

# The Physician Assistant/associate Medical Workforce: 2020-2035

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## Research

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# Abstract

## Background:

Physician assistant/associates (PAs) are health care professionals whose roles expand universal access to a broad range of people across many nations. In the US, there is a growing shortage of physicians.

PAs and advanced practice registered nurses (APRNs) were developed to help span medical providers' supply and demand gap. A forecasting project was undertaken to predict the likely census of PAs in the medical workforce spanning 2020 to 2035.

## Methods:

Microsimulation modeling of the American PA workforce was performed using standard stock and flow format. The number of clinically active PAs employed in 2020 formed the baseline. Graduation rates and PA program expansion were factored as critical parameters to predict annual growth; attrition estimates balanced the equation. Two models, one based on data from the Bureau of Labor Statistics (BLS) and another based on data from the National Commission on Certification of Physician Assistants (NCCPA), were analyzed to estimate future annual PA numbers.

## Results:

As of 2020, the BLS estimated 125,280 PAs were employed in the medical workforce; the NCCPA estimate was 148,560 PA in active practice. The mean age was 40, and 76% were female. The Accreditation Review Commission accredited 277 PA education programs for the Physician Assistant (ARC-PA), and 99% had a graduating class. The mean annual graduation cohort was 45. The BLS model predicted approximately 204,243 clinically active PAs by 2035; the NCCPA-based model predicted 211,537 PAs in clinical practice.

## Conclusions:

A physician assistant/associate predictive model based on two data sources projects the supply of PAs by 2035 between 204,000 and 212,000: a growth rate of  $\pm 35\%$  (**3.5% model differences**). If the most likely scenario is realized, the 15-year growth of the PA will help improve the gap in the supply and demand of American medical service.

## Introduction

The 69th World Health Assembly adopted a global strategy for the health workforce in 2016.<sup>1</sup> A five-year check-in calls for new evidence and insights to demonstrate measurable results toward universal health coverage and a capable medical workforce. For Americans, this is important because two population stresses are underway. One demand has been the swelling of an aging population that requires more human resources for health delivery services. With population growth comes the burden of chronic diseases and improved technology requiring frequent upgrading of skills and knowledge.<sup>1</sup> The other is a

growing physician and surgeon shortage. The Association of American Medical Colleges predicts that medical service demand in the US will grow faster than physician supply, leading to a projected total physician shortage of between 54,100 and 139,000 by 2033. This means a primary care physician shortage of between 21,400 and 55,200; and a shortage of non-primary care specialty physicians of between 33,700 and 86,700.<sup>2</sup> Compounding this supply and demand issue is the frequency of medical care visits is increasing, and the annual productivity of primary care providers is decreasing.<sup>3,4</sup>

The enactment of the Affordable Care Act (ACA) in 2010 was a policy to improve healthcare coverage for all citizens. One of the ACA provisions directed an increase in the role of physician assistant/associate (PA) and advanced practice registered nurses (APRNs) in medical service delivery.<sup>5</sup> We report on PAs, a growing provider presence in American medicine.<sup>6</sup>

Knowing the stock of PAs for the nation requires modeling their growth over the next decade. Forecast models assist policymakers and health services researchers in anticipating shortages or surpluses. Patterns of labor behavior and demographic trends are used to predict workforce imbalances. The prerequisites to a microsimulation model require understanding the dynamics of employment and the sources of the labor supply. The first PA forecasting model was published in 2011 and predicted approximately 120,000 employed PAs by 2020. This was done by triangulating PA association data and patterns of attrition.<sup>7</sup> The Bureau of Labor Statistics (BLS) estimated 125,280 PAs employed in 2020.<sup>8</sup> This 1% differential is within the BLS relative statistical error rate of 1.7%.

A latter PA forecasting model used a different set of PA licensure information from 56 jurisdictions (50 states, District of Columbia, five territories). The model relied on the policy that all PAs had to have a state-based license to practice medicine.<sup>9</sup> In the 2014 model, which presumed employment data was more accurate at the decentralized state-based medical licensure level, the prediction was off compared to the BLS contemporary figures. The 2014 study underestimated that the 2020 employed PA population would be 108,000 (8% differential compared to the 2020 BLS data).

In both forecasting models, an upper and lower set of sensitivity analyses were applied to offer a range of estimates based on different assumptions. One strategy used a population-based method of accounting for the lower end and a PA program growth method for the upper bound range.<sup>9</sup> It appears that the population-based approach is a better predicting technique of projecting a PA census and is adopted here as the PA census forecasting method.

A third data source has been added – certified PAs who report they are clinically active in the NCCPA database.<sup>10</sup> This database is in a constant state of change as PAs log their continuing medical education hours and refine their role and status.<sup>11</sup>

## Methods

Dynamic stock and flow asset model was constructed to forecast the annual supply of new PAs from 2021 through 2035. Historical PA graduation data from 2014 through 2020 was obtained from the Physician Assistant Education Association (PAEA). Because stock and flow models use contemporary numbers for the stock (i.e., PAs) and new inflows (annual cohorts), we then subtract the estimated number of clinicians who will leave clinical practice. Information from the Accreditation Review Commission on Education for the Physician Assistant (ARC PA) regarding new PA program application and the annual number of certified PAs from the National Commission on the Certification of PAs (NCCPA) provide variables in the equation. Retirement estimates were obtained from the NCCPA (unpublished data). Concurrently, the BLS annual result estimates PA employment growth for the next ten years to 2031 at 31% and is based on employer surveys. These models are predicated on a career span of an annual PA cohort that approaches 50 percent attrition by year 30, and less than 1% are clinically active by 40 years. The yearly PA cohort has been growing since 2000.<sup>6</sup>

## Data Sources

The number of PAs in clinical practice is derived from the BLS PA employment statistics and not from self-report. PA education programs produce the source of graduates for the American system. Essential PA data systems are identified in **Exhibit 1**.

<b>Exhibit 1</b>		
<b>Data Sources for PA Predictive Modeling</b>		
<b>Data</b>	<b>Attributes</b>	<b>Limitations</b>
<b>Accreditation Review Commission on Education for the Physician Assistant (ARC PA)</b>	Accredits PA programs active and in development and periodically evaluates them.  All potential PA programs must apply for and be granted provisional accreditation before inaugurating a class.	Lengthy application process and no more than 10 new programs per year.  Personal communication is required for data.
<b>Bureau of Labor Statistics (BLS)</b>	A Survey of PA employers across all health service industries is published annually.  Estimates growth for 12 years.	Does not collect data on self-employed PAs in the five US territories or overseas. Historical data on employed PAs began in 2001.
<b>National Commission on Certification of Physician Assistants (NCCPA)</b>	Nationally certifies all PAs who want to work clinically in the US.  Administers a recertification examination.  Approximately 92% of all certified PAs input data triennially.	Self-reported data, including intent to retire.  Personal communication is required for data.
<b>Physician Assistant Education Association (PAEA)</b>	Annually surveys all PA programs for graduation rates and calculates the average number of graduates.	Dependent on the faculty member in each program to complete the survey. 2020 completion rate was 100%.

## PA Education Growth

PA supply is predicated on the number of graduates from accredited PA programs. That number in 2021 was 277 programs.<sup>12</sup> The estimated lag time from provisional accreditation (approval to enroll students) to a graduation cohort is three years. The mean number of graduates per program is 45 (PAEA, 2020). The annual number of new programs is estimated at 10. At least 260 programs had a graduating class in 2021, and 40 new program applicants requested provisional accreditation.<sup>12</sup>

## Clinically Active PAs

A clinically active PA holds a state medical license or is employed in a federal agency.<sup>13</sup> To be initially licensed to practice medicine, a PA must pass the PA National Certification Examination (PANCE), administered by the NCCPA. Historically the eventual pass rate is 95% (personal communication Sheila Maudlin, 2019). This 5% loss of clinical employment is factored into the annual attrition rate of a cohort. The NCCPA estimates that 95% of the 157,000 certified PAs were clinically active in 2021 based on self-report status (149,000 est).

# Baseline data for PA Forecasting

At the end of 2020, there were 127,560 PAs who had entered their biennial data in the NCCPA *PA Professional Profile* (PAPP). Of these, 105,699 PAs responded to the question assessing intentions to retire in the next five years (82% response rate). Also as of the end of 2020, 5.8% of certified PAs indicated that they plan to retire from the PA workforce in the next five years.

## Sensitivity Analysis

Sensitivity analyses were incorporated to explore the influence of uncertainty in the variables and assumptions used for estimating the projected numbers. Each sensitivity analysis was used with program growth and different annual attrition rates. These are illustrated in the graph as upper limits (UL) and lower limits (LL). Data were analyzed using Microsoft Excel and IBM SPSS.

The estimates of a future PA workforce size were based on new programs of 10 programs per year for four years, five programs per year for three years, four programs per year for two years, three programs per year for three years, two programs per year for two years, and one program per year attrition. The lag time from the day a new program begins classes to graduation averages 36 months (24-40). As of 2021, a total of 40 programs had applied to ARC PA for accreditation status.<sup>14</sup>

## Attrition

Departures from clinical practice were based on historical information from prior predictive models that included retirement, career breaks, and death.<sup>9,15</sup> (Hooker, 2011; Hooker, 2014). The annual attrition of 5% PAs from clinical status was selected based on published models of PAs, physicians, nurses, and some medical and surgical specialties and NCCPA data.<sup>2,16-18</sup>

The definition of attrition is any PA departing a clinical practice role. Exiting the clinical labor force occurs across 40 years, with an estimated half of a cohort vacated by year 30 and all by year 40.<sup>19,20</sup>

## Assumptions

Assumptions for this predictive model are listed in **Exhibit 2**. The data includes existing programs, new programs likely to grow in the third decade, program numbers, and characteristics. The assumptions result from combined replies from experts, health workforce economists, PA academics, and education leaders for their opinions. We used median numbers when given a range.

<b>Exhibit 2</b>	
<b>Key Assumptions underpinning the simulation model of clinically active PAs through 2035</b>	
<b>Variable</b>	<b>Key Assumption</b>
New graduates	Domestic graduates only. Mean age 28 years.
Attrition from clinical activity as a PA	Includes PANCE failures (5%), retirement, administration, academic career, death, emigration, and other reasons departing clinical practice.
New PA programs	The net number of PA programs requesting accreditation at the end of 2021 was 40.  Growth of PA programs is predicated on adding ten at first, then 5 per year from 2026 to 2028, 4 for the next two years, 3 for the next three years, and 2 for 2034 and 2035.
Existing PA programs	The number of PA programs with a graduating class at the end of 2020 was 260.  The mean program length is 27 months (range 18-36).  A historical steady state of 45 graduates (mean) per year is maintained.
Full-time status	Defined as 32+ hours per week worked clinically.  Remains stable at 85% of all clinically active PAs.
Other	

## Formula

The equation that underlies the conceptual projection is as follows:

$$nPA_{T,X,Y} = nPA_{T,X} - nOUT_{T,X,Y} + nIN_{T,X,Y} + \epsilon_{T,X,Y}$$

*nPA* = number of PAs; *nOUT* = number of outflows; *nIN* = number of inflows; *T* = target year; *X* = projection horizon; *Y* = base period;  $\epsilon$  = projection error.

The total estimated supply of future PAs ( $nPA_{T,X,Y}$ ) is calculated using the PAs in stock in the launch year  $nPA_{T,X}$ , minus the estimated outflow ( $nOUT_{T,X,Y}$ ), plus the estimated inflow ( $nIN_{T,X,Y}$ ) of PAs in the years between launch and target year ( $T - X \rightarrow T$ ), based on a specific base period ( $T - X - Y \rightarrow T - Y$ ).

## Results

Two sets of results of a PA stock and flow microsimulation predictive model were created. The first calculation draws on the Bureau of Labor Statistics 2000 – 2020 historical numbers. The BLS identifies employers of PAs and calculates their employment each year. Data on PAs has been collected since 2000 (**Exhibit 3**). Each year the BLS predicts the employment rate for the next ten years. The prediction was for

a 31% growth from 2020 to 2030 and a relative statistical error of 1.4% (BLS, 2021). These annual BLS estimates are calculated with data collected from employers in all industry sectors, metropolitan and nonmetropolitan areas, and states and the District of Columbia. It does not include employers of PAs in the five US territories. The expert modeler in SPSS, which selects the best fitting exponential smoothing or Autoregressive Integrated Moving Average (ARIMA) model, was used to project the number of clinically active PAs in 2021–2035 and a confidence interval  $\pm$  75%. The model predicted there would be 204,243 clinically active PAs by 2035, with an upper bound of 242,826 and a lower bound of 165,660 (**Exhibit 3**).

## **Exhibit 3**

### **Bureau of Labor Statistics: PA Growth 2000 – 2035**

#### **PA Stock and Flow with Program Growth and Annual Attrition: 5%: 2012 to 2035**

The projected supply of PAs in clinical practice is based on the addition of 10 new programs in 2022, 2023, 2024, 2025; 5 new programs in three subsequent years 2026 through 2028; 4 new programs in 2029 and 2030; 3 new programs in 2031 through 2033, and 2 new programs in 2034 and 2035. The model presumes each year, one program will close.<sup>12</sup> The historical average of 45 graduates per program per year remains constant. A 5% annual attrition rate was factored in. All graduates are retired from clinical practice by year 40.

**Exhibit 4****PA Program Growth: 1991 - 2035**

Year	Number of PA Programs	Predicted Number of PA Programs	Number of PA Programs with Graduates	Number of PA Programs with Graduates after Attrition
1991	54			
1992	54			
1993	57			
1994	60			
1995	63			
1996	86			
1997	106			
1998	110			
1999	120			
2000	126			
2001	132			
2002	134			
2003	134			
2004	135			
2005	136			
2006	134			
2007	139			
2008	142			
2009	148			
2010	154			
2011	159			
2012	170			
2013	181			
2014	190			
2015	200			

## Exhibit 4

### PA Program Growth: 1991 - 2035

2016	218			
2017	229			
2018	239			
2019	250			
2020	260			
2021	277			
2022	+10	287	277	276
2023	+10	296	286	285
2024	+10	306	296	295
2025	+10	316	306	305
2026	+5	321	311	310
2027	+5	326	316	315
2028	+5	331	321	320
2029	+4	335	325	324
2030	+4	339	329	328
2031	+3	342	332	331
2032	+3	345	335	334
2033	+3	348	338	337
2034	+2	350	340	339
2035	+2	352	342	341

## Estimated Percent of PAs Clinically Active in the Workforce: 40 Year

The attrition rate is steady from year one at 5%, with 95% of PAs clinically active through year 20, followed by a decline to 50% of PAs clinically active at year 30. Subsequently, there is a steep decline reaching 90% attrition at year 35 and 100% by year 40 (**Exhibit 5**).

## Exhibit 5

# Estimated Percent of PAs Clinically Active in the Workforce: 40 Year

The second calculation is based on the NCCPA: 2012 – 2020 historical numbers. The NCCPA collects data by surveying certified PAs. Certification by the NCCPA is a requirement for licensure by all US states. NCCPA produces annual reports on the number of PAs in active clinical practice and asks certificate holders to indicate their practice status; 95% of all certificate holders are in active practice (personal communication, NCCPA, October 23.2021). The base number of PAs in active clinical practice as of 2021 was 149,000 (95% of the overall estimate of 157,000). Using program growth and 5% annual attrition, we projected the number of clinically active PAs in 2021–2035 and a confidence interval  $\pm$  75%. The model predicts 211,537 clinically active PAs by 2035, with an upper bound of 251,729 and a lower bound of 171,345 (Exhibit 6).

## Exhibit 6

### PA Stock and Flow with Program Growth and 5% Annual Attrition: 2012 to 2035

#### Discussion

The US-PA labor supply has experienced a sustained growth phase mainly due to educational program expansion.<sup>21</sup> Supply appears roughly in balance with marketplace demand as PA wages rise ahead of inflation.<sup>8,22</sup>

Workforce estimations of the projected numbers of available healthcare providers with reasonable accuracy are helpful to employers and policymakers. Since the US lacks central government regulation of graduation rates of American medical workers, estimating the caliber of the workforce depends on calculators of labor activity. Our modeling showed that the overall supply of clinically active PAs is likely to increase to over 200,000 by 2035.

Retention in the PA workforce is predicted to remain at the current level for several reasons. PAs are in increasing demand, and job satisfaction is generally considered high.<sup>23</sup> The value of a PA employee is their cost-effectiveness to deliver care at the same or better level than a comparable physician.<sup>24</sup> PAs appear to respond to market forces, and at least half change another specialty throughout a career.<sup>25</sup> The ability to change specialties suggests mobility and adaptability and an occupational characteristic that may contribute to retention.

Furthermore, procedural-based specialties coupled with physician shortages tend to attract PAs. This may be due to high salaries associated with labor-intensive specialties.<sup>25</sup> Finally, traditional retirement patterns are changing, and bridging strategies to remain at least partially involved in one's career into their 70s is rising.

PAs contribute to medical care delivery and influence the gap between the supply and demand of physicians.<sup>2</sup> This is especially true in primary care, where team-based care is growing.<sup>26</sup> In total, PA contributions improve access to care in America and globally.<sup>27</sup> The utilization of PAs and APRNs as providers in hospitals and vertically integrated health systems represents significant US workforce trends. Employment of these providers in multispecialty practice sites, specialty practices, and health systems offering a health plan and participating in a Medicare accountable care organization increases.<sup>28</sup>

## Limitations

Predictive models depend on variables, parameters, and estimates which can differ amongst researchers and health workforce analysts. What a PA reports as clinically active and actual activity has not been assessed, and thus self-report data remains a weak link variable. A 2013 Dutch study on predictive modeling using a 5- and 10-year back-tested strategy of physicians in a country the size of Maryland illustrated that 10-year projections are less reliable than those for shorter periods.<sup>29</sup> Predictive models can lose usefulness when understanding the supply and demand effect from technology, a growing, and aging population, declining birth rate, economic perturbations, sustainability of chronic disease, and increasing efficiency in service delivery are unaccounted for. Forecasting complex trends in demand for types of health care providers will remain challenging for a long time.

The utilization of PAs and APRNs as providers in hospitals and vertically integrated health systems represent significant workforce trends in the US. Employment of these providers in hospitals, multispecialty practice sites, specialty practices, and health systems offering a health plan and participating in a Medicare accountable care organization is increasing.<sup>28</sup> We acknowledge that forecasts are vulnerable in several areas, including the adequacy of model documentation, the frequency of evaluative information on model validity, and data quality. Additional limitations include the inability to adjust the data to fit part-time employment nor parse the data for age and gender.

As with any modeling exercise, these projections depend on the parameters and estimates used. While the rate of attrition in the models may be subject to some margin of error, on the other hand, are accounted for by using differing scenarios. Adding retirement goals provides some insight into occupational stability.

## Conclusion

A physician assistant/associate predictive model based on two data sources projected the supply of PAs in the actively practicing medical workforce in the US spanning 2020-2035 was approximately 205,000 assuming a growth rate of 35 ( $\pm$ ) percent. This new and refined information informs policymakers, workforce regulators, health systems, and employers regarding the growing presence of the American PA. These estimates depend on continuing demand for medical care services and continuing employment opportunities. Graduation rates of PAs are likely to slow due to limited clinical training sites. Under current assumptions, and barring significant changes in attrition, the number of clinically active PAs will increase

by one-third over the next 15 years. Health workforce analysts rely on PAs to provide medical services along with APRNs and physicians. Health policymakers believe that PAs are a needed component of the medical workforce to mitigate the growing doctor shortage.

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