

2. McMillen IC, Robinson JS. Developmental origins of the metabolic syndrome: prediction, plasticity, and programming. *Physiol Rev* 2005;85:571-633.
3. Barker DJP. Mothers, babies, and disease in later life. 2nd ed. New York: Churchill Livingstone, 1998.
4. Oken E, Gillman MW. Fetal origins of obesity. *Obes Res* 2003;11:496-506.
5. Bavdekar A, Yajnik CS, Fall CHD, et al. Insulin resistance syndrome in 8-year-old Indian children: small at birth, big at 8 years, or both? *Diabetes* 1999;48:2422-9.
6. Adair LS, Cole TJ. Rapid child growth raises blood pressure in adolescent boys who were thin at birth. *Hypertension* 2003;41:451-6.
7. Valdez R, Athens MA, Thompson GH, Bradshaw BS, Stern MP. Birthweight and adult health outcomes in a biethnic population in the USA. *Diabetologia* 1994;37:624-31.
8. Frankel S, Elwood P, Sweetnam P, Yarnell J, Smith GD. Birthweight, body-mass index in middle age, and incident coronary heart disease. *Lancet* 1996;348:1478-80.
9. Rich-Edwards JW, Kleinman K, Michels KB, et al. Longitudinal study of birth weight and adult body mass index in predicting risk of coronary heart disease and stroke in women. *BMJ* 2005;330:1115.
10. Barker DJP, Osmond C, Forsén TJ, Kajantie E, Eriksson JG. Trajectories of growth among children who have coronary events as adults. *N Engl J Med* 2005;353:1802-9.
11. Bhargava SK, Sachdev HS, Fall CH, et al. Relation of serial changes in childhood body-mass index to impaired glucose tolerance in young adulthood. *N Engl J Med* 2004;350:865-75.
12. Stettler N, Stallings VA, Troxel AB, et al. Weight gain in the first week of life and overweight in adulthood: a cohort study of European American subjects fed infant formula. *Circulation* 2005;111:1897-903.
13. Singhal A, Lucas A. Early origins of cardiovascular disease: is there a unifying hypothesis? *Lancet* 2004;363:1642-5.
14. Gillman MW. Epidemiological challenges in studying the fetal origins of adult chronic disease. *Int J Epidemiol* 2002;31:294-9.
15. Oken E, Wright RO, Kleinman K, et al. Maternal fish consumption, hair mercury, and infant cognition in a U.S. cohort. *Environ Health Perspect* 2005;113:1376-80.
16. Gillman MW, Rifas-Shiman SL, Kleinman KP, Rich-Edwards JW, Lipshultz SE. Maternal calcium intake and offspring blood pressure. *Circulation* 2004;110:1990-5.
17. Toschke AM, Montgomery SM, Pfeiffer U, von Kries R. Early intrauterine exposure to tobacco-inhaled products and obesity. *Am J Epidemiol* 2003;158:1068-74.
18. Seckl JR. Glucocorticoid programming of the fetus: adult phenotypes and molecular mechanisms. *Mol Cell Endocrinol* 2001;185:61-71.
19. Gillman MW, Rifas-Shiman SL, Berkey CS, Field AE, Colditz GA. Maternal gestational diabetes, birth weight, and adolescent obesity. *Pediatrics* 2003;111:e221-e226.
20. Crowther CA, Hiller JE, Moss JR, McPhee AJ, Jeffries WS, Robinson JS. Effect of treatment of gestational diabetes mellitus on pregnancy outcomes. *N Engl J Med* 2005;352:2477-86.

Copyright © 2005 Massachusetts Medical Society.

## Fatal Flows — Doctors on the Move

Lincoln C. Chen, M.D., and Jo Ivey Boufford, M.D.

The movement of physicians from poor to rich countries is a growing obstacle to global health. Ghana, with 0.09 physician per thousand population, sends doctors to the United Kingdom, which has 18 times as many physicians per capita. The United States, with 5 percent of the world's population, employs 11 percent of the globe's physicians, and its demand is growing.<sup>1</sup> As underscored in the article by Mullan in this issue of the *Journal*,<sup>2</sup> today, 25 percent of U.S. physicians are international medical graduates, and the number is even higher in the United Kingdom, Canada, and Australia. Many of these graduates come from poor countries with high disease burdens — precisely those nations that can least afford to lose their professionals.

The plain truth is that medical systems in the United States and other wealthy countries are heavily dependent on imported workers — for hospital staffing, coverage of underserved areas, and meeting gaps in skill levels. U.S. medical schools turn out a relatively stable 17,000 graduates annually, but the demand for residency staffing exceeds this number by 30 percent.<sup>3</sup> This gap is filled by international medical graduates, most of whom will attain citizenship or permanent residence and remain in the United States to practice medicine.

Medical coverage of disadvantaged Americans also depends on U.S. federal waivers for international medical graduates to enter primary care practice in underserved areas. The dependence is not confined to doctors, since nurses and other medically skilled workers are in equally high demand.

International professional mobility is inevitable when persons have skills they can sell in a global marketplace. The migration of medical professionals reflects a balance of supply and demand — but it has ethical implications, too. Demand in affluent countries pulls health care workers from poor countries as low salaries, limited career prospects, poor working environments, family aspirations, and political insecurity push them out. The beneficiaries are the importing countries and, of course, the migrants themselves. Countries that intentionally export skilled workers tolerate “brain drain” in exchange for financial remittances, relief from high unemployment rates, and the possibility of scientific connections. Markets for medical labor operate in and across all of the major world regions, with Asians moving into North America, Egyptians into countries with oil-exporting economies, and Eastern Europeans into an expanding European Union.<sup>4</sup> South Africa exports health professionals

to wealthier countries while simultaneously importing them from neighboring African nations.

Emigration from the poorest countries is unquestionably damaging. More than a dozen countries in sub-Saharan Africa have plummeting life expectancies mostly as a result of the epidemic of human immunodeficiency virus infection and AIDS.<sup>5</sup> With just 600,000 doctors, nurses, and midwives for 600 million people, African countries need the equivalent of at least 1 million additional workers in order to offer basic services consistent with the United Nations Millennium Development Goals. Instead, these countries are moving backward, with the hemorrhaging of clinical and professional leaders crippling the already fragile health care systems. These failures have been characterized as “fatal flows,” because poor people are left vulnerable to devastating diseases and avoidable death.<sup>6</sup> The exodus also constitutes a silent theft from the poorest countries through the loss of public subsidies for medical education, estimated at \$500 million annually for all emigrating skilled workers from Africa.

Moral outrage over the “poaching” behavior on the part of rich countries has reached a crescendo.<sup>7</sup> Yet simply blocking migration is neither effective nor ethical, since freedom of movement is a basic human right. The challenge is to advance human health while protecting health workers’ rights to seek gainful employment. The first responsibility for action belongs with each country to “train, retain, and sustain” its workforces through national plans that improve salaries and working conditions, revitalize education, and mobilize paraprofessional and community workers whose services are demonstrably more cost-effective and who are less likely to emigrate. Since such urgent actions must be pursued in the world’s poorest nations, much will depend on the global community’s provision of appropriate financial and technical aid.

The U.S. government and philanthropic institutions, arguably the most influential actors in global health, should demonstrate stronger leadership by broadening their current strategies. The President’s Emergency Plan for AIDS Relief is well financed, at \$15 billion over five years, but its strategy is preoccupied with short-term numerical targets for patient treatment in 15 priority countries. The Bill and Melinda Gates Foundation, the world’s largest philanthropic organization, focuses its support on the development of breakthrough health technologies. To enhance their impact, outreach, and sus-

tainability, both of these organizations must invest more in human resources and health care systems — the delivery vehicle for ensuring that persons have access to available technology. Dispatching U.S. health professionals abroad through laudable programs such as the one proposed by the Institute of Medicine should not be misconstrued as a substitute for the essential task of building local capacity.<sup>8</sup>

The United States must become more informed about global health in order to navigate domestic policies in the midst of rapidly changing international developments. The case for U.S. leadership is based not simply on humanitarianism but also enlightened self-interest. As demonstrated by international medical graduates, the United States is inextricably linked to global health. It has a vital stake in controlling the spread of infectious diseases such as the severe acute respiratory syndrome (SARS) and looming avian influenza pandemics. Protecting Americans requires viral detection and interdiction at points of origin, which are undermined by the depletion abroad of qualified professionals.

The United States can better harmonize its domestic and global health policies by moving toward self-sufficiency in preservice training. In the 1990s, fears of a physician surplus drove federal workforce policies. Now, dire predictions of massive shortages of 200,000 physicians and 800,000 nurses by 2020 — driven by the escalating demands of an aging society, new technologies, management of chronic diseases, changing family structures, and consumer and provider preferences — are prompting major American organizations to endorse targeted increases in the size of U.S. medical schools and the number of residency training slots.<sup>9</sup> A serious engagement of key stakeholders in the United States is needed to develop effective policies for the health care workforce that prepare for the future without raiding the limited human resources of poorer societies.

Managing international medical migration ultimately will require global political consensus. As the most powerful actor in multilateral agencies and funds, the United States must join other governments in crafting collective solutions. In the last two annual meetings of the World Health Assembly, African health ministers pushed through resolutions calling for urgent action to dampen unplanned emigration of health care workers, and Commonwealth states recently enacted a code of conduct to curtail unethical recruitment.<sup>10,11</sup> The World Health

Organization just announced that its 2006 World Health Report will provide a global action agenda with regard to human resources for health care. The migration of workers in service industries is on the agenda for the upcoming negotiations of the World Trade Organization. In terms of global health, especially the health of Americans, U.S. leadership at home and abroad can make a decisive difference in an increasingly interdependent world.

From Global Equity Initiative, Asia Center, Harvard University, Cambridge, Mass. (L.C.C.); and the Robert F. Wagner Graduate School of Public Service, New York University, New York (J.I.B.).

1. Joint Learning Initiative. Human resources for health: overcoming the crisis. Cambridge, Mass.: Harvard University Press, 2004.
2. Mullan F. The metrics of the physician brain drain. *N Engl J Med* 2005;353:1810-8.
3. Council on Graduate Medical Education. Physician workforce policy guidelines for the United States, 2000-2020. (Accessed October 6, 2005, at <http://www.cogme.gov/16.pdf>.)
4. Ahmad OB. Managing medical migration from poor countries. *BMJ* 2005;331:43-5.

5. An action plan to prevent brain drain: building equitable health systems in Africa. Boston: Physicians for Human Rights, 2004. (Accessed October 6, 2005, at <http://www.phrusa.org/campaigns/aids/pdf/braindrain.pdf>.)
6. Proceedings of the Ministerial Summit on Health Research, Mexico City, Mexico, November 16-20, 2004. Geneva: World Health Organization, 2004.
7. Buchan J, Dovo D. International recruitment of health workers to the UK: a report for DFID. London: Department for International Development, 2004. (Accessed October 6, 2005, at [http://www.dfid-healthrc.org/shared/publications/reports/int\\_rec/exec-sum.pdf](http://www.dfid-healthrc.org/shared/publications/reports/int_rec/exec-sum.pdf).)
8. Mullan F, Panosian C, Cuff P, eds. Healers abroad: Americans responding to the human resource crisis in HIV/AIDS. Washington, D.C.: National Academies Press, 2005.
9. Cooper RA, Getzen TE, McKee HJ, Laud P. Economic and demographic trends signal an impending physician shortage. *Health Aff (Millwood)* 2002;21(1):140-54.
10. International migration of health personnel: a challenge for health systems in developing countries: 58th World Health Assembly. Geneva: World Health Organization, 2005. (Accessed October 6, 2005, at [http://www.who.int/gb/ebwha/pdf\\_files/WHA58/WHA58\\_17-en.pdf](http://www.who.int/gb/ebwha/pdf_files/WHA58/WHA58_17-en.pdf).)
11. Commonwealth Code of Practice for the international recruitment of health workers (and companion document). London: Commonwealth Secretariat, May 2003.

Copyright © 2005 Massachusetts Medical Society.

**JOURNAL EDITORIAL FELLOW**

The *Journal's* editorial office invites applications for a one-year research fellowship beginning in July 2006 from individuals at any stage of training. The editorial fellow will work on *Journal* projects and will participate in the day-to-day editorial activities of the *Journal* but is expected in addition to have his or her own independent projects. Please send curriculum vitae and research interests to the Editor-in-Chief, 10 Shattuck St., Boston, MA 02115 (fax, 617-739-9864), by November 1, 2005.