



## DocFlows: A Web-Based, Interactive App to Explore the Interstate Migration of Residents-in-Training and Practicing Physicians

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### I. Introduction/Background

The nation faces a persistent maldistribution of physicians and investments in physician training are similarly skewed. Large variations exist in the number of Medicare-funded residency positions by state with 1.63 residents per 100,000 population in Montana compared to 77.13 in New York.<sup>1</sup> Efforts to redistribute graduate medical education (GME) to needed specialties and communities have not been successful. *The Medicare Prescription Drug, Improvement and Modernization Act of 2003* redistributed nearly 3,000 positions but only 12 of them went to rural communities.<sup>2</sup> The National Academy of Medicine has argued that the existing GME system fails to produce the physician workforce needed to meet the nation's health care needs and that the "United States has never established a data infrastructure to support an assessment of the health care workforce or the education system that produces it."<sup>3</sup>

In previous work, we demonstrated that if workforce data were used to target GME expansions, the distribution of GME funds would look significantly different, with GME positions targeted toward states with poor health outcomes and high health care utilization (AR, MS, AL); large, growing populations (TX, CA); aging populations (FL); low resident/population numbers (ID, WY, MT, AK, NV); and first-certificate specialties (FM, IM, Peds etc.) and cardiology (due to aging population).<sup>4</sup>

While federal GME reform efforts have stalled, states have become increasingly active in determining ways to target Medicaid and state appropriations toward producing the workforce needed to meet population health needs. However, states have voiced the need for better data to determine where to target these funds and evaluate their return on investment (ROI). To address this gap, we developed the DocFlows data visualization tool. The DocFlows app (<http://docflows.unc.edu>) allows users to query, download and share maps and graphs of interstate moves by residents and actively practicing physicians in 35 specialties. Data can be used by state and federal policy makers to understand where their physician workforce is trained and where their trainees are moving.

### II. Methods

The 2009 and 2015 American Medical Association Masterfiles<sup>®</sup> were merged and physicians who were in active practice in both years were included in the analysis (n=788,905). Active refers to physicians in direct patient care, administration, or research. Physicians who were retired, semi-retired, temporarily not in practice, not active for other reasons, did not have information identifying the state they worked in, or were age 80 or older in 2009 were excluded. Residents-in-training in 2009 who were still in training in 2015 (n=6,381) or who were not in active practice in 2015 (n=1,001) were also excluded from the analysis. The final analytic sample contained 672,606

### Conclusions and Policy Implications

- States are seeking better data to evaluate the ROI for public funds spent on GME. The DocFlows app ([www.docflows.unc.edu](http://www.docflows.unc.edu)) fills this gap by providing information on where their workforce is trained and where their trainees are moving.
- California, Florida, and Texas were the largest net importers of physicians. They also had the highest retention rates for actively practicing physicians, keeping over 90% of their actively practicing physicians in-state between 2009 and 2015.
- Wyoming had the lowest retention rates, keeping just 18% of residents and 76% of practicing physicians.
- The market for physicians is national, with significant migration between states of newly trained and actively practicing physicians. Many of these moves are regional. This means that any change a state implements to expand GME or increase retention will affect other states.

physicians who were in active practice in 2006 and 2015 and 116,799 residents who were in training in 2009 and in active practice in 2016. Data are reported separately for physicians and residents.

Five measures were reported for each group: 1. National trade balance—the number of residents/physicians a state imported from all other states minus number that it exported to all other states between 2009 and 2015; 2. State trade balance—the number of residents/physicians a state imported from each other state minus number that it exported to each other state; 3. Retention—the number and percent of physicians and residents retained between 2009 and 2015 in each state; 4. Import—the percent of a state’s workforce in 2015 that was trained in other state (resident analysis) or moved from another state (actively practicing physician analysis); and 5. Export—the percent of residents and actively practicing physicians that left the state between 2009-2015. Data for these five measures were uploaded to a MySQL database and a data visualization (i.e. web app) was built using modern web technologies (PHP, HTML, CSS, javascript), and the javascript library d3.

### III. Findings

Thirteen percent (n=87,829) of actively practicing physicians and 55% (n=64,120) of residents in 2009 had moved to another state in 2015. As expected, given the number of residents they train, New York, Pennsylvania, Michigan, Illinois and Ohio were the largest net exporters of residents. In contrast, states with low numbers of residency positions relative to population like California, Florida, and Texas were the largest net importers of physicians. California had the highest retention of residents, keeping 72% of their residents, followed by Texas that retained 60%. Wyoming had the lowest retention rate, keeping just 18% of residents trained in the state. 20% of Wyoming’s residents moved to Colorado and 20% of Nevada’s residents moved to California, the largest interstate migrations in the sample.

California, Texas and Florida were not only the highest net importers of residents, they also had the highest retention rates for actively practicing physicians, keeping over 90% of their actively practicing physicians in-state between 2009 and 2015. The District of Columbia had the lowest retention rate of actively practicing physicians (64%) but many of these moves were local with 13.7% actively practicing physicians moving to Maryland and 7.4% moving to Virginia between 2009 and 2015. Wyoming had the second lowest retention rate for actively practicing physicians, with nearly 1 out of 4 (24%) moving out of state between 2009 and 2015. Most of these moves were regional with 4.6% of its physician workforce (n=41) moving to Colorado and 8% (n=70) relocating to Idaho, Montana, Washington, Utah and California during the same time period. The app provides numerous ways to explore flows between states by specialty that are too numerous and varied to be captured in this brief.

### IV. Conclusion

The market for physicians is national, with significant migration between states of newly trained and actively practicing physicians. Many of these moves are regional. This means that any change a state implements to expand GME or increase retention will affect other states. States like Wyoming that have a low retention of residents and practicing physicians may want to investigate the reasons behind their low retention rates and explore why other states are more successful in retaining their workforce.

### V. Policy Implications

States are seeking better data to evaluate the ROI for public funds spent on GME. The DocFlows app fills this gap by providing them with information to understand where their workforce was trained and the migration of their workforce to other states. GME is only one point in a physician’s career trajectory in which policy makers can intervene. Since retention rates for residency are much higher for physicians who also attend both medical school and residency training in state, training tracks that combine undergraduate and graduate medical education could increase in-state retention.

### References

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