

Confronting The Growing Burden Of Chronic Disease: Can The U.S. Health Care Workforce Do The Job?

The answer is “no”—not as currently constituted.

by Thomas Bodenheimer, Ellen Chen, and Heather D. Bennett

ABSTRACT: The U.S. chronic illness burden is increasing and is felt more strongly in minority and low-income populations: in 2005, 133 million Americans had at least one chronic condition. Prevention and management of chronic disease are best performed by multidisciplinary teams in primary care and public health. However, the future health care workforce is not projected to include an appropriate mix of personnel capable of staffing such teams. To prepare for the growing chronic disease burden, a larger interdisciplinary primary care workforce is needed, and payment for primary care should reward practices that incorporate multidisciplinary teams. [*Health Affairs* 28, no. 1 (2009): 64–74; 10.1377/hlthaff.28.1.64]

IN 2005, 133 MILLION AMERICANS WERE LIVING with at least one chronic condition. In 2020, this number is expected to grow to 157 million. In 2005, sixty-three million people had multiple chronic illnesses, and that number will reach eighty-one million in 2020.¹

Not surprisingly, the proportion of the population diagnosed with chronic conditions increases with age (Exhibit 1). More worrisome is the striking gap between the high prevalence of chronic conditions among people who are below the federal poverty level compared with the average prevalence in the general population. The cost burden of chronic illness—currently 78 percent of total health spending—will increase markedly by 2023 (Exhibit 2). The number of people with diabetes is expected to double in the next twenty-five years, from twenty-four million to forty-eight million. By 2023, the number of people with chronic mental disorders may increase from thirty million to forty-seven million. Similar increases are forecast for virtually every common chronic condition.

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EXHIBIT 1
Chronic Disease Demographics Among Americans Age 18 And Older, 2007

| Chronic disease | Entire population | Age (years) | | | Race | | | | Income (percent of poverty) | | |
|------------------------|-------------------|-------------|-------|-----|-------|-------|--------|-------|-----------------------------|----------|-------|
| | | 45-64 | 65-74 | 75+ | White | Black | Latino | Asian | <100% | 100-200% | >200% |
| Diabetes | 8% | 11% | 19% | 18% | 7% | 12% | 11% | 8% | 12% | 10% | 7% |
| Hypertension | 24 | 33 | 53 | 54 | 22 | 31 | 20 | 19 | 28 | 25 | 22 |
| Asthma ^a | 7 | 8 | 8 | 6 | 7 | 8 | 5 | 6 | 12 | 8 | 7 |
| CPD ^b | 6 | 8 | 11 | 13 | 6 | 5 | 3 | 3 | 12 | 9 | 5 |
| Arthritis ^c | 21% | 29% | 48% | 51% | 21% | 22% | 15% | 11% | 26% | 23% | 21% |
| CHD ^d | 6 | 7 | 18 | 26 | 7 | 6 | 5 | 4 | 10 | 8 | 6 |
| Obesity ^e | 26 | 31 | 28 | 18 | 25 | 35 | 27 | 8 | 30 | 29 | 25 |

SOURCE: Summary of Health Statistics for US Adults: National Health Interview Survey 2007.

NOTES: Race and income percentages are age-adjusted. Percentages represent number of patients with the disease over the total number of patients in that category. A person may be represented in more than one column.

^a Respondents who had been told they had asthma were asked if they still had asthma.

^b Chronic pulmonary disease (CPD) data are the sum of chronic bronchitis and emphysema.

^c Includes any kind of arthritis, rheumatoid arthritis, gout, lupus, and fibromyalgia.

^d Coronary heart disease (CHD) includes CHD, angina pectoris, and heart attack.

^e Obesity is indicated by a body mass index (BMI) greater than or equal to 30 kg/m².

■ **Reasons for increased prevalence.** Reasons for the increased prevalence of chronic conditions are multifactorial—including an aging population plus a rise in disease-specific risk factors such as obesity. A comparison of chronic disease prevalence in the United States and in ten European countries reveals a markedly lower prevalence in Europe of heart disease, hypertension, diabetes, obesity, and arthritis. This difference may be attributable to a healthier diet and lower poverty rates in Eu-

EXHIBIT 2
Chronic Disease: Current And Projected Burden, United States, 2003-2023

| Chronic disease | Increase in prevalence (2003-2023) ^a | Current cost (2003) | Future cost (2023) |
|--------------------------------------|---|---------------------|--------------------|
| Overall chronic illness ^b | 42% | \$1.3 trillion | \$4.2 trillion |
| Cancers ^c | 62 | \$319 billion | \$1,106 billion |
| Diabetes | 53 | \$132 billion | \$430 billion |
| Hypertension | 39 | \$312 billion | \$927 billion |
| Pulmonary conditions | 31 | \$139 billion | \$384 billion |
| Heart disease | 41 | \$169 billion | \$927 billion |
| Mental disorders | 54 | \$217 billion | \$704 billion |
| Stroke | 29 | \$36 billion | \$98 billion |

SOURCE: R. DeVol and A. Bedroussian, *An Unhealthy America: The Economic Burden of Chronic Disease* (Santa Monica, Calif.: Milken Institute, October 2007).

NOTE: Cost figures include medical costs plus reduced on-the-job productivity.

^a Population is expected to grow 19 percent from 2003 to 2023.

^b These figures do not include all chronic conditions but are based on data for the seven most common chronic diseases: cancers, diabetes, hypertension, stroke, heart disease, pulmonary conditions, and mental disorders.

^c Includes breast, colon, lung, prostate, and other cancers.

rope than in the United States.²

■ **The cost picture.** For the 47 percent of Americans with multiple chronic diseases or conditions, health care costs increase dramatically. The average Medicare patient with one chronic condition sees four physicians a year, while those with five or more chronic conditions see fourteen different physicians a year.³ In 2002, beneficiaries with five or more chronic conditions accounted for 76 percent of Medicare expenditures.⁴ The population over age eighty-five, the group with the highest proportion of people with multiple chronic conditions, is projected to grow from five million in 2005 to twenty-one million in 2050, ensuring a major increase in the number of very-high-cost patients.

■ **Four policy questions.** These data raise both general societal issues and specific policy questions. In this paper we address four specific policy questions, with greatest emphasis placed on questions 2 and 3: (1) Can dramatic public health prevention slow down the rate of increase of chronic disease prevalence? (2) Should chronic care be delivered chiefly by specialist physicians, generalist physicians, or multidisciplinary teams of health personnel? (3) Is the future health care workforce optimally positioned to provide the best care for patients with chronic diseases? (4) Is fee-for-service payment the best way to reimburse personnel who care for patients with chronic conditions?

Can Prevention Flatten The Curve?

Could robust public health measures flatten the upward trajectory of the chronic disease prevalence curve? Could diabetes prevalence, for example, increase by 33 percent from 2003 to 2023 rather than the predicted 53 percent? Might heart disease grow by 21 percent rather than the expected 41 percent? If strong public health measures were adopted nationwide, the growth in chronic disease prevalence might indeed slow down. For instance, a comprehensive package of tobacco control legislation, including an increase in the federal cigarette tax from its current 39 cents per pack to \$1 per pack, could reduce current adult smoking prevalence from 21 percent to 15 percent, leading to a substantial decrease in heart disease. However, the Institute of Medicine (IOM) panel recommending such legislation cautioned that this goal is unlikely to be achieved.⁵ A similarly ambitious campaign to reduce the consumption of high-fat, high-calorie foods and to dramatically increase physical activity could be based on such efforts as the Centers for Disease Control and Prevention (CDC) Nutrition, Physical Activity, and Obesity Program; Planet Health; and Coordinated Approach to Child Health. These interventions could prevent a significant number of children from becoming obese, thereby slowing down the rise of diabetes prevalence.⁶ Success in such a campaign, however, would require policy and funding that allow coordination among community, education, media, and health organizations to overcome the U.S. national culture that is grounded in TV watching, automobile dependence, and fast food.

How Should The U.S. Health System Be Organized To Provide Chronic Care?

One can imagine three scenarios by which the U.S. health care workforce might care for people with chronic conditions: (1) care primarily provided by specialists expert in particular diseases, (2) care chiefly offered by primary care physicians (PCPs), or (3) care organized through multidisciplinary primary care teams. Naturally, all three scenarios could take place simultaneously, and we can envision other options as well. We chose these three options because options 1 and 3 represent the extremes of what might take place, while option 2 describes the dominant current model of chronic disease care. To set the stage for a discussion of the health care workforce of the future, let us imagine that one of these scenarios becomes the prevailing paradigm.

■ **The specialist physician scenario.** This scenario would take place only if primary care continues to falter, with fewer young clinicians (physicians, nurse practitioners [NPs], and physician assistants [PAs]) entering primary care. If this trend persists, most patients with chronic conditions would have to consult specialists for most of their visits. The consequences of this scenario would be dire, as individual patients would lack the personal physician coordinator who would oversee their total care, while the overall health system would experience a steeper rise in costs.

Of the 133 million patients with chronic diseases, 47 percent do not live with a single predominant condition but have more than one diagnosis. In 1996, 53 percent of patients with hypertension and 60 percent with diabetes had four or more conditions diagnosed within a year.⁷ A typical patient with diabetes also has depression, obesity, hypertension, and osteoarthritis.

On average, family physicians manage 3.05 problems per visit; the number of problems grows to 3.88 for people over age sixty-five and 4.6 for patients with diabetes.⁸ A specialist-only health system would require several different specialists to address the variety of diagnoses that a PCP handles in a single encounter.

Comorbidities also interact with one another; for example, arthritis interferes with diabetic patients' ability to exercise, and medications for arthritis might interact with medications for hypertension. Patients' preferences, family dynamics, and socioeconomic/cultural determinants of health add to the complexity. Clinicians trained as generalists are better at handling this potpourri of issues than specialists are.⁹

Specialists are better than PCPs at treating some specific diagnoses and can provide procedural interventions that PCPs are not trained to do. Yet PCPs, compared with specialists, provide equal quality of care at lower cost for patients with diabetes, hypertension, and lower back pain.¹⁰ Within each of the fifty U.S. states, a greater supply of PCPs is associated with improved quality and reduced costs for Medicare beneficiaries, whereas a lower PCP supply and a higher specialist-to-population ratio are associated with lower quality of care and higher costs.¹¹

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Within smaller geographic units, higher PCP-to-population ratios are associated with lower total mortality and heart disease and cancer mortality, whereas higher specialist-to-population ratios are associated with greater mortality rates.¹²

■ **The primary care physician scenario.** Currently, most chronic illness care takes place in primary care practices: 79 percent of visits for hypertension, 83 percent for hyperlipidemia, 72 percent for diabetes, 76 percent for asthma, 67 percent for chronic obstructive pulmonary disease (COPD), 66 percent for congestive heart failure, and 71 percent for depression are visits to PCPs rather than specialists.¹³

Compared with specialist-only care, primary care offers high-quality care at lower cost for patients with chronic conditions. However, the PCP scenario has serious limitations. Informed, activated patients who are involved in clinical decisions have better chronic disease outcomes than patients who are passive recipients of care. Yet 50 percent of patients leave primary care visits not understanding what they were told by the physician. Only 9 percent of the time do these patients participate in clinical decisions.¹⁴

Although most visits for patients with cardiovascular risk factors take place in primary care, only one-third of U.S. patients with diabetes, hypertension, and elevated cholesterol levels have these conditions under good control. In addition, disparities for chronic illness remain prevalent: African American, Latino, and low-income groups have worse control and less recommended care such as HbA1c testing and eye or foot exams than whites or high-income groups have.¹⁵ PCPs by themselves lack time to adequately manage common chronic illnesses. It has been estimated that it would take a PCP 10.6 hours per working day to provide high-quality chronic care to a typical patient panel (the total number of patients—averaging about 2,300 in the United States—for whom a PCP is responsible).¹⁶

■ **The multidisciplinary team scenario.** Ample evidence demonstrates that multidisciplinary teams in primary care—providing the information and shared decision making that many PCPs lack the time to offer—can improve care, and at times lower costs, for patients with chronic diseases. Moreover, many highly prevalent chronic illnesses have risk factors that can be mitigated by effective public health measures, such as policies that reduce tobacco use; cut consumption of high-fat, high-calorie foods; and increase physical activity. Multidisciplinary teams ideally bring together personnel in primary care and public health settings.

At Kaiser Permanente, for instance, medical assistants trained as panel managers systematically review the chronic disease registry, contact patients to come in for overdue routine services, and help physicians intensify medications more rapidly, thereby improving clinical outcomes while offloading routine work from PCPs. In several health systems, patients with diabetes attending nurse-led

planned visits achieve better disease control than patients receiving physician-only care. Nurse participation improves blood pressure control for patients with hypertension and cuts hospitalization rates for patients with congestive heart failure. Nurse- or pharmacist-planned visits for patients with asthma improve care and reduce hospitalizations and emergency department (ED) visits.¹⁷ These teams are often designed to offer culturally competent and linguistically concordant care for minority groups who are disproportionately affected by chronic illness. In addition, teams can help coordinate referrals to specialty and ancillary services outside the primary care practice.

For the Medicare patients with multiple comorbidities who are responsible for 76 percent of Medicare costs, nurse care managers working in primary care can reduce ED visits, hospitalizations, and spending compared with physician-only care.¹⁸ Adding geriatricians to primary care reduces hospitalizations and total health care costs.¹⁹

Public health personnel are important additions to the multidisciplinary team. Public health interventions for primary prevention of chronic illness have been highly effective in tobacco control.²⁰ A reduction in average cholesterol level in the U.S. population between 1980 and 2004 related to public education on healthy eating contributed to the reduction in heart disease mortality during those years.²¹

Thus, a number of studies strongly suggest that the most effective way to address chronic disease—with the aims of reducing disease burden, improving quality, and cutting costs—is through the implementation and action of multidisciplinary teams.

Will Our Health Care Workforce Be Well Positioned To Provide Chronic Care?

■ **The clinician workforce.** Although the United States has approximately the same number of physicians per capita as other industrialized countries, the number of U.S. PCPs per capita is considerably lower.²² In most industrialized countries—which tend to have lower costs, better outcomes, and better access to physician care than is the case in the United States—PCPs make up about 50 percent of the physician workforce, compared with 35 percent in the United States. Counting all clinicians—physicians, NPs, and PAs—40 percent of U.S. clinicians work in primary care.

The U.S. population is expected to increase 18 percent from 2005 to 2025, with the population over age sixty-five growing by 73 percent. The over-sixty-five group seeks care from generalists at twice the rate of people under age sixty-five. However, the number of adult generalist resident physician graduates (including both U.S. and international graduates) is dropping in family medicine and dramatically in general internal medicine. Projecting these trends and factoring in the increased generalist workload as a result of the aging population, a 27 percent shortage in adult generalist physicians is estimated by 2025.²³ Assuming that generalist

practice will continue to lose favor among young physicians, the Council on Graduate Medical Education (COGME) projects that the ratio of generalist physicians to population will fall 9 percent from 2005 to 2020.²⁴ Moreover, the gap between the supply of and need for geriatricians will balloon from 7,000 in 2005 to 36,000 by 2030.²⁵

Can NPs and PAs close the generalist gap? Forty-two percent of patient visits to NPs/PAs are in offices of specialists, not PCPs. Annual numbers of NP graduates fell from 8,200 in 1998 to 6,000 in 2005 and are projected at 4,000 by 2015; about 65 percent of NPs work in primary care settings. Numbers of PA graduates have been stable around 4,200 per year, but only one-third of PAs practice in primary care.²⁶ The number of PAs practicing in primary care is likely to be about 28,000 in 2020, and the number of NPs practicing in primary care may reach 100,000. Adding estimated PCP, NP, and PA numbers for 2020, and comparing this estimate to the number of primary care clinicians in 2005, the ratio of primary care clinicians to population is likely to fall by 9 percent from 2005 to 2020.²⁷

Since 1965, the number of specialists per capita has increased dramatically, while the ratio of generalist physician to population has remained relatively constant. Assuming that the current proportion of medical graduates choose specialist careers, COGME projects that from 2005 to 2020, the ratio of specialist physicians to population will rise 14 percent.²⁸

In summary, primary care clinicians will be in increasingly short supply, while specialist supply continues to grow. Because primary care clinicians have a greater propensity to care for the underserved, this shortage will broaden health care access disparities.²⁹

■ **The RN workforce.** The number of licensed RNs grew 8 percent between 2000 and 2004. However, because of the projected demand for nurses, the shortage of RNs may reach 500,000 in 2025.³⁰ Moreover, 56 percent of RNs work in hospital settings, while only 12 percent are situated in ambulatory care settings, where most chronic care takes place. The percentage of RNs who work in community and public health settings decreased from 18 percent in 2000 to 15 percent in 2004.³¹

■ **The pharmacist workforce.** Most observers feel that the supply of pharmacists is insufficient; the number of unfilled positions in chain-store pharmacies more than doubled between 1998 and 2000.³² Pharmacies serving low-income communities have even more difficulty filling vacancies.³³ One study predicts a deficit of 157,000 pharmacists for 2020.³⁴ Although newer analysis shows that this gap may be lessening, pharmacy jobs have become more demanding because the number of prescriptions continues to grow.³⁵

Newly trained pharmacists are required to have doctoral-level training. The occupation of pharmacy technician has been developed to assist pharmacists with tasks such as pill counting and labeling of bottles.³⁶ However, it is estimated that 69 percent of pharmacists' time is still spent on tasks that can be performed by such technicians.³⁷

■ **Community health workers.** Community health workers (CHWs) are lay members of communities who often share ethnicity, language, socioeconomic status, and life experiences with their patients, many of whom are underserved. CHWs—called *promotoras* in the Latino community—can provide culturally appropriate health education, assist people in receiving the care they need, and offer counseling on health behavior. The estimated 86,000 CHWs in 2000 may grow to 121,000 in 2005. Many CHWs assist patients with chronic conditions such as diabetes, hypertension, heart disease, and HIV/AIDS. However, with two-thirds of CHW jobs funded by federal and state governments, budget cuts could threaten the CHW workforce.³⁸

■ **The public health workforce.** The current public health workforce is insufficient to address the prevention of chronic disease using public health rather than medical care approaches. In both state and local public health departments, few funded positions are available in chronic disease prevention, and shortages of experienced personnel in program development, nursing, and health education are likely. Whereas the medical care workforce increased by 56 percent from 1994 to 2004, the number of people working in public health grew by only 13 percent. From 2003 to 2004, public health employment actually declined.³⁹

■ **The need for workforce diversity.** The diversity of the health care workforce is an important policy consideration. Minority health professionals are more likely to provide care to patients who are minorities, especially those on Medicaid or without insurance.⁴⁰ Ethnically concordant relationships between patients and health professionals positively affect interpersonal communication and patient satisfaction.⁴¹ However, the health professions do not reflect the diversity of the population. Although African Americans, Latinos, and Native Americans represent one-fourth of the U.S. population, they make up only 9.9 percent of pharmacists, 8.7 percent of physicians, 8.0 percent of physician assistants, 6.2 percent of nurses, and 5.4 percent of dentists.⁴²

How Should Chronic Care Services Be Reimbursed?

The vast majority of ambulatory care visits are paid for on a per visit, fee-for-service basis. The great majority of visits receiving reimbursement are visits to clinicians (physicians, NPs, or PAs), while visits to nurse care managers, pharmacists, health educators, and CHWs/*promotoras* are seldom reimbursed. Much chronic care does not, and should not, take place as face-to-face clinician visits. Panel managers systematically review registry data and contact patients to get needed lab work done. Nurses and pharmacists conduct planned visits that are shown by ample evidence to improve care. CHWs do home visits to check on patients' understanding of and adherence to medication. In most practices, none of these services by panel managers, nurses, pharmacists, or CHWs are reimbursed. Payment reform should move toward risk-adjusted per patient payment with incentives for quality, services provided by nonclinician team members, and popula-

“Without a multidisciplinary team, consistently good chronic care is impossible. Without payment reform, such teams are impossible.”

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tion-oriented panel management.

If payment restricted to face-to-face clinician visits continues as the dominant payment mode, high-quality chronic care will remain an unfulfilled dream. Why? Because of the sobering statistic that without a team, it takes 10.6 hours per day for a lone clinician to provide good chronic care to an average patient panel (and with the impending primary care clinician shortage, patient panels will not be going down any time soon).⁴³ Without a multidisciplinary team, consistently good chronic care is impossible. Without payment reform, multidisciplinary teams are impossible.

Where Are We Heading?

Evidence strongly suggests that multidisciplinary teams in primary care and public health—rather than care provided principally by primary care clinicians or specialists alone—are best suited to deliver higher-quality and lower-cost chronic care and prevention. Yet workforce projections indicate a growing number of specialist physicians per capita coupled with shortages of primary care clinicians and other multidisciplinary team members.

What can we do about this? Serious policy reforms are needed. We suggest here only a few.

(1) Legislate a national policy goal that half of U.S. clinicians practice in primary care. Implement this policy by, for example, reforming the financing of graduate medical education, narrowing the payment gap between PCPs and specialists such that the generalist-to-population ratio increases, and encouraging the education of health care personnel from underrepresented population groups.

(2) Change payment for primary care practices and clinics from fee-for-service to non-visit-based payment, which could be risk-adjusted capitation or global budgeting including performance-based bonuses, in a way that rewards nonvisit care, care by nonclinicians, and high quality.

(3) Legislate national workforce policy that estimates the need for different categories and ethnicities of health care and public health personnel and regulates health care training accordingly.

(4) Institute dramatic public health policy related to tobacco control, physical activity, and healthy eating to slow down the growth of chronic disease prevalence.

Small steps have been taken to implement some of these reforms. Pennsylvania and Massachusetts have legislation to forgive medical school loans for physicians who practice primary care within the state. Proposals to reduce the generalist-specialist payment gap have been advanced, but none has been implemented.⁴⁴

Several initiatives are helping alleviate the nurse shortage, but these tend to focus on hospital rather than primary care nursing.⁴⁵ Many more examples of limited efforts can be cited, but serious policy reform awaits a future awakening. Hope for preventing and managing chronic illness will rest on our nation's adopting policies that are bold and far-reaching.

NOTES

1. S.Y. Wu and A. Green, *Projection of Chronic Illness Prevalence and Cost Inflation* (Santa Monica, Calif.: RAND, October 2000).
2. K.E. Thorpe, D.H. Howard, and K. Galactionova, "Differences in Disease Prevalence as a Source of the U.S.-European Health Care Spending Gap," *Health Affairs* 26, no. 6 (2007): w678-w686 (published online 2 October 2007; 10.1377/hlthaff.26.6.w678).
3. C. Vogeli et al., "Multiple Chronic Conditions: Prevalence, Health Consequences, and Implications for Quality, Care Management, and Costs," *Journal of General Internal Medicine* 22, no. 3 Supp. (2007): 391-395.
4. K.E. Thorpe and D.H. Howard, "The Rise in Spending among Medicare Beneficiaries: The Role of Chronic Disease Prevalence and Changes in Treatment Intensity," *Health Affairs* 25 (2006): w378-w388 (published online 22 August 2006; 10.1377/hlthaff.25.w378).
5. Institute of Medicine, *Ending the Tobacco Problem: A Blueprint for the Nation* (Washington: National Academies Press, 2007).
6. J. Cawley, "The Cost-Effectiveness of Programs to Prevent or Reduce Obesity: The State of the Literature and a Future Research Agenda," *Archives of Pediatrics and Adolescent Medicine* 161, no. 6 (2007): 611-614.
7. B. Starfield et al., "Comorbidity: Implications for the Importance of Primary Care in 'Case' Management," *Annals of Family Medicine* 1, no. 1 (2003): 8-14.
8. J.W. Beasley et al., "How Many Problems Do Family Physicians Manage at Each Encounter? A WREN Study," *Annals of Family Medicine* 2, no. 5 (2004): 405-410.
9. K. Grumbach, "Chronic Illness, Comorbidities, and the Need for Medical Generalism," *Annals of Family Medicine* 1, no. 1 (2003): 4-7.
10. T. Bodenheimer and K. Grumbach, *Improving Primary Care: Strategies and Tools for a Better Practice* (New York: McGraw-Hill, 2007); and M.H. Chin, J.X. Zhang, and K. Merrell, "Specialty Differences in the Care of Older Patients with Diabetes," *Medical Care* 38, no. 2 (2000): 131-140.
11. K. Baicker and A. Chandra, "Medicare Spending, the Physician Workforce, and Beneficiaries' Quality of Care," *Health Affairs* 23 (2004): w184-w197 (published online 7 April 2004; 10.1377/hlthaff.w4.184).
12. B. Starfield et al., "The Effects of Specialist Supply on Populations' Health: Assessing the Evidence," *Health Affairs* 24 (2005): w97-w107 (published online 15 March 2005; 10.1377/hlthaff.w5.97).
13. Data abstracted August 2008 by John Edward Watts IV, from National Center for Health Statistics, *National Ambulatory Medical Care Survey, 2006* (Hyattsville, Md.: NCHS, 2006).
14. T. Bodenheimer, "A Sixty-three-Year-Old Man with Multiple Cardiovascular Risk Factors and Poor Adherence to Treatment Plans," *Journal of the American Medical Association* 298, no. 17 (2007): 2048-2055.
15. Agency for Healthcare Research and Quality, *National Healthcare Disparities Report* (Rockville, Md.: AHRQ, 2008).
16. T. Østbye et al., "Is There Time for Management of Patients with Chronic Diseases in Primary Care?" *Annals of Family Medicine* 3, no. 3 (2005): 209-214.
17. Bodenheimer and Grumbach, *Improving Primary Care*.
18. M.L. Sylvia, "Guided Care: Cost and Utilization Outcomes in a Pilot Study," *Disease Management* 11, no. 1 (2008): 29-36.
19. J.J. Fenton et al., "Bringing Geriatricians to the Front Lines: Evaluation of a Quality Improvement Intervention in Primary Care," *Journal of the American Board of Family Medicine* 19, no. 4 (2006): 331-339.
20. S.A. Schroeder, "We Can Do Better—Improving the Health of the American People (Shattuck Lecture)," *New England Journal of Medicine* 357, no. 12 (2007): 1221-1228.
21. U.S. Department of Health and Human Services, *Health, United States, 2006* (Washington: U.S. DHHS, 2006).

22. Starfield et al., "The Effects of Specialist Supply."
23. J.M. Colwill, J.M. Cultice, and R.L. Kruse, "Will Generalist Physician Supply Meet Demands of an Increasing and Aging Population?" *Health Affairs* 27, no. 3 (2008): w232–w241 (published online 29 April 2008; 10.1377/hlthaff.27.w232).
24. Council on Graduate Medical Education, *Physician Workforce Policy Guidelines for the United States, 2000–2020*, 16th Report (Rockville, Md.: COGME, January 2005), Table 27.
25. R. Besdine et al., "Caring for Older Americans: The Future of Geriatric Medicine," *Journal of the American Geriatrics Society* 53, no. 6 Supp. (2005): s245–s256.
26. T. Bodenheimer and K. Grumbach, *Understanding Health Policy*, 5th ed. (New York: McGraw-Hill, 2008), chap. 7.
27. COGME, *Physician Workforce Policy*.
28. *Ibid.*
29. K. Grumbach et al., "Who Is Caring for the Underserved? A Comparison of Primary Care Physicians and Nonphysician Clinicians in California and Washington," *Annals of Family Medicine* 1, no. 2 (2003): 97–104; and R.A. Rosenblatt et al., "Shortages of Medical Personnel at Community Health Centers: Implications for Planned Expansions," *Journal of the American Medical Association* 295, no. 9 (2006): 1042–1049.
30. P. Buerhaus, D.O. Staiger, and D.I. Auerbach, *The Future of the Nursing Workforce in the United States* (Sudbury, Mass.: Jones and Bartlett, 2009).
31. Bureau of Health Professions, *The Registered Nurse Population: Findings from the 2004 National Sample Survey of Registered Nurses* (Rockville, Md.: Health Resources and Services Administration, June 2006).
32. Bodenheimer and Grumbach, *Understanding Health Policy*.
33. BHP, *The Pharmacist Workforce* (Rockville, Md.: HRSA, 2000).
34. D.A. Knapp, "Professionally Determined Need for Pharmacy Services, 2020," *American Journal of Pharmacy Education* 66, no. 4 (2002): 421–429.
35. K.K. Knapp and J.M. Cultice, "New Pharmacist Supply Projections," *Journal of the American Pharmacists Association* 47, no. 4 (2007): 463–470.
36. J.A. Cooksey et al., "Challenges to the Pharmacist Profession from Escalating Pharmaceutical Demand," *Health Affairs* 21, no. 5 (2002): 182–188.
37. Bodenheimer and Grumbach, *Understanding Health Policy*.
38. BHP, *Community Health Worker National Workforce Study* (Rockville, Md.: HRSA, March 2007).
39. K.M. Gebbie and B.J. Turnock, "The Public Health Workforce, 2006: New Challenges," *Health Affairs* 25, no. 4 (2006): 923–933.
40. S. Saha and S.A. Shipman, "Race-Neutral versus Race-Conscious Workforce Policy to Improve Access to Care," *Health Affairs* 27, no. 1 (2008): 234–245.
41. S. Saha et al., "Do Patients Choose Physicians of Their Own Race?" *Health Affairs* 19, no. 4 (2000): 76–83; and HRSA, *The Rationale for Diversity in the Health Professions* (Rockville, Md.: HRSA, 2006).
42. K. Grumbach and R. Mendoza, "Disparities in Human Resources: Addressing the Lack of Diversity in the Health Professions," *Health Affairs* 27, no. 2 (2008): 413–422.
43. Østbye et al., "Is There Time for Management?"
44. T. Bodenheimer, M. Matin, and B. Yoshio Laing, "The Specialist-Generalist Income Gap: Can We Narrow It?" *Journal of General Internal Medicine* 23, no. 9 (2008): 1539–1541.
45. S.B. Hassmiller and M. Cozine, "Addressing the Nurse Shortage to Improve the Quality of Patient Care," *Health Affairs* 25, no. 1 (2006): 268–274.