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SPECIAL ARTICLE

# 2015 American College of Rheumatology Workforce Study

## The Role of Graduate Medical Education in Adult Rheumatology

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***Objective***. **Graduate medical education (GME), through fellowship training, plays a critical role in preparing new rheumatologists for our workforce and is an essential component when addressing the gap of excess demand for adult rheumatology care. This study was undertaken to assess the demographic characteristics and employment trends of new entrants entering the rheumatology workforce and the impact this will have on the supply of rheumatologits over the next 15 years.**

***Methods***. **Primary and secondary data sources were used to develop an integrated workforce model. Factors specific to new graduates entering the workforce included available and filled fellowship positions, gender shifts, planned work schedules (part-time or full-time), practice settings (academic or non-academic, private practice), and number of international medical graduates (IMGs) anticipating US practice.**

***Results***. **In 2015, there were 113 adult rheumatology programs, with 431 of 468 available positions filled. Using the 215 actual positions available annually in fellowship programs as a starting point, after all factors were applied, the projected clinical full-time equivalent number entering the workforce each year was 107; this number was affected significantly by gender and generational trends. In addition, 17% of IMGs self-identified their plan to practice outside the US. Confounding predictions included a large proportion of current rheumatologists planning retirement with substantially reduced patient loads by 2030.**

***Conclusion***. **The current US adult rheumatology workforce is in jeopardy of accelerated decline at a time when demands on the workforce face tremendous growth. The current GME training structure cannot support the increased demand. Potential strategies to address this gap include innovative mechanisms for GME funding to increase fellowship training positions, incentives for pursuing rheumatology training (e.g., loan repayment programs), and novel means for recruitment of care to underserved areas of the US.**

A decade has passed since the previous assessment of the rheumatology workforce (1,2). The 2005 US Rheumatology Workforce Study was conducted to better understand factors affecting the supply of and demand for rheumatologists, to quantify these factors where possible, to project likely paths for the evolution of workforce supply and demand, and to assess the implications (1,2). Since 2005, projections of a workforce shortage have increased significantly. The Council on Graduate Medical Education has projected a deficiency of 85,000 physicians in 2020, a shortfall equaling ~10% of the current physician workforce (3). The Association of American Medical Colleges has similarly made projections and predicted a shortage of 124,000 full-time physicians by 2025 (4).

In 2005, an American College of Rheumatology (ACR) Workforce Study estimated the adult rheumatology

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workforce to be 4,946 providers and projected growth of only 1.2% by 2025, resulting in a projected deficit of 2,576 rheumatologists (1,2). A significant gender shift in the workforce from 30.2% women to 43.6% women by 2025 was also predicted. In response to the projected gap in supply, the ACR supported initiatives to expand the number of rheumatology fellowship positions, improve practice efficiency, and increase the recruitment of nurse practitioners (NPs) and physician assistants (PAs) into rheumatology practice. As a result, available rheumatology fellowship positions increased nearly 19%, from 396 to 470 between 2005 and 2015. The ACR Committee on Training and Workforce convened a Workforce Study Group (WSG) to conduct the 2015 Rheumatology Workforce Study in consultation with the Academy of Academic Leadership. Among the WSG leadership were rheumatologists with expertise in graduate medical education (GME). The WSG was charged with updating rheumatology workforce projections, capturing a realistic view of clinical full-time equivalents (FTEs), and producing a comprehensive picture of access to care. The 2015 Workforce Study used a comprehensive, patient-centered, integrative framework approach to assess the current workforce and to project the supply of and demand for adult rheumatology services through 2030.

This article summarizes results pertaining to adult rheumatology training programs, demographic characteristics, and employment trends of graduates entering the adult rheumatology workforce. Additionally, the impact of GME on the supply of and demand for adult rheumatology care through 2030 is described.

## METHODS

**Workforce Study Group.** The WSG, comprising volunteers with diverse backgrounds, broad perspectives, and a wide range of expertise relative to rheumatology workforce issues, included 3 fellowship program directors and 2 division directors. The WSG worked collaboratively to develop data collection procedures, design the workforce survey of ACR/Association of Rheumatology Health Professionals (ARHP) members, catalog critical supply and demand factors for adult rheumatology services, select the workforce study modeling process, and approve the final workforce study findings (5).

**Data collection.** A mixed methods approach was employed using both primary and secondary data to evaluate workforce issues and inform the development of the workforce model. Primary data, collected through electronic surveys of ACR/ARHP members and 2014–2015 rheumatology fellows-in-training (FITs), were supplemented by focus group data. Data were collected from many secondary sources such as the ACR membership database, American Medical Association (AMA), American Board of Internal Medicine, Rheumatology Nurses Society, and National Commission on Certification of Physician Assistants, as well as other published data for the purpose of assessing the current base workforce and potential factors that would have a direct impact on the future workforce.

**Workforce study modeling.** The workforce study model incorporated an integrated workforce framework that combined socioeconomic and epidemiologic factors that drive demand with utilization rates that incorporate the current use of health care services. Supply factors included demographic breakdown of new graduate entrants, geographic distribution of programs, practice settings, productivity metrics (e.g., relative value units [RVUs]), retirement trends/succession planning, and workload trends. Demand factors included practice trends for providers, disease prevalence, population demographics, per capita income, cost of rheumatology care, and physician distribution per population, encompassing geographic trends.

**Clinical FTE.** The WSG recognized the importance of including both actual numbers of and clinical FTE for adult rheumatology practitioners entering the workforce. Clinical FTE describes the percentage of work effort devoted to clinical care to reflect a more realistic picture of patient access to care (e.g., 2 providers each caring for patients 50% of the time would together equate to 1.0 total clinical FTE). There are many factors that contribute to patient access to care, such as the number of female physicians (who tend to work fewer hours and see fewer patients [4]), part-time versus full-time workers, and retirement trends (4,5). Information from the literature and the guidance of the WSG, which included members from both the academic and the non-academic, private practice workforce, led to the assumption that 80% of the adult rheumatology workforce worked in non-academic private practice settings, with the remaining 20% in academic settings. Additionally, based on available data (both primary and secondary) regarding the distribution of workload in academic settings, the WSG reached consensus on the definition of a clinical FTE for purposes of the workforce study: 1.0 clinical FTE for adult rheumatology physicians working in non-academic private practice settings and 0.5 clinical FTE for adult rheumatologists working in academic settings.

**Sensitivity testing.** Sensitivity testing is a technique used to determine how different values of an independent variable impact a particular dependent variable under a given set of assumptions. Once the base-case model (starting point of 2015) was completed and the results were validated by the WSG, sensitivity testing was used to ascertain a best-case and worst-case scenario as it affects access to care, making it possible to estimate a range for supply of and demand for services through 2030. The base-case model incorporated best-estimated values of all selected parameters as determined through data collected from primary and secondary sources, as well as guidance from the WSG. This model represented status quo or unchanged assumptions across the workforce. The factors identified included changes in demographic parameters, anticipated retirements, part-time versus full-time employment, percentage working in academic versus non-academic settings, available adult fellowship positions, and non-physician providers (NPs and PAs) working in rheumatology (Table 1).

## RESULTS

**Systematic process outcomes.** The following outcomes are a product of the systematic process used to

**Table 1.** Supply and demand model assumptions (base-case, best-case, and worst-case models)*

| | Base-case model assumptions | Best-case model assumptions | Worst-case model assumptions |
|---|---|---|---|
| Supply factors | | | |
| Geographic | No changes in the geographic distribution through 2030<br>Physicians practicing in MSAs worked on average 15% fewer hours per week<br>Mean 53 hours | No geographic changes in the model | No geographic changes in the model |
| Productivity (RVUs) | No factor applied for adults, due to low growth rate | No factor applied for adults, due to low growth rate | No factor applied for adults, due to low growth rate |
| Succession planning | ~50% will retire through 2030<br>25% patient load reduction for those planning to retire (0.75 FTE) | Reduced retirement percentage to 40% for 2020, 2025, 2030 | Increased retirement percentage to 60% for 2020, 2025, 2030 |
| Sex | In 2015, 59.2% men and 40.8% women<br>Expected 14% increase in the number of women by 2030<br>Women work 7 fewer hours/week and treat 30% fewer patients | Percentage of women decreased by 10% for 2020, 2025, 2030 | Percentage of women increased by 10% for 2020, 2025, 2030 |
| Full-time versus PT employment | ~18% of the workforce work PT (0.5 FTE)<br>90% working PT are women | Percentage working PT decreased to 10% for 2020, 2025, 2030 | Percentage working PT increased to 25% for 2020, 2025, 2030 |
| Practice setting | 80% non-academic private practice settings (1.0 FTE)<br>20% academic settings (0.5 FTE) | Percentage working in non-academic, private practice settings increased to 90% for 2020, 2025, 2030 | Percentage working in non-academic, private practice settings decreased to 75% for 2020, 2025, 2030 |
| New graduate entrants | 215 graduates annually; ~1.4% will not graduate<br>~83% of IMGs stay in US<br>~18.3% work PT (0.5 FTE) | 100% fill-rate, 25% increase in new graduates | 50% fill-rate, stable number of new graduates |
| Non-physician providers (NPs/PAs) | ~2% to 5% increase into rheumatology | Increase to 30% into rheumatology | Increase to 10% into rheumatology |
| Demand factors | | | |
| Patients with OA and other nonrheumatic diseases | ~25% patient load | Decreased patient load to 0% | Increased patient load to 50% |
| Aging population | ~18% patients ≥65 years of age<br>~25% patients ≥65 years of age | No change in the aging population rates | No change in the aging population rates |
| Prevalence of disease | ~23% adult females<br>~18.6% adult males<br>~25% of all adult doctor-diagnosed arthritis by 2030 | No change in the aging population rates | No change in the aging population rates |

* Data are from the American College of Rheumatology 2015 Workforce Study (5). Sensitivity analysis was completed to see how changes in key parameters of the assumptions influenced supply and demand projections. All assumption factors have a synergistic effect that varies due to unexpected changes in estimated economic, geographic, and demographic variables. Best-case and worst-case scenarios were used to see how these changes may affect the rheumatology workforce. MSAs = metropolitan statistical areas; RVUs = relative value units; FTE = full-time equivalent; PT = part-time; IMGs = international medical graduates; NPs = nurse practitioners; PAs = physician assistants; OA = osteoarthritis.

determine the workforce model assumptions about the future rheumatology workforce needs and projected supply. It should be noted that these were not results of the workforce model but rather the preliminary product of the process in which the factors were determined to develop each model: base-case, best-case, and worst-case for access to care.

*Supply factors.* Data were collected from 94% of the 2014–2015 FITs, including demographic profiles and anticipated practice patterns. Based on the primary information gathered, in conjunction with secondary data, 3 major demographic changes emerged: 1) an increase in the number of retiring rheumatology physicians and non-physician providers (e.g., NPs and PAs); 2) an anticipated increase in the percentage of women entering the adult rheumatology physician workforce; and 3) an anticipated increase in the number of new entrants seeking part-time employment. Of note, due to the small number of NPs and PAs in the rheumatology workforce, gender shift trends were not significant in the model, and therefore were not included.

*Demand factors.* Regression modeling with backward stepwise analysis was used to determine which factors significantly contributed to the demand for rheumatology services ($F = 39.06$, $P < 0.001$; $R^2 = 0.37$). Pearson's chi-square test was used to determine model fit

($P$ = 0.81). There was no presence of multicollinearity. Major demand factors included health care utilization patterns, disease prevalence, and changes in patient demographics. Based on the regression results, ~50% of demand was due to the growth of the aging US population.

*Sensitivity testing.* Base-case supply projections assumed no increases in the number of training programs or changes in practice settings (non-academic private practice versus academic). In the best-case scenario for access to care, the supply of the adult rheumatology workforce increased to 5,989 and demand decreased to 6,692 clinical FTE by 2030. This reduced the excess demand from over 100% to 11.7%. In contrast, the worst-case scenario decreased the supply to 3,592 and increased demand to 8,666. This increased the excess demand to ~140%. The assumptions used in the base-case workforce model reflected the best estimates given the economic, social, and political climates in 2015. Table 1 provides the assumptions used in the base-case model, best-case model, and worst-case model for access to care.

**Fellowship training programs.** The number of adult rheumatology fellowship training programs increased from 108 (in 2005–2006) to 113 (in 2015–2016), with an associated increase in the number of available positions (396 in 2006–2007 to 470 in 2015–2016) (6–8) (Figure 1), reflecting both an increase in the number of programs as well as available positions within the programs. It should be noted that not all positions are filled each year (e.g., 431 of 468 positions were filled in 2014–2015). At the same time, ~50 applicants to adult rheumatology fellowships fail to match each year.

There is a disproportionate number of adult rheumatology training programs across the US, with a much larger number of training programs in the Northeast and Mid-Atlantic regions (Figure 2). Except for California, regions west of the Mississippi have very few programs. Many states in the Northwest, Southwest, and North Central US have no programs or 1 rheumatology fellowship training program. In contrast, 13 states have 3 or more programs, and 8 states have 5 or more training programs.

**New graduates.** In 2014–2015, there were a total of 431 Accreditation Council for Graduate Medical Education (ACGME) adult fellows (211 first-year and 220 second-year fellows), 50 third-year fellows, and 8 fourth-year fellows (6). Of the ACGME fellows (first- and second-year fellows), 53% were IMGs and 57% were women (6). Of those who matriculate, ~1.4% do not graduate, and a projected 17% of international medical graduates (IMGs) plan to practice outside the US, resulting in ~18% fewer total graduates entering the workforce upon graduation. Therefore, it was projected that 176 of the potential 215 new graduates will enter the US adult rheumatology workforce each year (6,7). This provided an actual base-case number of total new graduates for further projections.

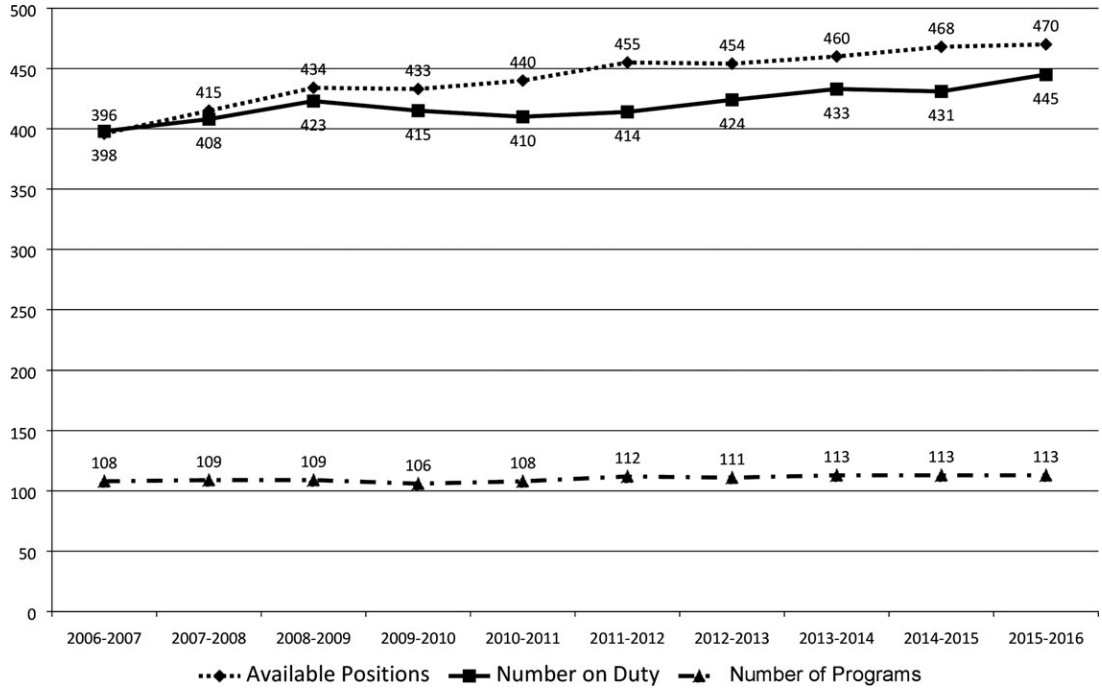


**Figure 1.** Adult rheumatology programs and positions in 2006–2007 through 2015–2016. The number of adult rheumatology training programs, available positions, and filled positions in the US in each academic year are shown. Data are from the Accreditation Council for Graduate Medical Education Data Resource Book, 2015–2016.

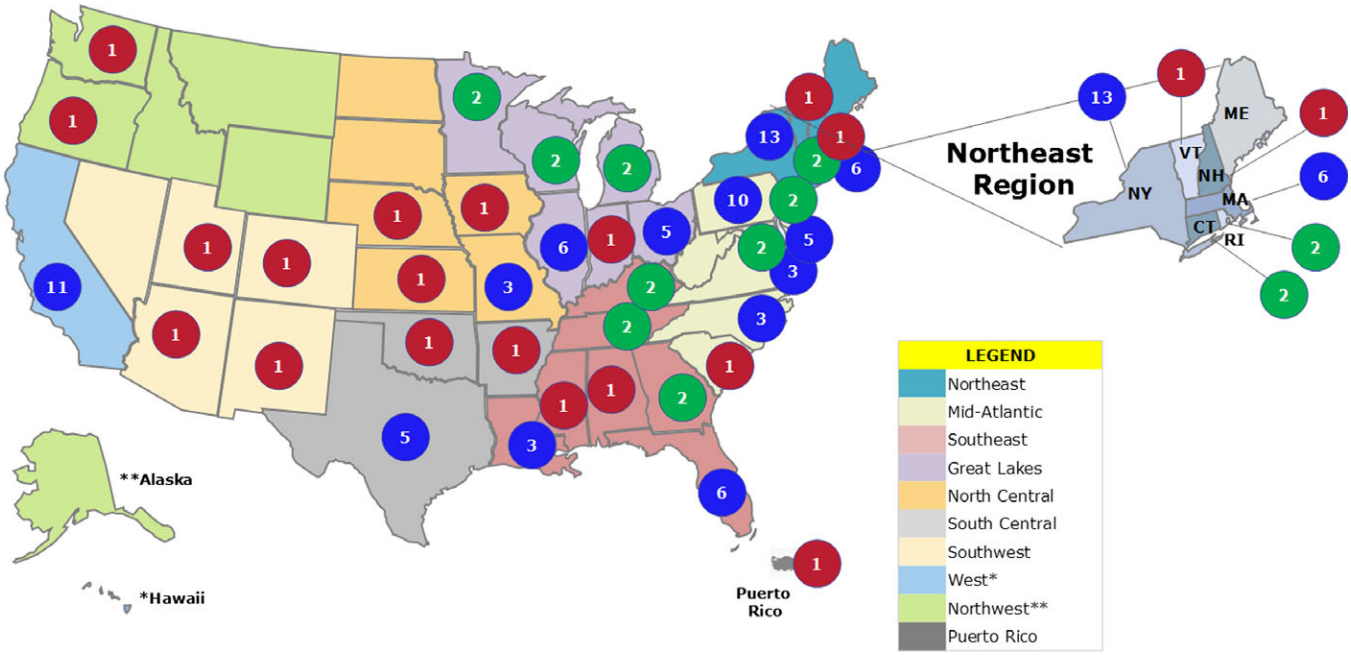


**Figure 2.** Number of adult rheumatology training programs in each US state in 2015. The numbers contained within the circles denote the number of fellowship programs in each state. Red indicates 1 program, green indicates 2 programs, and blue indicates 3 or more programs. * = includes Hawaii; ** = includes Alaska.

**FIT survey data.** While primary data were only a small portion of the development of the workforce study, information gathered from the FITs was used to help further develop factors used in the workforce study model associated with new graduates (5). A total of 351 adult rheumatology fellows, both first and second year (82%), completed the survey (7) (Table 2). Of those who responded to each item, ~63% (n = 214) were female, ~50% (n = 171) were IMGs, and most reported being white (49%; n = 164) of non-Hispanic origin (94%; n = 311). Most adult rheumatology FITs (83.2%; n = 292) were in a 2-year rheumatology fellowship program, the ACGME requirement for training. Of 113 fellows pursuing 3 or more years of fellowship training (23.3% of all FITs), 65.5% were US medical graduates and the remainder were IMGs. Student loan debt was carried by most US medical graduate FITs (70.6%). Among those with debt, 44.4% owe more than $100,000 and 12.2% owe more than $300,000 (7) (Figure 3).

More than 80% of adult rheumatology fellows reported they would work full-time (n = 283), with ~20% reporting that they planned to work part-time or were not sure at the time of the survey. Approximately 40% of the adult rheumatology FIT respondents planned to seek employment in an academic health center (n = 138). Of these, ~71% (n = 98) were women. A small proportion of FITs (4.6%; n = 14) had plans to pursue rheumatology before medical school, and the majority of FITs made their decision to pursue rheumatology during their second or third year of residency training. Intellectual interest, lifestyle, clinical exposure, and mentorship were impor-

**Table 2.** Self-reported demographic characteristics of adult rheumatology fellows-in-training 2014–2015*

| | |
|---|---|
| Sex (n = 341) | |
| Male | 127 (37.2) |
| Female | 214 (62.8) |
| Where graduated (n = 343) | |
| US medical school | 172 (50.1) |
| Non-US medical school | 171 (49.9) |
| Ethnicity (n = 331) | |
| Hispanic | 20 (6.0) |
| Non-Hispanic | 311 (94.0) |
| Race (n = 336) | |
| American Indian or Alaskan Native | 2 (0.6) |
| Asian | 143 (42.5) |
| African American | 11 (3.3) |
| Native Hawaiian or other Pacific Islander | 3 (0.9) |
| White | 164 (48.8) |
| >2 races | 13 (3.9) |
| Age, years (n = 330) | |
| 25–30 | 110 (33.3) |
| 31–35 | 174 (52.7) |
| 36–40 | 35 (10.6) |
| 41–45 | 6 (1.8) |
| >45 | 5 (1.5) |
| Length of fellowship (n = 351) | |
| 2 years | 292 (83.2) |
| >2 years | 59 (16.8) |

* Values are the number (%). Data were obtained from a survey of 2014–2015 fellows (n = 351) (7). The number of responses varied for some demographic characteristics; thus, the total does not equal 351 for each category.

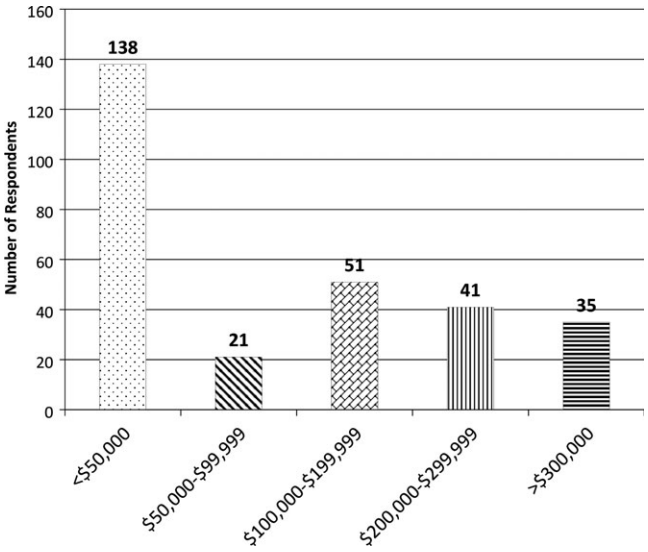


**Figure 3.** Reported student loan debt of adult rheumatology fellows-in-training in 2015 (7).

tant factors reported in making the decision to pursue rheumatology subspecialty training. Income potential was the least likely contributor to this decision-making process (6.1%; n = 21).

**Workforce projections.** Women constitute a growing proportion of the physician workforce. The AMA reported that female physicians worked 7 fewer hours per week than male physicians, and treated ~30% fewer patients than did their male counterparts per year (4,9,10). For the purposes of the workforce study, several factors were considered, and the following were applied to new graduates entering the workforce. The number of fellowship programs and available positions would remain constant from 2015 through 2030 with all positions filled each year; 18% fewer total graduates due to both IMGs leaving to practice outside the US upon graduation and a small percent of natural attrition; 18% would seek part-time employment; and 59% of the new entrants would be women.

With these combined factors, the projected clinical FTE for adult rheumatology graduates was 107 per year, a significant decrease from the total of 215 possible new physician entrants per year. Importantly, it should be noted that the projected clinical FTE of 107 quantitates the clinical care providers available and/or the potential access to care number for patients rather than the total number of providers.

**Retirement and succession planning projections.** More than 50% of adult rheumatologists reported retirement plans over the next 10–15 years (Figure 4), 80% of whom anticipated decreasing their patient load by at least 25% before retirement. Therefore, a factor of 0.75 FTE was applied to reflect the proportion of those anticipating retirement.

**Supply and demand projections.** The projections for supply and demand for adult rheumatology services compared the total number of adult rheumatology providers to the projected clinical FTE of all providers from 2015 to 2030 (5). The base-case model indicated an excess demand for adult rheumatology providers of 1,118 FTE

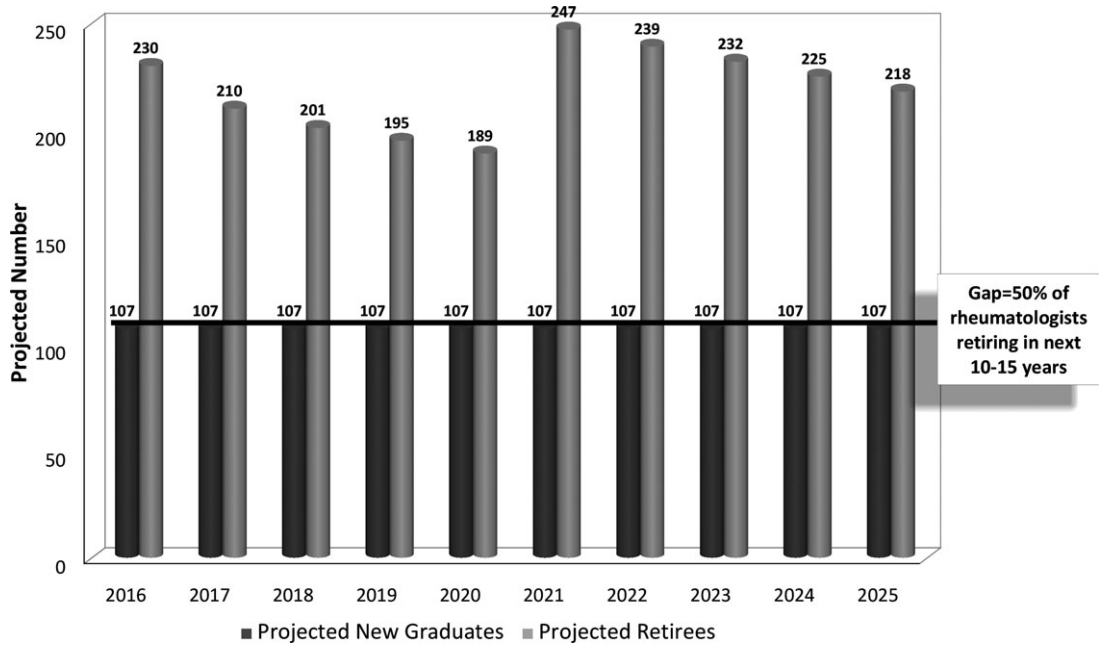


**Figure 4.** Adult rheumatologists 2016–2025. The projected numbers of retirees versus fellow graduates are shown in clinical full-time equivalents.

in 2015. By 2030, the excess demand would be 4,729 FTE, representing an increase of 137.8% (difference between the projected workforce FTE supply of 3,455 and the projected FTE need of 8,184) from the base-case model (5). Sensitivity testing produced the best-case and worst-case scenarios for access to care based on potential changes through 2030.

The excess demand would vary from 5,566 (+182% change) in the worst-case scenario to 1,388 (+26.6% change) in the best-case scenario for access to care, which is a range of >4,000 clinical FTE. While these best-case and worst-case scenarios identified extremes, they are helpful in distinguishing different ranges in the workforce as they compare to the base-case model that may occur in trends across the next 15 years.

## DISCUSSION

This study analyzed the ACR workforce study from a GME perspective to evaluate the status of the current workforce, assess need, address retirement rates, facilitate planning for training of new entrants, and maximize access to care potential. While total numbers of providers (including non-physician providers) were projected, the WSG clearly defined clinical FTE to better project available clinical providers for patient access to care. This factor, clinical FTEs, was included with all other factors to provide the best projection for the future rheumatology workforce. Any projected deficit in supply should be used to inform GME innovations to train more rheumatologists available for patient care.

While men currently comprise 59% of the rheumatology workforce, there is an anticipated gender shift occurring due to the current adult rheumatology workforce beginning to retire and being replaced by new graduates. By 2030, it is anticipated that men will constitute only 43% of the workforce. In that regard, the literature has reported that female physicians work, on average, 7 fewer hours each week, and see 30% fewer patients than their male counterparts (4,9,10). Additionally, notably, 60% of FITs plan to enter private practice, a smaller proportion than the currently estimated 80% of rheumatologists in non-academic private practice. Each of these shifts contributes significantly to the reduced supply of rheumatologists over the next 15 years.

Moreover, millennials (born between 1982 and 2004) comprise 6% of the current workforce but by 2030 will comprise 44% of the rheumatology workforce (11), surpassing the baby boomers to become the largest proportion of the American workforce (12,13). Millennials see 5% fewer patients now than did their counterparts in 2005 (4,12). In comparing patient visits with male compared to female providers, there was a drop in the average number of patient visits between 2005 and 2015; female millennials, on average, had ~35% fewer patient visits, whereas the decline in average patient visits for male millennial providers was 17% (5). The ability to work flexibly and find a job near other family members has been reported as a high priority by more millennials (12,14). Additionally, millennials were more likely to have made, or to be willing to make, sacrifices for family and personal responsibilities (9,10).

Approximately 53% of the US adult rheumatology FITs are IMGs and, importantly, nearly 20% of IMG FITs plan to practice outside the US, thus not necessarily contributing to reducing the US workforce supply gap. While IMGs do not have the same burden of loan repayment as most US medical school graduates have incurred (13), they may have immigration and work visa–related pressures affecting post-fellowship career choices. These factors, along with gender and millennial factors, significantly contribute to the lower estimate of only 107 new graduate clinical FTEs per year.

In light of the potential increases in demand for adult rheumatology services, succession planning patterns were critical to the workforce supply model. The accuracy of physician supply projections has been questioned because of uncertainty about physician retirement patterns. Data from the literature suggest that physicians tend to retire at a more advanced age than individuals in other occupations (4); therefore, primary data were used to assist in succession planning projections over the next 15 years. Of the 50% of rheumatologists who reported plans to retire over the next 15 years, a significant proportion plan to reduce their clinical patient load (5). These high projections will clearly impact access to care for patients with rheumatic diseases as the aging workforce retires and/or reduces patient workload and is replaced by new graduates. Innovative strategies to expand GME training positions must be established to address these potential deficits, while in parallel addressing practice design and efficiency.

The US adult rheumatology workforce is thus projected to experience multifaceted limitations in its growth potential over the next 15 years, amplifying the already increasing gap between supply and rising demand for rheumatology care. To target closure of this gap by increasing new graduate entrants into rheumatology would require the training of more than 4,000 providers over the next 15 years; this is unrealistic, requiring a more than doubling of the number of available fellowship positions. Nonetheless, increasing GME positions in rheumatology and targeting underserved locations are requisite to addressing the looming supply-demand chasm and regional maldistribution.

Between 2005 and 2015, the percentage of internal medicine residents entering rheumatology has remained stable at ~4% (6,8). During this period, the number of internal medicine residents has increased, thus resulting in a small increase in entrants into rheumatology. During this period, the number of rheumatology fellowship training programs has also increased from 108 to 113, and the number of available first-year rheumatology fellowship positions has increased by 35%, from 156 to 210. Approximately 50 applicants to rheumatology fellowships fail to match each year, and 100 failed to match in 2016. With <10 open or unmatched rheumatology fellowship positions each year, it is apparent that there are many potential applicants available for fellowship selection, suggesting that physicians will be available to fill fellowship positions if additional GME slots are made available.

The Centers for Medicare and Medicaid Services have been the single largest supporter of GME financing for residency and fellowship training since the 1980s, and each ACGME-accredited program receives direct GME funds proportionate to the share of the hospital's care provided to Medicare patients (15). In 2014, the Institute of Medicine delineated the importance of reassessing GME support, distribution, and governance to better address the changing health care landscape and the already occurring changes in workforce needs; it is imperative that modifications in GME financing occur to address the workforce shortage (15).

Following the 2005 US Workforce Study, the Rheumatology Research Foundation (RRF) initiated a grant program to provide partial salary support for rheumatology fellows. These grants were initially valued at $25,000 per fellow and, since 2015, $50,000 per fellow per year (current estimate of up to 50% salary and fringe benefits support per fellow). In total, support has ranged from $500,000 to $1,400,000 per year, and over the past 14 years the RRF has awarded a remarkable 392 grants, totaling just under $11,000,000 in partial salary support for fellows. This grant funding mechanism has been crucial for providing rheumatology fellow salary support and growing the workforce, and we encourage its continuation.

Providing incentives for IMG FITs to remain in the US to practice is another way to bolster the workforce. Most IMGs do not have student debt, but many face immigration and visa-related obstacles that impact choice of practice location. Unless IMGs hold US citizenship or permanent residency status, they are often not eligible for grants to fund salary and/or research and are thus less likely to train in 3-year training programs. Therefore, they are more likely to provide direct patient care after completing 2 years of fellowship training. Strong advocacy may be needed to increase the number of J1 waiver slots in underserved areas (allowing many IMGs to remain in the US after graduation), and to reduce barriers to visa renewal for these important members of the field, especially given that more than half of rheumatology FITs are now graduates of medical schools outside the US.

The 2015 Workforce Study projected not only a deficit but also a growing maldistribution of rheumatologists. Metropolitan areas have a higher density of rheumatologists (5). These data have not changed substantially relative to the 2005 Workforce Study, and there have not been significant actions to resolve this imbalanced distribution. It has been demonstrated previously that most trainees enter practice in close geographic proximity to their training program (16). Important to this consideration is that there are 5 states with no rheumatology training programs. The RRF recently developed a fellowship training award targeting programs in underserved areas. More such targeted GME funding mechanisms are needed.

Strengths of this study included the incorporation of several robust databases from different sources (1–4,6,8,17). In addition, the secondary data were supplemented by primary data from rheumatology providers, FITs, and patients; primary data provided current and reliable information about new entrants into our field. Importantly, estimates and projections for workforce supply and demand were based upon FTEs rather than numbers of health care providers. This approach provides a more accurate estimate of supply from the vantage point of the patient than a simple enumeration of practitioners.

There were several limitations to this study, including determining the actual number of rheumatologists in the workforce treating patients as well as the number of currently board-certified physicians who are no longer treating patients. Defining an accurate breakdown between those working in non-academic, private practice and academic settings was also a limitation. The modeling was based on a stable number of new entrants into the workforce, with projections for part-time practice and practice setting derived from both primary and secondary data sources. The response rate to the ACR membership survey, while sufficient (38.5%) (5), may not have been representative of the entire population of rheumatology practitioners. Last, the use of cross-sectional data to project forward, reflecting changes across time, was also a limitation.

Planning for the future of the rheumatology workforce is vital. GME provides the necessary inflow of rheumatologists into our specialty and is thus of fundamental importance in filling the gap between rheumatology supply and demand. It is imperative that the rheumatology specialty adopt innovative approaches to augment the supply of rheumatologists, and while this was one of the strategic plans derived from the 2005

Workforce Study, the workforce landscape has since changed significantly due to shifts in demographics, practice setting, and part-time work. These new projections underlined a well-defined picture of adjusted provider clinical productivity that clearly portrays the need. These projections more accurately approximated the patient-centered approach to care access and demonstrated that merely increasing fellowship positions will not suffice. A multipronged approach is warranted and must include both increased recruitment of trainees into rheumatology and improved geographic distribution of rheumatologists. The 2015 Workforce Study not only informed us of the magnitude of the supply versus demand chasm, but added insight into the requirement for novel mechanisms as we move forward. To escalate recruitment, it is important to increase mentoring opportunities for medical students and internal medicine residents. Consideration may be given to incentives such as student loan repayment, geographic redistribution, and attracting IMG fellows to remain in the US for practice.

Additionally, it is imperative to address physician burnout and foster continued dedication to rheumatology practice for those entering the field, by advocating for policies that increase practice efficiency and reduce barriers to patient access. At the same time, innovative approaches to rheumatology care are needed since the number of FITs would have to more than double to meet our needs in the coming years. Increased recruitment of NPs and PAs to rheumatology, practice redesign, use of telemedicine to extend our reach, and further collaboration with primary care physicians in the co-management of patients with some rheumatic diseases are some approaches to consider. It is, however, evident that we must train more rheumatologists, and this will require innovative GME funding mechanisms.

In conclusion, the specialty of rheumatology is facing a crisis of diminishing supply in the face of growing demand. Demographic shifts related to generation, gender, productivity, and immigration status, along with the aging practitioner population, are creating a trajectory that is diverging from the increasing demand for rheumatology care. This study provides data and valuable insight into the role of GME and the challenges of sustaining an adequate supply of rheumatologists over the next 15 years.

## AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be published. Dr. Bolster had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Study conception and design.** Bolster, Hausmann, Deal, Ditmyer, Greene, Monrad, Battafarano.

**Acquisition of data.** Bolster, Hausmann, Deal, Ditmyer, Greene, Monrad, Battafarano.

**Analysis and interpretation of data.** Bolster, Bass, Hausmann, Deal, Ditmyer, Monrad, Battafarano.

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