PERSPECTIVE

Analyzing Cause And Effect In The U.S. Physician Workforce

It is a daunting enterprise to estimate the physician surplus or shortage one or two decades into the future.

by Uwe E. Reinhardt

AT THE RISK of offending the algebraically challenged, one can describe the surplus or shortage of physicians in some future year t with the following compact equation:

$$X_t = a_t \, c_t \, S_t - (D_t/Q_t) \, N_t$$

In this expression, the product $a_t c_t S_t$ denotes the projected supply in year t of full-time-equivalent (FTE) physicians in patient care. Component S_t denotes the number of physicians projected to be alive in year t, component a_t is the fraction of those physicians who are projected to be professionally active in year t, and component c_t is the fraction of the professionally active number of FTE physicians in year t who are projected to be active in patient care.

The product $(D_t/Q_t)N_t$ represents the projected "demand" or "requirements" of physicians in year t. Variable D_t denotes the projected average number of physician services per capita thought to be needed or demanded in year t. Q_t is the projected average number of physician services projected to be produced per FTE physician in year t (physician productivity). N_t is the size of the population to be served. The ratio D_t/Q_t is the familiar physician-to-population ratio, although here expressed as the number of FTE physicians per capita rather than per 100,000 population.[1] Finally, variable X_t represents the projected physician surplus (if positive) or shortage (if negative) in year t.

Even this highly compact forecasting model shows just how daunting an enterprise it is to estimate the physician surplus or shortage one or two decades into the future. Any of the variables in the equation can change over time, sometimes in unforeseen ways. Forecasters have tried to cope with this uncertainty on the demand side of this equation simply by positing normative physician-population ratios (that is, normative values of the ratio D_t/Q_t), either for all physicians or for subgroups of physicians. In his well-known projection of physician workforce requirements, for example, Jonathan Weiner used for that purpose the relatively low physician staffing ratios now observed in fully integrated managed care networks, including the Kaiser Permanente plans.[2] On that basis, and on the assumption that 40–65 percent of Americans would receive their care from fully integrated managed care plans in 2000, Weiner projected a huge physician surplus for that year and beyond. As it turned out, Americans have not flocked into managed care organizations of this sort, and the projected surplus never materialized.

In their paper in this volume, Richard Cooper and colleagues proceed at an even higher level of aggregation on the demand side. They observe that the actual physician-to-population ratio (D_t/Q_t) tends to be highly positively correlated with per capita gross domestic product (GDP), within nations over time, across regions within nations at a point

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in time, and across nations at a point in time. The authors seem to accept this correlation as something akin to a natural economic law of physician workforce requirements. The law suggests that if U.S. GDP per capita continued to grow at its long-run average growth rate during the past few decades, the country would experience a serious shortage of physicians two decades from now.

The tight, positive correlation between per capita GDP and physician density (D_t/Q_t) found by Cooper and colleagues is fascinating. In fact, I had observed it across regions of the United States as early as 1975.[3] Unfortunately, a statistical correlation is not a causal model, which raises the question of what causal flows might lurk behind this highly aggregate statistic.

Cooper and colleagues appear to believe that causation flows from per capita GDP to genuine, patient-initiated per capita demand for physician services (D_t) and thence to the supply of physicians (S_t), which merely adapts itself to patient-initiated demand. In the United States that adaptation would have taken the form not of additional medical school places (which have remained constant since the 1970s) but of commensurate increases in the influx of international medical graduates (IMGs).

An alternative hypothesis is that the influx of foreign physicians was independent of patient-initiated demand for health care and was driven mainly by teaching hospitals' attempts to tap into a source of cheap labor: low-paid and overworked medical residents. On that hypothesis, the nation's physician supply (variable S_t) has a life of its own and during the past three decades has dragged up per capita use of physician services in tow. "Use," however, is not to be confused with "patient-initiated demand." For example, as John Wennberg and colleagues have shown, the use of health services by Medicare beneficiaries during their last six months of life varies enormously among U.S. counties. In 1996

the number of visits to physicians for such patients varied by a factor of 5.6.[4] It is never clear whether these remarkable geographic variations in observed use of health care services reflect patients' active decisions to demand health care from their physicians or merely their and their insurers' decisions courteously to accept the utilization recommended by physicians.

Cooper and colleagues cannot claim to have solved this puzzle of causal flows. Even so, their paper is a welcome contribution to the long-dormant debate over future workforce requirements, as it will undoubtedly stimulate further work. In the meantime, policymakers can take comfort in the thought that no one knows what differences in the quality of patients' lives are associated with the stunning geographic variations in practice style reported by Wennberg and colleagues. Consequently, no one can claim to know what would be a proper overall physician-to-population ratio for the United States or for any of its regions. Luckily, the safety valve of IMGs probably will remain available, even if the capacity of American medical schools were not expanded.

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NOTES

1. U.E. Reinhardt, *Physician Productivity and the Demand for Health Manpower* (Cambridge, Mass.: Ballinger, 1975), 51–61.
2. J. Weiner, "Forecasting the Effects of Health Reform on U.S. Physician Workforce Requirement," *Journal of the American Medical Association* (20 July 1994): 222–230.
3. Reinhardt, *Physician Productivity*, Figure 1-3.
4. J.E. Wennberg and M.M. Cooper, eds., *The Quality of Medical Care in the United States* (Chicago: AHA Press, 1999), 176.