

tients with mild heart failure with reduced ejection fraction and left bundle-branch block. All those responsible for pursuing and supporting long-term follow-up should be congratulated for this effort. Funding agencies and investigators should take note of the value of such intermediate to long-term studies and promote their execution.

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## Convergence to Common Purpose in Global Health

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Health and disease are, to a large extent, effects of local environmental conditions, and the work of health professionals is still largely performed one patient at a time, facilitated or constrained by local resources. So does it make sense to conceptualize “global health” on a worldwide basis rather than as a patchwork of national and local jurisdictions and responses? In examining the 17 contributions to this series (concluding with the article by Gostin and Sridhar in this issue of the *Journal*<sup>1</sup>), we see five major forces and trends suggesting that as the 21st century progresses, a global perspective on public health will be increasingly critical.

First, the demographic transition from high birth and death rates to low birth and death rates in most countries, leading to a doubling of life expectancy in the 20th century and a quadrupling of the world population, is associated with the epidemiologic transition from infectious causes of death to noncommunicable diseases as the primary causes of death. In terms

of morbidity, mental illness now accounts for a large proportion of years lived with a disability. Between 2010 and 2050, the proportion of the world’s population older than 65 years of age will almost double, and the proportion older than 85 will be three and a half times as large.<sup>2</sup> This dramatic reshaping of the age structure of the world population predicts an equally dramatic reshaping of disease patterns, which will challenge health systems to adjust across the spectrum of preventive and therapeutic services. Although the transition will be completed in some countries, people in many low- or middle-income countries will face a “double burden” of disease — the “unfinished agenda” of persisting common infections, undernutrition, and maternal mortality, plus a growing burden of noncommunicable diseases.

The second major trend relates to the health consequences of globalization. The tripling of world merchandise exports since 1980, a result of economic liberalization and cheaper trans-

port, has had manifold effects on health. Economic growth and countries' movement from low-income to middle-income status have led to decreased poverty rates in countries such as China and India, along with an ability to invest more in health infrastructure and to plan for, or at least debate, approaches to implementation of universal health coverage. By 2030, India will probably have the world's largest population, and China will probably be the largest economy; decisions made in New Delhi and Beijing are arguably already more important to global health than those made in Washington, Brussels, or Geneva. Jamison et al.<sup>3</sup> have proposed that by 2035, a "grand convergence in health" is possible, as mortality patterns equilibrate in many countries.

Economic growth, however, has been accompanied by rapid urbanization, reduced physical activity, increased tobacco and alcohol consumption, and adverse changes in dietary patterns. Increases in the volume and speed of travel will enable pandemics to spread more rapidly — but there has been no corresponding acceleration in the development and manufacturing of drugs and vaccines. Diseases such as polio, which had been limited to a handful of countries and attended by hopes for worldwide eradication, can recrudescence when conditions favor the virus and a pool of unimmunized children is present. These changes in lifestyle and habitation and in the numbers of people traveling are predicted to increase, along with the consequences for human health. International disease-control regulations and other global governance mechanisms are rudimentary when compared with the size of the challenges.

Third, environmental threats are destabilizing long-standing agricultural and residential patterns and access to clean air and water, setting off unpredictable changes that affect all regions of the globe. The most obvious threat comes from climate change; related threats include the cross-border spread of air and water pollution and the export of toxic wastes. Global solutions to these problems will require unprecedented global solidarity and coordinated responses. The multilateral actions aimed at reducing atmospheric chlorofluorocarbons set a promising precedent, but the actions needed to reduce the effects of climate change are far more complex, and the delay between action and mitigation

longer — all of which suggest that scaling up capacities for humanitarian response to address the increased incidence of weather-related disasters will be a necessary activity for several decades.

The fourth major trend is the internationalization of medical knowledge and the globalization of the health workforce. As little as 30 years ago, medical knowledge traveled slowly, if at all, in the pages of journals, sometimes in "airmail editions" printed on lightweight paper. Now, key articles appear online a month or two before publication in print and are available around the world instantaneously. But because drugs and devices are far from universally available and affordable, there are growing inequities in doctors' ability to treat their patients using the latest medical knowledge. These limitations are particularly unfortunate now that medical knowledge flows in multiple directions and innovations borne of necessity in poor countries may hold the key to reducing the cost of health care in rich countries.<sup>4</sup> New educational opportunities, such as massive open online courses, or MOOCs, hold the promise of training more health workers more quickly than can possibly be done in standard brick-and-mortar classrooms.

The globalization of the health workforce has many benefits, but rich countries' importing of health professionals from poorer countries, a result of poor workforce planning, strips poorer countries of precious health professionals and reduces their populations' access to care.<sup>5</sup> We must not let the communications revolution, which should lead to more up-to-date and better-trained health professionals and more globally engaged and collegial interactions around the world, become a Trojan horse for accelerated medical migration from poorer countries. To the extent that such migration is fed by frustration with inadequate infrastructure for practicing medicine to the highest standards, those problems could be mitigated by relatively modest investments in improving health facilities.<sup>3</sup>

The final trend is the globalization of medical science. Since the report in the late 1980s of the Commission on Health Research for Development,<sup>6</sup> the number of countries engaged in what the commission referred to as "essential national health research" has increased substantially; China, a developing country at the time, is now second in the number of articles published

annually and listed in the Science Citation Index. Countries can increasingly decide for themselves what medical science they wish to pursue, instead of relying on the interests of scientists in other countries.

How we handle these five trends will do much to determine the quality of health and health services in the world in the coming decades. The environmental community uses the concept of “local to global” to remind us that individuals and communities have a role in environmental impact worldwide. Although the individual patient encounter is a local event, and global health institutions may constitute a patchwork of entities, each patient encounter takes place in a global tapestry of influences that constitute “global public health.”

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