Noncommunicable diseases (NCDs) are increasingly getting attention from different forums, including media outlets, health agencies, and the public and private sectors. Progress is being made in addressing NCDs, though more slowly in low- and middle-income countries (LMICs) as compared with high-income settings. Here, we offer an analysis of the challenges faced in LMICs. We discuss realistic strategies to understand and develop capacity needs (workforce, finances, and infrastructure) and systems (institutions and processes) to sustainably optimize NCD prevention and care in LMICs.

HEALTH DISPARITIES ACROSS THE WORLD

Chronic noncommunicable diseases (NCDs)—such as cardiovascular disease (CVD), diabetes, cancer, and chronic respiratory diseases—threaten the health and economics of individuals and populations worldwide. NCDs account for 65% of deaths globally, and 80% of these occur in low- and middle-income countries (LMICs) (1, 2). The 25- to 64-year-old age group in LMICs—those in the prime economically productive years of life—bear the greatest morbidity and mortality, perpetuating productivity losses, poverty, and stifled development (3). As an example, 26.1% of coronary heart disease deaths in Mexico (4) and 35% of CVD-related deaths in India (5) occur in persons under 65 years of age; this contrasts starkly with the United States, where only 12% of CVD-related deaths occur in this age range. Cancer transitions offer another example of disparities between country-income groups. Over the period from 1980 to 2010, incidence and mortality related to cervical cancer—a largely preventable malignancy—increased by 24 and 19% in LMICs, respectively, whereas high-income countries (HICs) experienced a 30% decrease for both. Similarly, over the same period, breast cancer incidence and mortality increased in LMICs by 60 and 53%, respectively, whereas the increase in HICs was 47 and 20%, respectively (6, 7).

These health disparities between countries are a result of several interacting factors in LMICs, including a low awareness of NCDs, few preventative and early detection services, low availability of essential treatments, and suboptimal organization of care delivery. We do recognize that LMICs are not all homogeneous and experience different combinations of these challenges. However, we believe that the challenges cumulatively amount to a gap between our existing knowledge of cost-effective health interventions for NCDs and the implementation of these proven prevention and control services.

There are vague suggestions that LMIC health systems need “reorientation” or “strengthening,” which fail to effectively delineate what specific components are needed to better implement evidence-based policies and interventions for NCD prevention and control. Resource constraints is a core issue (8). However, financial and infrastructural resources alone are insufficient. LMIC health systems also require human and institutional capacity strengthening to improve the effectiveness, quality, distribution, and connectivity between NCD prevention and control services through smart designs and use of technology. Acknowledging that approaches to developing capacity and systems might be different between or within LMIC groups, we propose a general framework and potential steps to evaluate and address capacity needs in LMICs.

A CONSTELLATION OF CHALLENGES

The imperative to address NCDs has become evident. Strong advocacy from the global community has become evident in reports from nongovernmental and multilateral health agencies (9–11) and in high-profile forums, such as the United Nations High-Level Meeting in New York City in September 2011 (12, 13) and subsequent conferences hosted by The Economist and The Washington Post (14, 15). Conceptually, the interventions to address NCDs are not unrealistic; there are several effective policies (such as tobacco taxation), service delivery strategies (such as cancer screening and provision of essential medications), and individual behavioral interventions (such as lifestyle modification and medication adherence) that are not widely implemented (16). However, LMICs face substantial challenges in implementation that have not been duly considered in outlining these interventions:

Competing priorities. LMIC government leaders are responsible for the health of their countries’ populations as well as the economic development and international affairs priorities of their countries. However, with economic development and population aging, LMICs are experiencing accelerated epidemiological transitions so that populations are vulnerable to parallel health and social burdens (i.e., residual infectious diseases and nutritional deficiencies, in addition to growing NCD-related burdens and costs, such as pensions and health care for the elderly). Data from the recent Global Burden of Disease Study show that undernutrition and unsafe water and sanitation contribute 30 to 50% of the absolute disability-adjusted life years lost in LMICs in Asia and Africa. These burdens are much lower in Latin America and higher-income parts of Asia, where CVD risks become equally as burdensome as undernutrition and water-related diseases (17).

Financing. Historically, LMICs have not had enough financing or service providers, which limits access to care and drives poor health throughout these countries. Limited or nonexistent social protections, such as insurance, and high out-of-pocket health expenditures are the norm. For example, in 2005, private expenditures accounted for 74 and 55% of all health expenditures in LMICs, respectively, compared with 40% of health expenditures in HICs (18). With such high individual responsibility for healthcare costs and a long time before beneficial effects on health are observed, the likelihood of people investing their scant resources in preventative behaviors, such as exercise and health checks, is also diminished.
Systems. Chronic conditions typically require long-standing, integrated, patient-empowered care based in some financially, physically, and culturally accessible setting. A regular point of contact is important to deliver preventative, diagnostic, therapeutic, and/or referral services and maintain continuity of care. In reality, most LMIC health systems have roots in managing acute conditions (19). These systems, however, are also characterized by fragmented health services that vary in quality, emphasize symptomatic care for late-stage disease, and often lack accountability. As an example, World Health Organization (WHO) data from 1990 to 2006 show that even with a focus on the traditional risk factors like nutrition, maternal health, and infectious disease, most LMICs experience large coverage gaps for basic immunization, antenatal care, and births attended by skilled personnel (18), as well as delivering primary care for NCDs (20).

Data and evidence deficits. LMICs have nascent or sometimes nonexistent surveillance systems to identify, quantify, and inform policy-makers about major health burdens (21). Likewise, there are scant context-specific data from LMICs regarding the upfront investments, implementation and maintenance costs, and potential benefits of health interventions—in other words, how cost-effective these are.

HEALTH SYSTEMS AND DATA DEFICITS
For the remainder of this article, we focus exclusively on the latter two challenges of health systems and data deficits and what can be done to address these. Although financial and infrastructural resources are important considerations, we believe the significance of data as well as human and institutional capacity tends to be overlooked. Reliable data, capacity, and organization are the binding ingredients for systems to function effectively (22). High-performing systems are founded on strong leadership and strategy, robust institutions, intelligent systems design, and appropriate harnessing of technologies (23). Developing these qualities and aspects of a health system requires time and resource investments and exceptional training. To strengthen LMIC capacity and systems to address NCDs, we propose that the following aspects need greater attention:

Better understanding. The global community needs a better understanding of the capacity needs for NCDs; this includes the type and amount of human and infrastructural resources to improve the quality of care and prevention for NCDs.

Capacity development. Development of the workforce to implement interventions is needed, as well as the creation and/or strengthening of institutions (such as national public health institutes) that house and sustain the interdisciplinary capacity and health leaders that can inform and evaluate policy and program changes in populations.

Data and surveillance. Responsive, evidence-based decisions should be locally relevant. Therefore, a parallel focus on strengthening surveillance systems for health research and implementation to provide context-specific data are crucial (24).

Linking stakeholders. Connectivity between research, clinical needs, and policy plus industry leaders is required to achieve progress in policy-making and program translation to address NCDs. Civil society and advocacy groups can connect researchers (who generate data and evidence) with end users (government and industry leaders, practitioners, and the general public) of these data. In particular, the NCD Alliance has provided important leadership in this area (11). Furthermore, all capacity and institutional development activities should include effective communications training as a core competency.

WHAT THE GLOBAL HEALTH COMMUNITY CAN DO
Focusing on the overarching goal of strengthening capacity and systems for NCDs, we propose some specific goals and potential stakeholders that could initiate and lead these key efforts (Table 1). The goals outlined in this framework were developed at the “Workshop on Building Global Capacity for Non-Communicable Diseases (NCD) Prevention: Defining Direction and Roles” organized by the International Union for Health Promotion and Education (IUHPE) and the U.S. Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia in July 2012. The processes described in this framework are not necessarily linear but are instead organized into action items (assess, plan, implement, and evaluate) for clarity. Implementation of recommended preventative and health services will involve different actions at the national, provincial, and community levels. For example, in our framework, prioritization and situational assessments that identify existing local resources have been recognized as a first step, which supports previous recommendations by Nugent and Jamison (13). Then, adapting the recommendations to the existing context reinforces the credibility of the recommended agency and the Ministry of Public Health institute that is implementing these care and preventative services.

The framework addresses the fact that there are very few recommendations and no clear metrics to appropriately evaluate what workforce is required to achieve positive health outcomes; for example, what ratio of trained cancer screening staff to candidates is needed. We propose that institutions could convene technical panels with this type of expertise, such as WHO or Institute of Medicine (IOM) (25). An opportunity starting point might be to thoroughly evaluate any existing recommendations regarding human resources for NCD prevention and care services, in order to understand how these are calculated and their limitations, before embarking on de novo studies.

To further inform this process with empirical data, we propose convening expert

**TABLE 1.** NCD prevention and care service, in order to understand how these are calculated and their limitations, before embarking on de novo studies.
committees or commissioning research to (i) map out systems, identifying human resources and their roles for NCD prevention and control within and outside the health sector—the latter to capture behavioral influences on health from environmental, educational, and agricultural sectors; (ii) undertake secondary analyses of existing programs or implementation trial data emerging from LMICs (26, 27) so as to understand the minimal or optimal human resource and infrastructure needs (such as use of lay community health workers or laboratory capacity); and (iii) devise new implementation studies to measure the effectiveness, cost-effectiveness, and acceptability of interventions within the context of local cultures and resources (28).

Technology is enabling aggregation of more real-time health-care data through mobile health applications and electronic medical records. The global health community can benefit from these platforms, but more data are needed. In particular, calculating the short- and long-term financial inputs and returns will be necessary to inform sound policy decisions and also engage non-health actors, including ministries of finance and large corporations in which workforce wellness also drives economic growth and profits, respectively.

**WHAT IT WILL TAKE**

Financial resources and political leadership are both needed for holistic improvements in how LMICs address NCD burdens (29). As noted, the constraints of financing, data deficits, human and institutional resources, and competing priorities are already well-known to global NCDs prevention and control efforts (30). Although financial constraints perpetuate the implementation gaps, investing in capacity and systems can mitigate future gaps and potentially lower the long-term incremental costs. In parallel, governments need to develop risk-pooling mechanisms to provide financial coverage for health services; these have been shown to improve health outcomes in Mexico, Thailand, and Brazil (31).

Institutionalizing collective capacity and expertise in the form of national public health institutes, as has occurred in Mexico and India, can help mobilize resources and encourage interaction with non-health-based stakeholders. Although we have focused on the health sector in this Commentary, we acknowledge that sustainable responses to the NCD pandemic will require the engaged involvement of non-health actors from the media, agricultural, business, and other sectors (13). Also, population-based societal and individual-focused clinical interventions should be viewed as complementary, as opposed to mutually exclusive entities that compete for resources and attention. In a recent report from the United Nations and WHO (32), options are presented for facilitating multisector action for NCDs. Many of the recommendations in that report, along with those made in other key reports and resources (9, 10, 33) align with the approaches we have addressed in this paper, which provide a greater opportunity for synergy as research and political agendas move forward in finding solutions to the NCD pandemic. To progress this agenda in LMICs, we reiterate that we need to develop the human and institutional capacity and systems, as these are the means to implement action.

**REFERENCES AND NOTES**


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Table 1. A model framework for systems-focused capacity development. The goals outlined in this framework were developed at the “Workshop on Building Global Capacity for Non-Communicable Diseases (NCD) Prevention: Defining Direction and Roles” organized by IUHPE and the CDC in July 2012 (17). The strategies fall into the categories of Assess, Plan, Implement, and Evaluate.

<table>
<thead>
<tr>
<th>Overarching goals</th>
<th>Specific strategies</th>
<th>Responsibility</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity development</td>
<td>Evaluating capacity needs (Assess)</td>
<td>• Multidisciplinary technical panels (for example, IOM, WHO)</td>
<td>• Technical analyses</td>
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<tr>
<td></td>
<td></td>
<td>• Academia</td>
<td>• Technical reports</td>
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<tr>
<td>Adapting to contexts and prioritization (Plan)</td>
<td>In-country ministry or national public health institutes</td>
<td>• Multilateral agencies</td>
<td>• NCD program plans (national or subnational)</td>
</tr>
<tr>
<td>Training or technical assistance (Implement)</td>
<td>Multilateral agencies</td>
<td>• Professional groups</td>
<td>• Skilled workforce</td>
</tr>
<tr>
<td>Data and surveillance</td>
<td>Evaluating health needs and impacts of interventions (Assess)</td>
<td>In-country ministry or national public health institutes</td>
<td>Incorporate NCD surveillance</td>
</tr>
<tr>
<td>Implementation research (Assess/Evaluate)</td>
<td>Funds: Funding agencies</td>
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<td>Actionable evidence</td>
</tr>
<tr>
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<td>Dissemination (Plan/Implement)</td>
<td>• Synthesis: Technical institutes (for example, IOM, WHO)</td>
<td>Policymaker roundtables</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• In-country ministry or national public health institutes</td>
<td>Enhanced local surveillance plus applied research</td>
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