The Curious Economist

Goldilocks, the Devil, and Physician Supply and Demand

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In introductory economics, we learn that product supply and product demand are each a function of price. As price increases, product supply increases and demand decreases. At the intersection of the supply and demand curves is the equilibrium price. There is no shortage and no surplus; everything is "just right." Shifts in the supply or demand curves (e.g., because of changes in consumer preferences, the cost of production, or the prices of substitute or complementary products) would result in a shortage or surplus if prices were fixed. Allowing price changes mitigates shortages and surpluses as the amount supplied is equal to the amount demanded at the new equilibrium price.

Workforce supply and demand are similar; however, in labor economics the "price" is compensation. As compensation rises, demand falls and supply increases. As substantial or rapid shifts (increases) in demand occur, a temporary shortage arises because labor markets, especially those for professionals such as physicians, are "sticky." It takes time to adjust supply since the pipeline is filled over several years. The figure on this page illustrates the temporary "shortage" created while supply increases because of increased compensation due to shifts in demand (from $Demand_1$ to $Demand_2$).

Numerous factors affect physician supply and demand besides compensation, but greater compensation will, *ceteris paribus*, decrease the demand for and increase the supply of physicians. In the language of oversimplified economic models, *ceteris paribus* means "with other conditions remaining the same." However, the many factors affecting supply and demand are continuously changing. Long-term, everything should reach equilibrium as the supply of and demand for physicians and related drivers such as compensation adjust.

Despite the stickiness of the physician workforce and regulatory restrictions on increasing the supply pipeline, I think, as Goldilocks would say, things are "just right." The physician workforce is neither too hot nor too cold, neither too big nor too small, and there is neither a shortage nor a surplus.

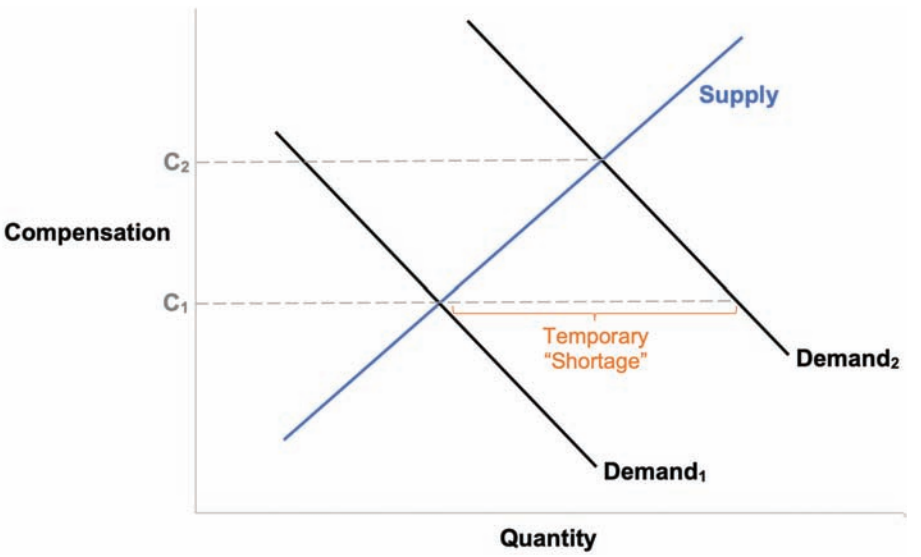


Figure: Creation of temporary workforce "shortage" after a shift in the demand curve. Adopted from Arrow and Capron (1959). (*The Quarterly Journal of Economics* 1959;73:292-308)

A selected history of physician workforce projections

In the research literature, there are many projections of physician supply and demand. Despite compensation being the equalizer for supply and demand in labor economic theory, none of the published studies summarized below considered the role of physician compensation in their projections.

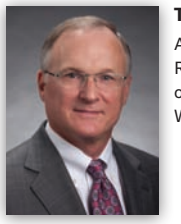
One of the largest studies of physician workforce needs was the 1980 Report of the Graduate Medical Education National Advisory Committee (GMENAC) (asamonitor.pub/3hl1Z0H). In its report, GMENAC projected a surplus of 70,000 physicians in 1990, increasing to 145,000 in 2000. The report indicated that although most specialties would have a surplus, primary care would be in balance, and there would be shortages in psychiatry, physical medicine and rehabilitation, and emergency medicine. After the report's publication, several economists and researchers published papers expressing concern with GMENAC's methodology and conclusions, especially as 1990 approached and it seemed unlikely that a physician surplus was imminent (*American Journal of Public Health* 1981;71:1149-57; *N Engl J Med* 1988;318:892-7; *JAMA* 1990;263:557-60).

Subsequently, several articles focused on the importance and complexity of health workforce forecasting. In 1991, Rosenblatt and Lishner summarized the methodologic approaches and differing assumptions used in seven major workforce studies between 1933 and 1988, along with the studies' conclusions (*West J Med* 1991;154:43-50). Three (including the GMENAC report) of the seven studies concluded a national physician surplus, three studies concluded a physician shortage, and one study by the AMA had no conclusion.

Also in 1991, Uwe Reinhardt, a prominent health economist, set forth a theoretical framework to illustrate the difficulty of forecasting physician supply (asamonitor.pub/3hIUEae). He suggested practical approaches to overcome some of these difficulties and provided a perspective on the relationship between health workforce forecasting and the formation of health policy.

In a 1995 article, Cooper predicted a physician surplus through 2010 and then a shortage of 13,000 physicians by 2020 (*JAMA* 1995;274:1534-43). Just seven years later, Cooper and co-authors predicted a shortage of more than 200,000 physicians by 2020, primarily due to increased demand for and spending on health services (*Health Aff (Millwood)* 2002;21:140-54).

One thing seems clear: the devil is definitely in the details. To appreciate the various physician workforce predictions, one needs to understand the supply and demand assumptions used in the projections. Compared to assumptions about future supply, projecting the demand for physician services seems to be more challenging and controversial (*JAMA* 1995;274:1558-60).



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The Association of American Colleges (AAMC) published its first comprehensive report on the physician workforce in 2008 (asamonitor.pub/3qQ2uTC). Seven years later it followed with its second report and then annual reports published through 2021 (asamonitor.pub/3wAn9MI). The AAMC reports provide detailed assumptions and several future scenarios in addition to the baseline scenario. Examining these reports is a great way to understand the effect of varying assumptions and the difficulty of measuring current shortages. The scenarios represent different expectations on the number of new residents, retirement age, productivity, population demographics, historical use of physicians, death rates, managed care, scope of practice changes, drugs, and medical technology. For those interested in workforce planning, reflecting on, and discussing these assumptions is an excellent starting point.

The AAMC's publications also highlight the difficulties in projecting the future physician workforce. First, in the 2008 report, the 2025 supply projections were already surpassed by 2013, based on the 2015 report. More importantly, for the initial year of the projections in each report after the 2008 report, shortages were reported only in primary care and mental health. These estimated shortages were based on the Health Resources and Services Administration's (HRSA's) physician requirements model and designation of Health Professional Shortage Areas (HPSAs) (*Health Serv Res* 1997;31:723-37). In each of the eight AAMC reports, for modeling purposes, the authors assume that all surgical specialties and the other medical specialties were in balance at the beginning of the projection period (i.e., supply equal to demand). For example, the 2021 report indicated no physician shortages in 2019, other than those estimated by HRSA in primary care and mental

health, despite 2019 projected shortages in each of the prior reports.

There are two specialty-specific workforce studies worth mentioning, one focused on emergency medicine and one on pediatric anesthesiology. First, the American College of Emergency Physicians (ACEP) workforce research concluded that there will likely be an "oversupply of emergency physicians in the next decade (asamonitor.pub/3wmISb5). As part of its research work, the ACEP committed to "stabilize and strengthen" the specialty by addressing eight areas that affect physician supply and demand.

In a 2018 article, Muffly and colleagues concluded that the growth in pediatric anesthesiologist supply may exceed the growth in both the pediatric population and inpatient procedures between 2015 and 2035 (*Anesth Analg* 2018;126:568-78). The study referenced a survey of program directors conducted more than 10 years ago that found that pediatric anesthesiology fellowship graduates from 2008 to 2010 outnumbered retiring academic faculty by 12 to one, also pointing toward a possible surplus (asamonitor.pub/3jQFpi3).

Shortage or surplus? More questions than answers

Almost all predictions of a physician shortage or surplus are based on projecting out supply and demand a specified number of years and then comparing the difference in that year. How does one define or determine quantitatively, measurably, if there is a shortage or surplus *today*? If there is a projected physician shortage in 10 years, how will the supply pipeline, compensation, labor substitutes, and other factors affecting supply and demand adjust?

Baird and colleagues recognized that some specialized labor markets such as physician specialties may be in disequilibrium over time (asamonitor.pub/3xsDeFK). They estimated labor market disequilibrium in the market for anesthesiologists by incorporating shortage indicators into their econometric models. These indicators were based on relative changes in wages and hours worked between two time periods. In a sense, these researchers developed measures of the "stickiness" of the anesthesiology workforce to identify a "shortage," even if temporary as in the figure previously described.

Measurable or not, there are frequently perceived shortages. Do these perceptions reflect difficulty in recruiting at the level of compensation the practice or hospital employer wants to pay? Does the perception of a shortage arise from competition among hospitals and practices as they try to increase market share, merely moving the supply from location to location?

Perceived shortages may reflect difficulty in recruiting to certain locations. I have had conversations with physicians regarding markets to which it is difficult to recruit. These include the very high-cost-of-living markets of New York City and San Francisco on the one hand, and rural markets on the other. In a 2020 mixed-methods study, the researchers found that within rural counties, 55% of counties had no surgeon, 58% had no nurse anesthetist, and 81% had no anesthesiologist (*J Rural Health* 2021;37:45-54). Is this evidence of a shortage, or equilibrium, *ceteris paribus*?

In the literature, there seems to be consensus that there is a shortage of primary care physicians. That perspective is not universal. Some researchers do not believe there is a shortage per se but blame maldistribution, incomplete coverage, inconvenient hours, inflexible care models, payer aversion, and inefficient use of physician labor (asamonitor.pub/3dPfK5K).

Shortages may have some benefits. An individual physician may prefer a shortage within her or his specialty to support a level of compensation. Shortages also provide incentives for efficiency and innovation.

In general, however, physician shortages are probably not good for society. Some health policy researchers believe it is better to develop physician workforce projections biased toward a shortage and to err on the side of expanding U.S. medical schools. The alternative is to risk the harmful effects of a physician shortage on population health. A shortage would likely be felt more severely by those in the greatest need of health services, and such a shortage would require several years to reverse (*JAMA* 2008;299:2680-2).

Is there a physician shortage? Uwe Reinhardt once noted, "As on so many other areas of the real world, the views of economists on this matter cancel one another out" (asamonitor.pub/3yzWf9n). Is there a shortage of anesthesiologists? I am not sure, primarily because I am not aware of a definition of shortage that is measurable and meaningful over a specified time frame. Although I may lean toward the Goldilocks perspective of things are "just right," or soon will be, I strongly support workforce planning. The assumptions around future supply and demand are important to identify and discuss, and sometimes interventions may be warranted.

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I appreciate the opportunity to contribute brief articles on health economics to the *ASA Monitor*. Although these topics may not be of everyday concern to anesthesiology professionals, I hope that others are as curious as I am. I welcome your suggestions for future issues. ■