MEDICAL SOCIETIES, PATIENT ADVOCATES, AND POLICYMAKERS have been sounding alarm bells for decades that the supply of physicians is far too limited to meet Americans’ medical needs. Stakeholders of the U.S. health system have attempted to compensate for this shortage in various ways. For example, medical schools have increased enrollment, Congress has added residency slots, and health care organizations have shifted some labor from physicians to other team members. Yet, despite these efforts, shortages persist.

Gaining a better understanding of physician workforce dynamics could help these and other stakeholders identify and assess the effectiveness of policies to address the imbalances in the physician workforce.

Researchers at RAND and the Association of American Medical Colleges (AAMC) have partnered to build this understanding using system dynamics (SD) modeling methods. The SD model
has four components: clinical need, perceived need, demand, and supply of care. The model calculates utilization by considering the demand for care relative to the possible supply of care (Figure 1).

**Approach Brings New Clarity**

The SD model enables a holistic view of the evolving supply of physicians and how care delivery affects the need for, demand for, and future utilization of physicians. The model explicitly describes key mechanisms and their influence on each other over time. For example, in the supply component of the model, the research team visually and quantitatively tracks the inputs and mechanisms of the physician-training pathway. This component delineates the pathways through which U.S. and international students become trained physicians, most of whom provide patient care. The component also shows pathways through which physicians leave the supply, including retirement and temporary work breaks.

Importantly, the model also incorporates feedback mechanisms that drive trends over time. For instance (Figure 2), the number of physicians occupying residency slots decreases the number of available slots. That lower number of available slots, in turn, constrains the number of graduating U.S. students who can “match” into a residency program the following year, as students can match only if there are slots available. The residency capacity limits the number of available slots, therefore affecting the volume of newly graduated doctors who enter residency.

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**Figure 1**
Model Components, Subcomponents, and the Calculation of Utilization

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**NOTE:**
The subcomponents shown in each box are examples of key factors within the component. Components are shown in orange. Their subcomponents are shown in deep blue. Sources for utilization (the blue box) are shown via the gray arrows.
The model can provide support to a variety of stakeholders who are interested in different imbalances in the system. An elected official who is concerned about poor health outcomes despite high health care spending nationally, for instance, might focus on the imbalance between clinical need and utilization of care, asking why the care that patients are getting is not sufficiently improving the health of the population. In contrast, a public health official might focus on the imbalance between clinical need and supply, exploring why the supply of physicians is not keeping up with the amount of services indicated for the population to achieve optimum health. Further, a health navigator might zero in on the imbalance between demand and perceived need to inquire why patients are not actively seeking the services that they think they need. The model tracks eight potential imbalances in total (Figure 3).

**User Interface Offers Direct Stakeholder Engagement**

The user-friendly interface of the SD model includes dials and switches, as well as graphs and diagrams, to help policymakers and other stakeholders directly interact with the underlying model, understand its assumptions, and inspect its mechanisms. In so doing, these policymakers and other stakeholders can obtain insights into the dynamics of the physician workforce, adjust assumptions and policies in real time, and chart the effects on multiple outcome trends across all four components. Like pilots in a flight simulator, stakeholders can test the impact of various strategies and design
improvements as they develop an understanding of the system’s functions and build confidence in policy recommendations. Thus, the model raises the role of the user from audience member to active partner in research and policy analysis.

Ongoing Development
The SD model has been verified using historical trends, with data reported from 2002 onward (e.g., U.S. population, students in medical school, physicians in residency), as well as stakeholder input on the model structure and results. RAND and AAMC continue to refine the components, subcomponents, and mechanisms within the model and adapt the model to different levels of analysis (e.g., specific physician specialties or states). Future work could also adapt the model to simulate the dynamics among need, demand, supply, and utilization for additional health care professions.

For More Information
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The research described in this publication was funded by the AAMC (contract #041822) and conducted within RAND Health Care and RAND Education and Labor, divisions of the RAND Corporation. RAND is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest.

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