



**Global Inequalities in Access to Cardiovascular Health Care: Our Greatest Challenge**

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STATE-OF-THE-ART PAPER

# Global Inequalities in Access to Cardiovascular Health Care

## Our Greatest Challenge

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Cardiovascular disease (CVD) was the leading cause of death globally in 2005, responsible for 17.5 million deaths, more than 80% of which occurred in low- and middle-income countries (LMIC). In these regions, CVD occurs at a much younger age than in high-income countries, thereby contributing disproportionately to lost potential years of healthy life as well as lost economic productivity. Many effective interventions for CVD prevention and management are now affordable for all but the very poorest countries, but large treatment gaps still exist because of poor prescribing practices, limited availability of medicines, and lack of appropriately skilled health care providers. Despite the increasing awareness of the growing epidemic of CVD in LMIC, this public health priority has received little attention from those who determine the international health agenda. Although the burden of CVD is already enormous in developing countries, there exists a window of opportunity to prevent the epidemic reaching its full potential magnitude. This requires the rapid deployment of strategies already proven to be effective in high-income countries. Such strategies need to be tailored for LMIC for them to be affordable, effective, and accessible to disadvantaged groups and the burgeoning middle classes. Ideally, the control of CVD in these countries would involve a dual approach in which evidence-based clinical strategies for CVD prevention and treatment are complemented by evidence-based population level strategies. We propose that upgrading primary health care services is a central requirement for the control of the CVD epidemics facing the developing world. (J Am Coll Cardiol 2008;52:1817–25) © 2008 by the American College of Cardiology Foundation

Although it is now well recognized that cardiovascular disease (CVD) is a major and growing health problem for low- and middle-income countries (LMIC), it is less well recognized that it is also a major cause of the widening inequity in the health status of the rich and poor. No longer can CVD be considered a problem of affluence (1). In most high-income countries, rates of CVD reached a peak in the middle of the 20th century, and have declined progressively ever since, because of a combination of successful population-wide preventive strategies, effective primary and secondary preventive health care, and improved treatment for acute cardiovascular events. However, although cardiovascular mortality has decreased by around three-quarters

over the past 3 decades in countries such as Australia, Canada, the United Kingdom, and the U.S., rates in many LMIC have increased over the same period (2,3). At the beginning of the 21st century, this epidemic is gaining pace and is already the leading cause of death in many LMIC. Although safe and effective preventive treatments are available at low cost, it is still the case that most individuals for whom such treatments are recommended do not receive any care (4). Hence, interventions that have been so successfully deployed in high-income settings to curb the growth of CVD are still largely missing from the health care services of most LMIC.

The development and implementation of strategies to prevent and treat CVD in LMIC will require major efforts to direct scarce resources to interventions that are cost effective, culturally appropriate, and sustainable. This has implications not only for resources currently directed toward the health problems associated with poverty, but also for resources currently directed toward high-technology procedures such as percutaneous coronary interventions (5). In this article we review the burden of CVD in LMIC, describe the escalating inequalities in access to primary CVD health care, and discuss practical solutions that could be implemented to reduce such inequalities, using rural China as an example.

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## Abbreviations and Acronyms

**CVD** = cardiovascular disease  
**DALYS** = disability-adjusted life years  
**GDP** = gross domestic product  
**LMIC** = low- and middle-income countries  
**WHO** = World Health Organization

## The Problem of CVD in LMIC

**Disease burden.** Worldwide in 2005, CVD was estimated to have caused approximately 17.5 million deaths, of which more than 80% occurred in LMIC (6). By 2030, the number of cardiovascular deaths is projected to increase to 23 million, with about 85% occurring in these countries (Fig. 1) (7). This increase is of roughly equal magnitude to the

projected increase in deaths from human immunodeficiency virus (HIV) infection over the same period. Already, CVD is the leading cause of death in China (8) and India (9), the world's 2 most populous countries. Even in countries such as South Africa, where deaths from HIV still dominate, the rate of deaths from high blood pressure has increased by 25% in less than a decade (10). The CVD burden suffered by many LMIC now exceeds that suffered by many high-income countries. For example, in 2003, the disability-adjusted life years (DALYs) lost because of coronary heart disease were 27 and 20 per 1,000 population in the Russian Federation and India compared with 5 and 8 per 1,000 in Australia and the U.S., respectively (Table 1). Similarly, DALYs lost because of stroke in China were 12 in 1,000 compared with 4 in 1,000 in the United Kingdom (11).

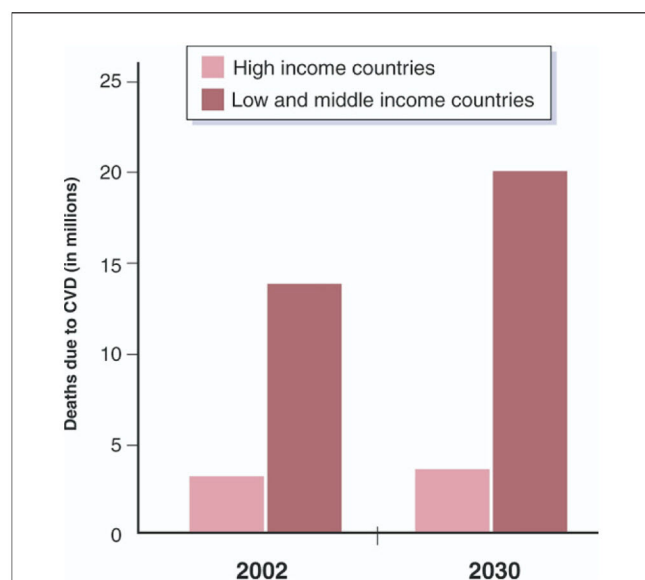
Fueling the increasing mortality rates from CVD in LMIC are upward trends in the prevalence of risk factors such as obesity, high blood pressure, tobacco smoking, and

diabetes. Although similar trends for some of these risk factors, such as obesity, are present in high-income countries, the rate of increase in the prevalence of risk factors is higher in developing countries (12). In China, for example, obesity has increased 4-fold in the last 2 decades (13). Consequently, the average level of total cholesterol among Chinese men age 25 to 64 years has increased from 4.15 mmol/l in 1984 to 5.25 mmol/l in 1999 (11). In India, the prevalence of diabetes is projected to increase from 32 million in 2000 to 79 million in 2030 (14). By 2025, the prevalence of hypertension is expected to increase to 500 million in India and China (15). Even in settings where risk factor rates are already high, the trends are not encouraging; for example, over the past decade the prevalence of smoking among adult men in Russia has increased from 57% to 62% (16), in contrast to Australia, where it decreased from 28% to 25% (17). Furthermore, within these countries, individuals of lower socioeconomic status are often more vulnerable to CVD as a consequence of greater exposure to risk factors such as smoking and reduced access to health care and health education (3).

**Economic burden.** CVD has a huge economic impact on individuals, households, and countries. The effects are particularly marked in LMIC, where CVD more frequently affects those of working age, and for this reason contributes disproportionately to lost potential years of healthy life. In such countries, approximately one-half of all cardiovascular deaths occur before the age of 70 years, compared with just one-quarter in high-income countries (12). An example of the stark difference between high- and lower-income regions is provided by Tanzania, where stroke-related death among people age 15 to 59 years is 3 to 8 times higher than that in England and Wales (12). Similarly, in India, CVD mortality in the working age population (30 to 59 years) is twice that in the U.S. (18).

Recent estimates of foregone gross domestic product (GDP) associated with CVD and diabetes for 23 LMIC highlight how such illnesses can significantly impair economic growth (19). It was estimated that the aggregate loss in GDP across these countries in 2006 as a consequence of these diseases was \$6.8 billion, with China, India, and Russia each incurring annual losses of over \$1 billion. Furthermore, it is projected that if there is no change in disease trends, the annual foregone GDP across these 23 countries will increase to 150% of current levels by 2015, resulting in a cumulative loss over this 10-year period of \$84 billion. Hence, efforts to produce even modest reductions in age-specific disease rates could have very large economic impacts. For example, a 2% annual reduction in cardiovascular death rates, as proposed by the World Health Organization (WHO) in 2005 (20), may avert the loss of \$8.1 billion over a decade, including \$1.36 billion in China, \$1.64 billion in India, and \$1.49 billion in Russia (Table 2).

However, such estimates of the costs of illness are unreliable and often tend to underestimate macroeconomic impacts (21). For instance, coping strategies used by house-



**Figure 1** Global CVD Mortality

CVD = cardiovascular disease.

Table 1 DALYs Lost Because of Heart Disease and Stroke			
	DALYs Lost per 1,000 Population Because of Heart Disease	DALYs Lost per 1,000 Population Because of Stroke	Mortality Because of Heart Disease and Stroke, No. of Deaths (2002)
High-income countries			
Australia	5	3	37,204
United Kingdom	7	4	179,852
U.S.	8	4	678,218
Low-income countries			
China	4	12	2,355,810
India	20	10	2,302,601
Russian Federation	27	19	1,192,305
South Africa	9	11	57,319

Data from The Atlas of Heart Disease and Stroke (11).  
DALYs = disability-adjusted life years.

holds in response to the treatment costs and loss of income frequently involve the use of savings and the removal of children from schools (3), each of which have long-term implications in terms of investment and human capital development that are often not well taken into account. Such issues might explain some of the wide differences in available estimates.

**Treatment gaps.** Secondary prevention has contributed substantially to the dramatic decline in CVD mortality rates in

high-income countries such as the U.S. (22). Despite the strength of scientific and economic evidence about the benefits of aspirin, blood pressure-lowering drugs, and statins in secondary prevention, such treatments are underused in most LMIC (4). For example, a WHO study conducted in 10 developing countries indicated that fewer than one-fifth of all patients with a previous history of CVD were on statins (4). In a recent study in rural Andhra Pradesh, India, CVD was found to be the leading cause of death; however, fewer than one-sixth

Table 2 Cost of Cardiovascular Disease in Terms of Lost GDP in 23 Low- and Middle-Income Countries					
	Baseline Scenario				
	Foregone GDP,* U.S. \$ Billions		2015 as Proportion of 2006 Estimates (%)	Cumulative GDP Loss by 2015, U.S. \$ Billions	Cumulative GDP Loss Averted if Global Goal Were Achieved by 2015, U.S. \$ Billions (%)
	2006	2015			
China	1.01	1.84	182	13.81	1.36 (9.83)
India	1.35	1.96	145	16.68	1.64 (9.83)
Russia	1.49	1.64	110	16.09	1.49 (9.26)
Brazil	0.33	0.5	150	4.18	0.43 (10.23)
Indonesia	0.33	0.53	158	4.18	0.39 (9.33)
Mexico	0.48	0.89	186	7.14	0.75 (10.58)
Turkey	0.39	0.52	133	4.7	0.46 (9.72)
Pakistan	0.15	0.21	140	1.72	0.15 (8.62)
Thailand	0.12	0.18	150	1.49	0.15 (10.20)
Bangladesh	0.08	0.14	175	1.14	0.08 (7.14)
Ukraine	0.13	0.13	100	1.33	0.13 (9.43)
Egypt	0.11	0.14	125	1.4	0.11 (8.89)
Argentina	0.13	0.16	125	1.4	0.13 (9.09)
Burma	0.03	0.06	200	0.43	0.04 (9.09)
Iran	0.08	0.13	167	0.99	0.10 (10.53)
Poland	0.17	0.23	133	2.17	0.23 (10.53)
South Africa	0.16	0.21	133	1.88	0.21 (11.43)
Philippines	0.06	0.07	133	0.62	0.06 (9.09)
Colombia	0.07	0.1	150	0.82	0.07 (8.33)
Vietnam	0.02	0.03	200	0.27	0.03 (12.50)
Nigeria	0.12	0.12	100	1.17	0.12 (10.00)
Ethiopia	0.03	0.03	100	0.16	0.01 (7.50)
Democratic Republic of the Congo	0	0.03	140	0.15	0.01 (7.90)
Total	6.8	9.8	1.5	83.8	8.1 (9.5)

Data from Table 2 of Abegunde *et al.* (19), with permission.  
GDP = gross domestic product.



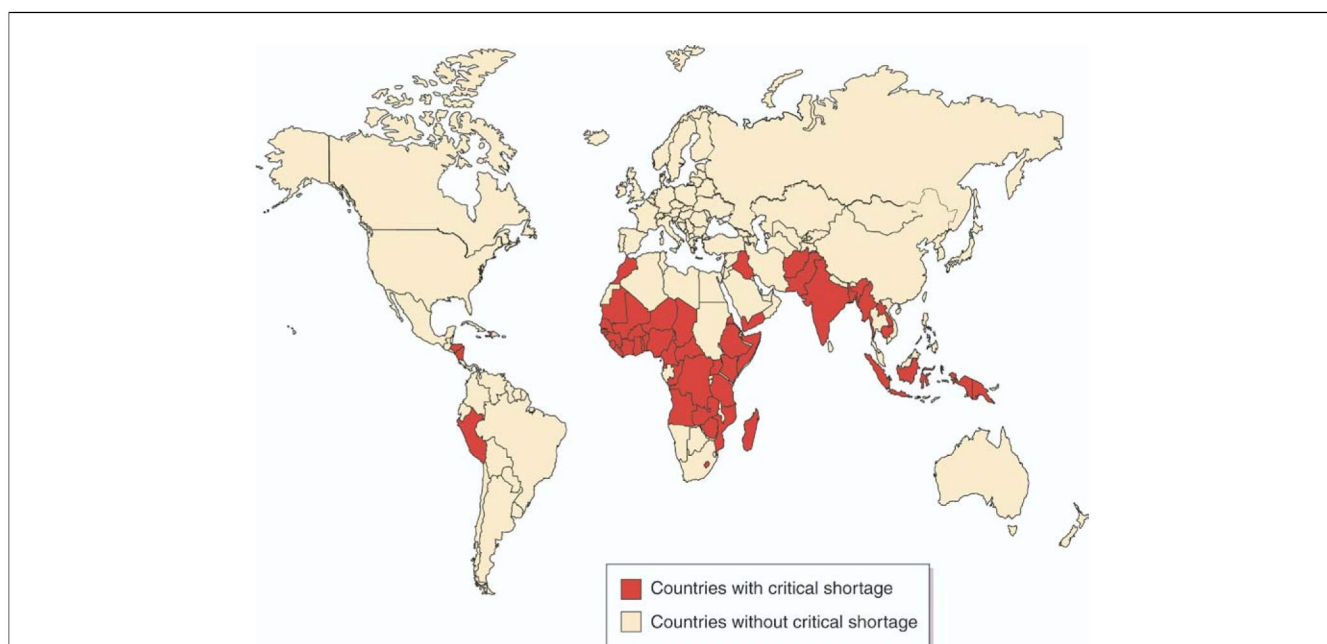
of those with a previous cardiovascular event (mostly myocardial infarction) were receiving antiplatelet therapy (23). In the same study, <50% of people with diabetes were aware of their condition, and of these, only two-thirds were receiving glucose-lowering therapy (24). Similar gaps exist for the treatment of acute coronary syndrome. For example, in urban hospitals in China, management of patients with acute coronary syndrome deviated significantly from current guidelines (25).

The reasons for these treatment gaps are complex. However, they are likely to include incomplete use of guidelines by physicians and other health care workers, low treatment adherence in part because of the cost of therapy, and the stigma associated with taking medications over the long term in some settings. Studies examining the reasons for poor implementation of guidelines suggest numerous barriers at the patient, doctor, and health system level (26). Additionally, some essential preventive medicines, such as generic diuretics, angiotensin-converting enzyme inhibitors, and statins, are not readily available through the public sector in many developing countries (27). This could be partially explained by budgetary constraints and out-of-stock drugs attributable to poor estimates of use; however, these reasons need to be explored further (28). Although such drugs are more often available through the private sector, their cost is generally several-fold higher, in part because of the greater availability of drugs manufactured by international pharmaceutical companies rather than drugs manufactured by generic producers. In terms of the relative affordability of prevention treatments, there is enormous

variation worldwide. For example, a 1-month course of combination therapy for the secondary prevention of coronary disease (generic aspirin, beta-blocker, angiotensin-converting enzyme inhibitor, and statin) varies in cost from 1.5 days' wages in Sri Lanka to 18 days' wages in Malawi (28).

These treatment gaps can also be partially explained by the limited availability of health care providers in most parts of the developing world. For example, in Nigeria and India in 2006, there were 3 and 6 physicians per 10,000 population, respectively, whereas in the U.S. there were 26 per 10,000 population (29). This disparity reflects a broader imbalance in the availability of key health care providers (doctors, nurses, and midwives) such that those countries with the lowest relative need have the highest numbers (Fig. 2). Within countries, the distribution of health care workers also varies by locality: there is typically a higher density of health workers in urban areas because of better standards of living and higher salaries compared with rural regions (29).

**Lack of investment.** Despite increasing recognition of the problems arising from CVD in LMIC, few resources have been directed toward the development of solutions. The lack of international commitment is illustrated by the complete absence of CVD prevention and treatment in the Millennium Development Goals (30). Similarly, chronic disease attracts only 5% of the entire WHO budget, and whereas \$7.50 is spent per communicable disease death, only \$0.50 is spent per death from chronic disease (31,32). Funding for CVD prevention and control also has been neglected by the major health development funds, the World Bank, regional development banks, and bilateral aid programs. Another



**Figure 2** Countries With a Critical Shortage of Health Care Providers

Based on data from Figure 2 of the report published in the World Health Report 2006 (29), with permission.

example highlighting the low priority attached to the problem of CVD in LMIC is the exclusion by the Bill and Melinda Gates Foundation of CVD from their list of priority diseases and conditions (33). Exacerbating this situation is the lack of capacity of governments within LMIC, such those in Africa and Southeast Asia, to redress this imbalance. Despite accounting for more than one-third of the world's population, these governments have access to only 2% of the global health resources (34).

### Addressing Inequalities in Access to Cardiovascular Care

Although the burden of CVD is already enormous in LMIC, there exists a window of opportunity for preventing the epidemic from reaching its full potential magnitude (35). This requires the rapid deployment of strategies already proven to be effective in high-income countries. Such strategies need to be tailored for LMIC for them to be affordable, effective, and accessible to disadvantaged groups and the burgeoning middle classes. Ideally, the control of CVD in LMIC would involve a dual approach in which evidence-based clinical strategies for CVD prevention and treatment are complemented by evidence-based population-level strategies. An example of a highly cost-effective evidence-based population strategy that can reach a very wide cross section of the population is legislation to control the use of tobacco products through taxation and restrictions on advertising (36). There may be benefits of other population strategies, such as legislation to control the salt or fat content of processed foods or urban planning policies to promote physical activity. However, the evidence base in support of these strategies is not as strong (37). Therefore, beyond legislative change to reduce smoking, the most important platform on which to base CVD prevention efforts is clinical strategies to deliver proven and affordable preventive strategies to those at high risk of fatal or catastrophic events. We propose that upgrading primary health care services is central to achieving this goal.

**A primary health care-based approach.** As in high-income countries, an effective and affordable primary health care system is essential for the prevention and control of CVD. Wherever possible, the roles of primary health care should include, at a minimum: 1) targeted screening for the identification of individuals at very high risk of a fatal or disabling cardiovascular event and the provision of cost-effective evidence-based preventive care; and 2) the identification of individuals with disabling symptomatic CVD, and either the provision of simple cost-effective treatments for symptom control (e.g., nitrates for angina, loop diuretics for symptoms of heart failure) or, where possible and appropriate, referral for specialist care.

Although the Declaration of Alma-Ata defines the concept of primary health care and highlights the need for such care to be universally accessible and affordable (38), few LMIC have primary health care systems that can reliably provide the

services that are essential for the control of CVD (39). There is clear evidence from systematic reviews that health systems with well-functioning primary care services are generally associated with better health outcomes, lower disparities in health, and lower costs of care (40). Among the reasons for this are that primary care can most effectively facilitate access to services for deprived populations and is best able to deliver preventive interventions. Such preventive interventions together with the early treatment of overt illness can often substitute for more expensive and sometimes inappropriate specialist and hospital treatment (40).

However, for this to be achieved on an appropriately broad scale, major changes are required in the organization and resource management of primary health care services. Historically, health systems in LMIC evolved to cater to infectious diseases, injuries, and conditions associated with childbirth. In many situations, this has led to primary health care typically providing episodic rather than continuing care, and to a failure to develop reliable systems for maintaining medical records. Furthermore, in countries such as China, the lack of separation between prescriber and dispenser in primary health care settings can lead to decisions about treatment being determined by the price that can be charged rather than the cost-effectiveness (or even effectiveness) of the treatments available. None of these factors is conducive to the delivery of reliable, cost-effective primary cardiovascular health care.

**Critical components.** The key to achieving real reductions in the CVD burden is through a well-functioning and accessible primary health care system that reliably delivers cost-effective therapy to those most in need. The system should be geared toward using estimated absolute risk to identify individuals who would benefit most from medical intervention. The approach involves assessing risk on the basis of multiple risk factors and CVD history, rather than focusing on elevations in single risk factors. Various risk prediction tools, such as the Framingham risk prediction tool, have been developed to calculate cardiovascular risk and tailor clinical management according to the level of risk. Because these tools have been developed in U.S. they are not directly applicable to all populations, particularly those in which the incidence of stroke is higher than that of coronary heart disease; hence, they need to be recalibrated and validated using data from LMIC (41). The level of risk at which preventive treatments should be provided will differ depending on disease burden and available resources. However, for all but the poorest nations, secondary prevention could be available to all individuals with a history of overt CVD. Table 3 sets out estimates of the cost effectiveness of interventions for CVD prevention in developing regions of the world (42). Primary health care services should be organized such that core interventions can be delivered by nonphysician health care workers, ideally working under the supervision of a physician, to enable the most efficient use of scarce resources including health care personnel (43). Importantly, this would reduce the costs and other barriers to accessing primary health care associated with traditional



**Table 3** Cost-Effectiveness of Combination Therapy Compared With No Treatment for CVD Prevention in Developing Countries

	Secondary Prevention	Primary Prevention			
		Absolute Risk			Gross National Income × 3
		>25	>15	>5	
East Asia and Pacific	336	890	923	1,214	3,180
East Europe and central Asia	362	858	905	1,207	6,030
Latin America and Caribbean	388	881	930	1,219	11,010
Middle East and northern Africa	341	872	930	1,221	6,270
South Asia	306	746	790	1,039	1,320
Sub-Saharan Africa	312	771	846	1,145	1,410

All values above are in U.S. \$. Gross national income per head by region. The World Health Organization recommends interventions <3 times the gross national income per head. Drugs for secondary prevention: aspirin, angiotensin-converting enzyme inhibitor, beta-blocker, and statin. Drugs for primary prevention: aspirin, angiotensin-converting enzyme inhibitor, calcium-channel blocker, and statin. Data from Table 4 of Gaziano et al. (42), with permission.

physician-based models. Historically, the reduction in childhood diseases and the consequent gains in life expectancy in LMIC have been ascribed to strategies such as immunization and distribution of oral rehydration therapy that were performed by this type of primary health care worker.

A critical feature of any strategy for the prevention and treatment of CVD is therefore to reorient primary care systems to more effectively deliver the care required for chronic disease management. This requires several key components, including appropriate screening tools and treatment packages, improved health record systems, cost-effective drug distribution systems, systems to protect patients from prohibitive health care costs, and basic health surveillance systems. The most appropriate screening tools for use in resource-poor settings should involve simple methods focused on medical history and physical measurements such as blood pressure and body mass, without reliance on laboratory test results (44). Inexpensive urinary tests for albuminuria and glycosuria may be cost-effective additions to a screening algorithm. Although laboratory tests such as blood cholesterol and blood glucose may be required in some cases, the cost-effectiveness of these tests needs to be established for resource-poor settings. Treatment regimens should be simple to administer and not require extensive titration. In this regard, the concept of a CVD “polypill” for disease prevention is attractive insofar as the combination of aspirin, a statin, and 1 or more blood pressure-lowering drugs at low dose should be well tolerated and should reduce CVD risk by at least one-half without any need for dose escalation (45). This combination can be manufactured with generic components at very low cost and would be suitable for a broad range of patients with a history of CVD or at high risk of an initial cardiovascular event. Other cost-effective strategies could include nicotine replacement therapy for smoking cessation and low-dose, fixed-combination blood pressure-lowering therapy for those with moderate to severe hypertension. The management of such screening and intervention programs requires reliable medical record systems, which often are missing from primary health care services in resource-poor settings. Innovative approaches to the provision and maintenance of such systems are required.

Undoubtedly, the ultimate solution will be the provision of electronic records developed specifically for use in these settings. In addition to providing a system for maintaining records, this approach also opens up the possibility of providing electronic decision support, including estimation of disease risks and treatment recommendations based on guidelines (46).

The other critical components require higher-level policy change. Improvement of drug distribution systems is necessary in many countries because affordable generic products are frequently unavailable through the public system and unaffordable through the private system (28). In some countries, the fees charged by multiple distribution networks together with those charged by the dispenser can increase the cost several-fold. In addition, there also are problems with drug quality, including counterfeit drug production, in some countries. These issues can only be resolved through legislative change and enforcement, although incentives to provide quality drug supplies through efficient distribution systems also should be considered. Innovative approaches to personal health care financing are also required, given that most health care expenditures are out of pocket in LMIC (47). Because it is unlikely that the public health systems of most developing countries will pay for primary CVD care in the foreseeable future, systems of pre-payment or community health insurance need to be developed and deployed (48). However, it is critical that any such systems provide benefits for outpatient care and medication, and not just hospitalization, which has been a focus of community health insurance schemes in some regions.

Finally, better health information systems, such as mortality surveillance systems, are required to inform health policies and set targets, as well as to monitor the effects of intervention programs (49). Countries with the highest mortality levels, and arguably the greatest need for robust mortality statistics, are the least likely to have civil registration systems with complete coverage of the population. Overall, only about one-third of the world's deaths are presently covered by civil registration systems (50). The extension of such systems to LMIC would greatly enhance the capacity of health systems to support operational research aimed at evaluating the effects of novel strategies for



CVD prevention and control in these settings (51). The recently established Global Partnership to Stem the Growth of Chronic Diseases, involving Ovatons (a United Health care subsidiary), the WHO, the National Institutes of Health, and the Oxford Health Alliance, incorporates the promotion of such research within its objectives (52).

### Rural China: An Example

The policy challenges faced by some of the world's largest populations are exemplified by the current situation in rural China, where stroke, chronic obstructive airway diseases, cancer, and heart disease are the 4 most important contributors to total disease burden. In 2005, 74 million deaths (78% of total deaths) in China were caused by such diseases and one-third of these were caused by CVD (53). Even with China's booming economy, these costs are unsustainable. One of the downsides of the market reform that has led to China's economic growth has been the decline in access to health care for the poor. The factors that have undermined access to services are the growing health care costs, low levels of insurance coverage, and low levels of public funding. This has meant that patients when faced with serious illness are often confronted with the choice of either forgoing treatment or financial catastrophe (54).

Most people in China have limited access to and little capacity to pay for preventive cardiovascular treatments. This is particularly true in rural areas, where health services are less developed, income is low, and the population is large. Allied with this is a health care system very much oriented toward hospital-based care and treatment. Health care providers in China are generally paid according to the services provided, with commissions from the sale of medicines being a significant component. A byproduct of this is that it discourages prevention and encourages overtreatment through, for example, the overuse of high-technology diagnostic tests, prescription of expensive drugs (often administered parenterally), and the prolongation of hospital admissions. Such incentives toward high-cost and often inappropriate treatment have contributed to the gradual erosion of community trust in primary health care services, particularly in rural populations (54).

In rural China, primary health care workers typically hold no formal medical qualifications and only one-third have a technical school certificate (55). Additionally, most health care workers are trained only in the recognition and treatment of infectious diseases together with the management of childbirth, and generally have very little or no training in the recognition and management of noncommunicable conditions. However, the market changes that have taken place in China over the past few decades have reduced the state's support for these health care workers, and as a result they have come to depend more and more on income generated by prescribing. Over the same period, there has been a transformation of patient expectations fueled by an awareness of increasing medical technology and a preference for hospital treatment

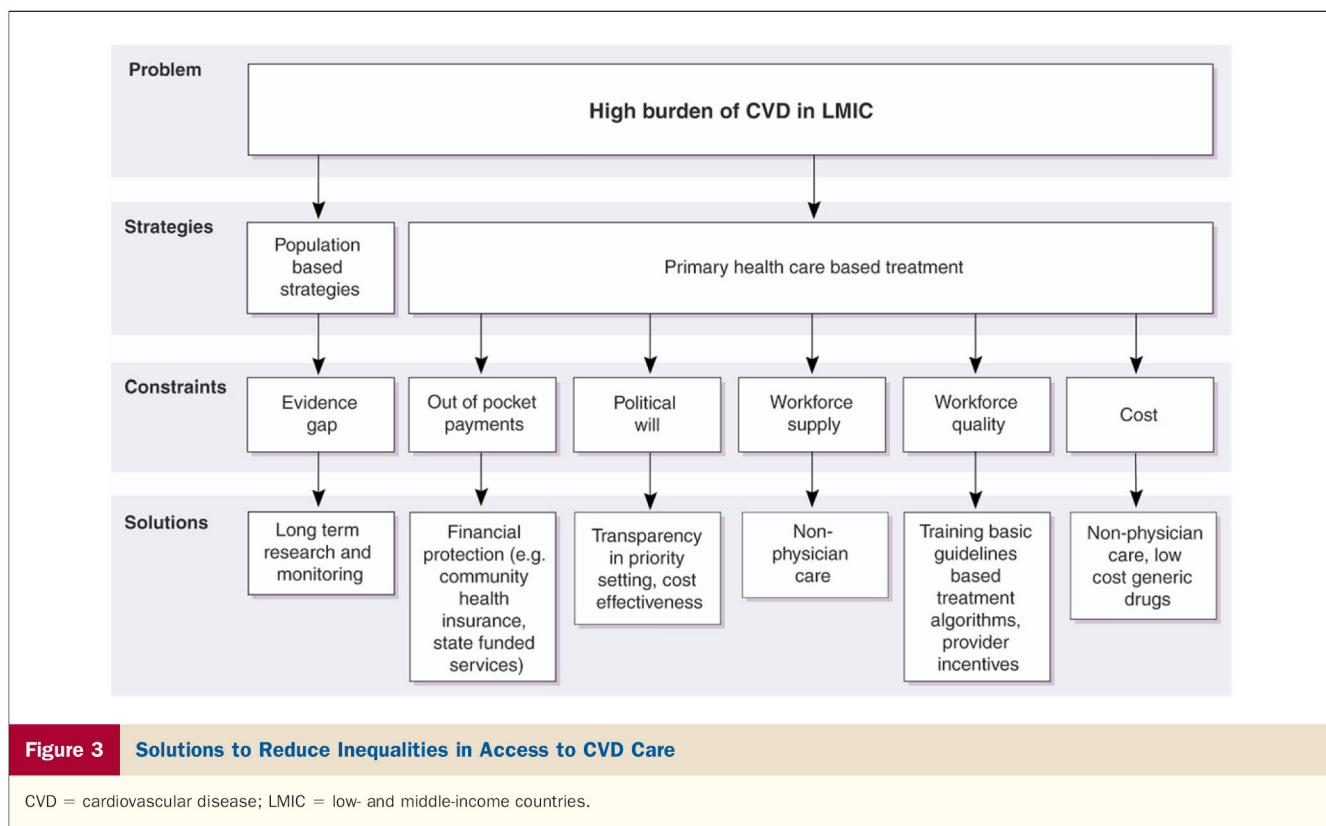
even for the most basic of illnesses (54). Addressing this mismatch between patient expectations and primary care workforce capacity is a key challenge for the Chinese government that will necessitate policy changes to increase the skills of primary health care workers and to improve the services that they provide. Such steps are urgently required to re-establish patient confidence in the quality of primary health care services.

To rectify this problem will require a system that provides new and existing health care workers with the skills and tools to manage CVD. This will require a training program focused on the detection of individuals with symptomatic CVD, those with a history of CVD, and those at very high risk of cardiovascular events. It will also require training in the use of proven low-cost treatments for symptom management (e.g., nitrates, beta-blockers) and event prevention (e.g., aspirin, diuretics, statins). This should be augmented by training in a system of referral to hospitals for specialist care for those in need. Training in the maintenance of long-term follow-up and the management of treatment adherence also would be ideal. Such practices should be reinforced by the provision of a simple medical record system. The cost of screening and therapy could conceivably be reimbursed through the Cooperative Medical Schemes, a system of social health insurance that is currently being rolled out across China but at present covers mainly hospital care (56). This may be affordable so long as treatment primarily comprises of generic drugs, which can be purchased cheaply on the international market (e.g., \$1 per year for a diuretic) (15,57). Incentives should also be provided to health care workers for screening, detection, treatment, and follow-up, as have been used in some higher-income settings. This change in practice would need to be supported by an improved drug supply system that ensured the availability of quality generic products at a price that was closer to the wholesale rate. Change would also be supported by separating prescriber and dispenser functions, because this is essential to ensuring evidence-based, rather than revenue-based, practice.

The implementation of low-cost disease surveillance programs would enable the effects of such changes of primary health care practice to be documented. China already has a well-functioning sentinel surveillance system. Other systems designed specifically for resource-poor settings have been tested and shown to be effective in rural populations elsewhere in Asia (23). The implementation of such systems in rural China would also facilitate the conduct of health care delivery research, through which it should be possible to evaluate the effects of various primary care strategies and help inform decisions about scaling up such strategies.

### The Way Forward

Underlying all solutions to the inequalities in access to cardiovascular care is the need for much greater transparency in the setting of national and international priorities for resource allocation. It is not necessarily the case that reducing the disparities in access requires prominent advo-



cacy and calls for the prioritization of CVD over other diseases. The size of the CVD epidemic facing LMIC speaks for itself, as does the strength of the evidence about low-cost interventions that can be delivered through primary health care services. If governments and funding agencies really believe that health investments need to be geared toward best buys based on evidence of cost and effect, then there needs to be much greater investment in primary health care programs to prevent and treat CVD. Upgrading primary health care services would also have positive consequences for the management of other important chronic conditions, including HIV infection. Achieving this, however, is unlikely to be straightforward, and there will inevitably be major institutional and resource constraints that require any such reforms to be accompanied by programs geared toward, among other things, the training of health care providers, the development of appropriate guidelines for treatment, establishing appropriate incentives for providers, ensuring reliable supplies of low-cost drugs, and taking measures to minimize the out-of-pocket costs to patients of such treatments through financial protection such as insurance or direct state financing (Fig. 3).

A critical first step in the resolution of disparities in access to care in LMIC settings is to establish locally relevant templates for acceptable and affordable primary health care oriented toward evidence-based, cost-effective strategies. Such strategies would promote awareness and improve access to prevention, early diagnosis, and early treatment. This would result in cost savings to individuals and the

community as a consequence of reduced morbidity and mortality, lower levels of hospitalization, and increased economic productivity. The results would have implications for both the health and the wealth of the developing world.

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**Key Words:** cardiovascular health care ■ global inequalities ■ primary health care ■ evidence-based treatment.

## APPENDIX

For a list of high-income economies, please see the online version of this article.



## Global Inequalities in Access to Cardiovascular Health Care: Our Greatest Challenge

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