creating and applying knowledge in support of decision making for sustainable development; and (iii) ensuring that the knowledge is useful by having it coproduced through collaboration between researchers and practitioners.62–64

Table 3: Reviews of multiple programmes and factors relating to sustainability

<table>
<thead>
<tr>
<th>Reviewed empirical research</th>
<th>Concepts regarding programme sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bossert (1990)</td>
<td>Effectiveness in reaching clearly defined goals and objectives; integrated activities into established administrative structures; gained substantial funding from national sources during the project life; negotiated project design with a mutually respectful process of give and take; included a strong training component; tailored to, and perhaps develop aspects of, the context; and strengthened institutions</td>
</tr>
<tr>
<td>Evashwick (2003)</td>
<td>Importance of leadership, financing, organisational structure, governance, marketing, and evaluation or research</td>
</tr>
<tr>
<td>Pluye (2004)</td>
<td>Institutionalisation is a combination of organisational routines and institutional standards: three degrees of sustainability—weak (absence of routine), medium (non-standard routines), and high (standardised routines); planning for sustainability needs to start early</td>
</tr>
<tr>
<td>Scheerer (2005)</td>
<td>Five important factors: a programme can be modified over time; a champion is present; a programme fits with its organisation’s mission and procedures; benefits to staff members or clients are readily perceived; and stakeholders in other organisations lend support</td>
</tr>
</tbody>
</table>

Figure: A system for sustainable health programmes

A health programme functions as a complex system, the key components of which are health concerns, programme elements, and drivers of the programme (both positive and negative) that interact in important ways with each other, and are situated in a particular context with defined resource availability.

Health concerns of a population, programme components, and drivers of the programme are situated within a context defined by various sociocultural, political, geographical and health-system characteristics, and by the availability of resources. Although they might evolve or be changed as a result of programmes, these characteristics are often relatively fixed and might define the limits of what is possible in the short term.

The first important interaction for health-programme sustainability is the bidirectional relation between health of a population and programmes implemented within the population (figure). It is analogous to a programme quality cycle, in which health status informs programme design, and the effect of the programme modifies the health status of the population. Well-described methods for optimising and measuring programme quality exist—ie, a clear understanding of health needs, programme design closely aligned to these needs, quantifiable effect on the health status of the population, and timely modifications to programme design based on evolving understanding of programme effectiveness and changes in health needs. These are important foundations for programme sustainability. Programmes that positively affect the health of a population and can show this are more likely to be sustained. Planning for sustainability is therefore based on sound programme design, monitoring, and assessment and ongoing evidence-based programmatic refinements.

The second important interaction for health-programme sustainability is understanding and affecting the relation between a programme and its drivers (figure). From resource mobilisation to programme delivery, the flow and direction of financial resources depend on many factors: donor funds are affected by the status of the economy and the opinion of taxation or other base from which they are derived; the health and competing priorities of host governments, donor governments, multilateral institutions, and those of the implementing organisations that shape and deliver the interventions; and, ideally, the perspectives of the beneficiaries they
seek to help. These effects are more complex than simply positive or negative, and have an impact not only on the existence, scope, and duration of programmes, but also on the specific aspects of their design. Health-system analyses emphasise the importance of these effects, or drivers, on health programmes, but a comprehensive understanding of health-programme sustainability should also include an understanding of the opposite relation—ie, the programme’s ability, through demonstration of positive results or lack thereof, to affect ongoing resource mobilisation. These bidirectional relations constitute the political economy of health and are mediated by the flow of resources and benefits.

In many countries, lack of resources is a major constraint on all programmes, but well-characterised examples of countries or regions that have achieved substantial improvements in the health of their populations by prioritising health development exist. This result shows the importance of optimising the distribution of resources, even in severely resource-constrained settings. Health programmes that depend on international funding are hard to sustain because of the complex relations of sustained resource flow, increasing the difficulty in aligning health programmes and their powerful drivers. Perceived benefits accruing to stakeholders improve the possibility that resources will continue to be mobilised to sustain a certain health programme, but this is sensitive to the stakeholders’ power and priorities.

The third important interaction for health-programme sustainability is the relation between health concerns and health-programme drivers as mediated through the way that stakeholders identify, define, and prioritise health problems (figure). The knowledge of how various stakeholders respond to health issues relies on understanding how and why issues are formulated. The health status of a population can be defined by various health metrics, such as burden of disease, and ideally a deficiency in the health status of a population leads to the generation of demand and availability of resources for an intervention. However, problem definition is partly in the eye of the beholder, because the definition and prioritisation of issues in hierarchies of health needs is usually a subjective process that differs between stakeholders. Furthermore, the relation between drivers and health concerns is complex and bidirectional. For example, powerful stakeholders might modify the perceived health status of a population by influencing the generation of population health data and the way these data are presented. Transparency and objectivity in health-needs assessment and data use are goals that could therefore help meaningful programme planning.

In the model that we propose, clarification and alignment of components are crucial to these tasks, and form the basis of the questions for programme planners (panel 3). Initial questions relate to definition of the relevant components, beginning with key aspects of the context and resource availability. Local factors affect the vulnerability or resilience of the system. Pre-emptive identification of important differences between contexts and assessments of how components of the system could be modified is likely to promote sustainability across diverse times and places.

The health problem of interest, the programme design and implementation strategy, and the range of stakeholders engaged with or affected by the programme should then be clarified, even tough this task might be difficult.

Some other questions help to identify and plan the dynamic relations between components. The first group focuses on problem definition. Many interpretations of need might exist and who the interpreter is will have a

Panel 3: Planning for sustainability

Are the components of the system well defined?
- What is the health concern that is being and will be addressed? And how might it change over time as a result of the programme or other factors?
- What is the design of the programme? And how has it been or will it be implemented?
- What factors and which key stakeholders, especially funders, managers, policy makers, and community leaders have affected or will affect the programme, and what drives them?
- What are the limitations and opportunities created by the organisational setting, the broader context, and availability of resources?

Are the interactions between components understood?
Problem definition (alignment of drivers and health concern):
- Is the health concern documented?
- Is the health concern recognised by the drivers of the programme?
- Are there appropriate steps to include a beneficiary perspective?
- Are there appropriate steps to gather and report data for health needs and programme effectiveness?

Quality cycle (alignment of programme and health concern):
- Is the programme design evidence-based and appropriately targeted at the health concern or its determinants?
- Do the programme indicators address the health concern, its determinants, the programme’s implementation and effect, and stakeholders’ views and experiences?
- Is a process in place to capture emergent tacit knowledge and emergent research findings from other jurisdictions about the health concern, its determinants, the programme’s implementation and impact, and prompt periodic reappraisals?
- Is there a dynamic programme design in place so that programme elements can be adapted or dropped if features of the health concern or its determinants shift, if barriers to the achievement of its anticipated effects cannot be addressed, or if the programme’s anticipated effects are not realised?

Political economy (alignment of programme and its drivers):
- How do key stakeholders influence the programme and what guides their decisions?
- Is the net sum of drivers supporting the programme’s initiation and continued development?
- How can the negative programme drivers be addressed?
- What means exist for informing both positive and negative programme drivers of changes in the health concern, its determinants, barriers to achievement of anticipated effects, or shortfalls in realising anticipated effects and engaging them in supporting change?
Panel 4: Case studies

Specialist outreach to remote Indigenous communities in Australia

Australia’s Northern Territory is a vast sparsely populated region with many small disadvantaged Indigenous communities and only two hospitals with medical specialists. Facilities in communities are basic and, although remote Indigenous Australians have much higher rates of acute and chronic illness than other Australians, community residents face considerable geographic, poverty, cultural, and language barriers accessing hospital-based care. The Specialist Outreach Service is an Australian government-funded programme to overcome poor access to specialist ophthalmological, ear, nose, and throat, gynaecological, and general surgical care by providing regular clinics for consultations and minor procedures in the community setting. Communication between stakeholders was eased by central coordination, and data gathering helped to ensure a robust quality cycle. In the first 3 years, substantial improvement in indicators of access was shown, the need for remote people to travel was reduced, and specialists, health workers, and patients expressed positive attitudes towards the service.

In the early years of the service, especially at the time it was launched, national and territory governments, health-service managers, professional medical societies, Indigenous organisations, and specialists themselves were powerful positive drivers because they celebrated a seemingly worthwhile initiative and enjoyed good publicity. Indigenous communities and remote clinical staff were supportive but less influential. Throughout the programme’s inception and establishment, however, negative drivers existed; competing demands on regional policy makers for finite resources and fatigue from a small number of specialists involved who were balancing hospital roles with long-distance travel and rudimentary consulting conditions. As the enthusiasm of powerful stakeholders lessened or as new people came into powerful positions, the negative drivers became very important. When specialists ceased undertaking remote-area visits, some after a decade of outreach activity, resources were not targeted to restoration of the service to previous levels, and downsizing occurred. Now, the service provides an important, but smaller scale, service to remote communities.

The changing balance of drivers is common in the early years of health programmes. Especially if staff turnover is high, management of relations and effective use of performance data can be very helpful in maintaining enthusiasm from key stakeholders, resulting in resource flow, institutional support, and other benefits.

Towards the Millennium Development Goals (MDGs) in Rwanda

On Sept 30, 2000, 189 world leaders, including President Paul Kagame, attended the UN Millennium Summit and made a commitment to address the world’s most pressing development needs by 2015. Much remains to be done to achieve the MDGs, especially in sub-Saharan Africa. Rwanda has leadership in making sustained progress and deserves close examination.

Rwandan policy makers could define their issues in a dynamic evidence-based manner with data from periodic demographic health surveys, households’ living conditions surveys, and health and other service data. With presidential leadership, the government has explicitly recognised dynamic interactions between poverty, education, health, sex, and the environment, and embraced interdisciplinary approaches to address these challenges. The Ministry of Health continues to evolve to optimise its interdisciplinary coordination and policy-making structures to ensure that the health MDGs (reduction of child mortality; improvement of maternal health; and fight against HIV/AIDS, malaria, and other diseases) are aggressively addressed, drawing on evolving scientific knowledge and programme data, engaging all stakeholders and with an accompanying resource mobilisation strategy.

Key drivers include host government, donors, and civil society groups. Drivers also shift over time, with the emerging private sector and district government having increasingly important roles, and maturing civil-society structures more able to represent their constituencies. High donor-dependence drivers seem to be in a healthy equilibrium because of factors such as: strong government leadership; explicit seeking of beneficiary perspective in methods of problem definition; civil-society participation in programme implementation; culture of data use to drive evidence-based decisions; congruence between national and international priorities and hence funding; dynamic, timely, evidence-based policy and programming; use of emergent research, programme knowledge, technology, Rwandan programme monitoring, and evaluation data; tracking of impact data, and output or outcome data; and clear coordination structures at national and local levels bringing key stakeholders together.

Rwanda continues to make great progress towards achieving the health MDGs, overcoming considerable obstacles. Between 2000 and 2008, mortality of children younger than 5 years has fallen by 49% to 103 deaths per 1000 live births, with improvements in attended delivery and access to prevention of vertical HIV transmission services, and huge reductions in malaria-related mortality. HIV and malaria goals are on track, with a decline in HIV prevalence and substantial progress made towards achieving global access to HIV treatment. Multifaceted sex education and health interventions are used to reduce maternal mortality, children younger than 5 years has fallen by 49% to 103 deaths per 1000 live births, with improvements in attended delivery and access to prevention of vertical HIV transmission services, and huge reductions in malaria-related mortality. HIV and malaria goals are on track, with a decline in HIV prevalence and substantial progress made towards achieving global access to HIV treatment. Multifaceted sex education and health interventions are used to reduce maternal mortality, with 30% reduction between 2000 and 2005; however, achievement of this MDG needs further scale-up and innovations, such as current emphasis on couple involvement, family planning, and expanded health-insurance coverage.

Underpinning the ongoing success in Rwanda is an explicit recognition of the dynamic nature of the health ecosystem coupled with an evidence-based approach to defining issues and programmatic solutions. This conceptual approach promotes a dynamic response because it recognises that interventions bring change to the system and thus new opportunities. An example is the recent innovation to have couples (not just women) attend antenatal care, enabling new prevention and care opportunities in negotiating couple HIV status and addressing sex barriers to institutionalised deliveries and birth spacing and family planning. Evidence-based approaches and results have also been successful in optimising resource use, and sustaining and expanding external funding.

Some other questions engage the programme quality cycle to ensure and measure alignment of the programme with health needs. First, an assessment should be made of the alignment between the initial programme design and the health concern being targeted. Second, a monitoring
and evaluation system is needed, in which information is captured that reflects the health concern, the design of the intervention, and the views and experiences of stakeholders. This system includes ways to capture tacit knowledge and emergent research findings. Third, an assessment should be made of the degree to which new knowledge generated by the programme or from other programmes has been or will be used to modify implementation, and how this will affect alignment between the programme and health needs over time.

Another group of questions relate to the alignment between the programme and its drivers. These questions explore the flow of resources and benefits and underlying power dynamics. They encourage explicit activities that engage with different programme stakeholders, and seek to maximise the connections and positive exchange of resources and benefits between key stakeholders and the programme.

Panel 4 shows two case studies, in which the model is used to improve understanding of programme sustainability.

Conclusions

Despite many differences between health and environmental science, we showed that a useful conceptual understanding of health-programme sustainability can be derived from a synthesis of existing conceptual approaches to health-programme sustainability and evidence of associated factors, informed by conceptual approaches developed within sustainability science. We propose that health-programme sustainability is the ultimate manifestation of a complex web of inter-relations between health concerns, stakeholders, resources, and actions analogous to an ecosystem.

Sustainability is increased to the degree to which the components of the system are connected and aligned—an indication of system equilibrium. Unsustainable programmes are a form of disequilibrium, in which the health status of a population, the programme implemented within the population, and the drivers of the programme are disconnected and misaligned. A programme that is well designed to affect health status is vulnerable, particularly to withdrawal of funding or community support, if it has neglected the importance of stakeholders driving or hindering the programme. Similarly, a programme that panders to key stakeholders at the expense of commitment to health improvement is likely to run out of support.

The proposed model has not been tested, and prospective assessment during programme planning and assessment of existing programmes is needed. However, the model is based on previous frameworks and empiric evidence of programme sustainability in high-income countries, and in low-income and middle-income countries, and is also grounded in the theoretical background emerging in environmental science about sustainability. The entities and concepts of previous frameworks are easily incorporated into this model. However, the interactions between components are now the main concern, emphasising the importance of ongoing cycles of reflection, planning, and action that are needed to make programmes sustainable.

The model should be useful for programme planners and assessors. It encourages broad conceptualisation of programmes, and may therefore help comprehensive planning. Definition of components is followed by definition and measurement of the interactions between them. Differences between sites and characteristics of programmes can be explored. As Scheirer has suggested, assessment of sustainability is likely to be a multifaceted process, with results contingent on the specific programmes and contexts in which they are operating. Health-programme sustainability is therefore related to the general concept of local applicability, and health programmes need to be adapted to changing circumstances or different locations. Together with the support of successful health programmes lie the challenges of enabling them to engage local and national populations in ways that facilitate growth. Key questions are: can a health programme endure change in the local community or institutions? Can it be expanded to address a broader population? Can it be applied in different settings? And what issues are important in the identification, interpretation, and application of evidence about the programme?

All the elements of the system of health-programme sustainability are modifiable to a certain extent. Identification of modifiable factors could promote programme sustainability. At the same time, the identification of programmes or programme components that should not be sustained is important. Built into any programme, therefore, should be questions about planned obsolescence to identify triggers or tipping points for programme re-assessments to decommissioning programmes, or programme components that are no longer needed. Some health programmes are short term and are not intended to be sustained, just as some structural, economic, or political contexts are so unfavourable that sustainability may not be an initial goal. Conceptualising sustainability as a characteristic of systems, however, should encourage planners to undertake explicit activities that engage with the range of programme stakeholders, strengthening the connections and promoting mutual benefits. Many examples exist attesting successful and lasting institutionalisation of reforms derived from the interaction between programmes and key stakeholders, such as road traffic injury prevention, community-based HIV prevention, and national health-insurance reforms.

Sustainability or its absence can be shown by quantification of the continuation of health benefits, interventions, or capacity over time, but understanding the determinants of sustainability needs exploration of
interactions between drivers and programme components in a particular context. Formal structures and relations are important, but so are informal relations that often guide human behaviour. A broad conceptualisation of the components of a so-called health ecosystem, and the dynamic and complex inter-relation between these components opens up opportunities to assess and address factors that affect health-programme sustainability. Such an approach might promote the sustainability of health programmes and provide a robust framework within which new evidence can be framed.

Contributors
RLG conceived the paper. RLG and JHE wrote the paper, and all authors reviewed and contributed to the final version. RLG, JHE, PDL, MLN, and JNL developed the conceptual model. AP developed and did the searches, and RLG and CJM assessed, classified, and summarised the included studies. RLG and MLN supplied the case studies.

Conflict of interest statement
RLG is an author of one study included in the review. We declare that we have no other known conflict of interest.

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