

# Workforce Projections 2010–2020: Annual Supply and Demand Forecasting Models for Physical Therapists Across the United States

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**Background.** Health human resources continue to emerge as a critical health policy issue across the United States.

**Objective.** The purpose of this study was to develop a strategy for modeling future workforce projections to serve as a basis for analyzing annual supply of and demand for physical therapists across the United States into 2020.

**Design.** A traditional stock-and-flow methodology or model was developed and populated with publicly available data to produce estimates of supply and demand for physical therapists by 2020.

**Methods.** Supply was determined by adding the estimated number of physical therapists and the approximation of new graduates to the number of physical therapists who immigrated, minus US graduates who never passed the licensure examination, and an estimated attrition rate in any given year. Demand was determined by using projected US population with health care insurance multiplied by a demand ratio in any given year. The difference between projected supply and demand represented a shortage or surplus of physical therapists.

**Results.** Three separate projection models were developed based on best available data in the years 2011, 2012, and 2013, respectively. Based on these projections, demand for physical therapists in the United States outstrips supply under most assumptions.

**Limitations.** Workforce projection methodology research is based on assumptions using imperfect data; therefore, the results must be interpreted in terms of overall trends rather than as precise actuarial data-generated absolute numbers from specified forecasting.

**Conclusions.** Outcomes of this projection study provide a foundation for discussion and debate regarding the most effective and efficient ways to influence supply-side variables so as to position physical therapists to meet current and future population demand. Attrition rates or permanent exits out of the profession can have important supply-side effects and appear to have an effect on predicting future shortage or surplus of physical therapists.

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**H**ealth human resource (HHR) policy and planning continues to emerge as a critical element of health system reform in the United States and elsewhere.<sup>1–8</sup> An effective and efficient health care system should be able to ensure that the right provider encounters the patient at the right time, in the right place, and for the right cost.<sup>9</sup> Among the central health policy issues in the United States is the process of determining future health care demand so that policies may be implemented to meet such future demand.<sup>10,11</sup> According to Ricketts and Fraher,<sup>12</sup> most countries have adopted a coordinated approach to workforce planning and have developed some version of a national or regional human resource agenda for linking supply and demand as a way to meet population health demands. However, in general, the HHR policy and planning landscape in the United States is quite different because, for the most part, the country has forgone any systematic workforce planning across regions and across professions.

The introduction of the Patient Protection and Affordable Care Act (PPACA), otherwise known as the Affordable Care Act (ACA) or quite simply “Obamacare,” in 2010 is an important element related to workforce planning. For instance, under the ACA, there has been a strong push toward the creation of systems of care such as accountable care organizations and patient-centered medical homes. These changes created a new paradigm in care delivery in the United States that encourages a shift away from a fee-for-service reimbursement model trending toward more population-level reimbursement approaches. Although the structure, process, and outcomes are not yet clear, these new delivery paradigms are likely to reduce the barriers for other clinician workforces to engage with new and expanding scopes of practice. In light of these and other emerging policy changes, the American Physical Therapy Association (APTA) established a workforce task force in 2010 to ignite discussion and start to untangle the complexity of internal and external supply and demand variables that surround the profession. Part of the charge of this task force was to create a simple, feasible,

and annually replicable workforce model that would generate projected national surpluses or shortages of physical therapists along a time horizon to 2020. To these ends, this article proposes a workforce projection model, with the plan to revise and replenish the model annually using assumptions based on the then-best understanding of the relevant variables, including those related to policy decisions at the federal and professional levels.<sup>13–15</sup>

Understanding the balance between supply and demand for HHRs is challenging. The process attempts to predict a “future state” well before it occurs while trying to identify the potential impact of internal and external policy shifts that also might influence the overall workforce.<sup>16,17</sup> Nevertheless, HHR policy requires some reasonably accurate estimate of the number of health providers in a given field (ie, supply) and some estimate of the number of people who need or demand the services provided by the health providers (ie, demand) in order to engage in effective planning. The balance between the supply of services and the demand for those services is generally interpreted as a shortage when there are too few providers to meet demand or as a surplus when there are more than a sufficient number of providers to meet demand.<sup>18</sup> It is important to operationally define what is meant by demand and need for service. *Demand* refers to services that an individual wants and actually uses and can be expressed as utilization of services. *Need* refers to necessary services, regardless of whether the individual received it or not. Although there is no consensus on the most effective constellation in a workforce model, a blend of supply- and demand-based models is a preferred choice.<sup>19</sup>

Assessing current and future demand, or need, for physical therapists can be challenging, as there is often insufficient diagnostic categorization to define patient populations receiving physical therapist care and little data to demonstrate what care such populations actually require. The success of all such projection models depends on their ability to predict the future, thereby assisting or

informing health care policy formulation and prioritization. Many health disciplines have explored the fine balance between supply and demand and have projected important gaps or shortages into the future.<sup>20–27</sup> For instance, Tomblin Murphy et al<sup>18</sup> have estimated a large shortage of nurses (close to 60,000 full-time equivalents [FTEs]) across Canada by 2022. Predictive variables driving this shortage are related to increased population needs resulting from aging and prevalence of chronic diseases.<sup>18</sup> Models for physicians project similar shortages<sup>28</sup>; however, the predictive variables are different. Cooper et al<sup>28</sup> identified that the utilization of physicians is countercyclical to changes in the economy, with a 5- to 10-year lag. In other words, during economic upturns, physician utilization begins to build and continues to build until a downturn in the economy emerges. In the face of a downturn, physician utilization dwindles and continues to decline until the economy improves. Given this behavior in physician service utilization, Cooper et al<sup>28</sup> proposed that projections based on gross domestic product (GDP) can predict future physician utilization and may be used to make policy decisions, such as number and size of medical schools.<sup>16,29,30</sup>

## Assessing the Physical Therapist Workforce

In the late 1990s, APTA commissioned an analysis of physical therapist workforce needs through 2005, which came to be known as the “Vector study.” The analysis used supply and demand projections based on a mix of pre-existing data and interviews. Based on an assumption of continuing tightening of insurance reimbursement, a surplus of more than 50,000 physical therapists was predicted by 2005.<sup>31</sup> Implementation of the Balanced Budget Act of 1997 proved to be so disruptive in the market that the Vector study predictions of the analysis became irrelevant.<sup>32–39</sup> No formulas were made available from the Vector study for remodeling; therefore, it could not be used as a basis.

An attempt was made to apply economic forecasting to physical therapy using the GDP reported by Cooper et al.<sup>28</sup> Past uti-

lization of physical therapists in relation to changes in GDP was analyzed. Analyses revealed that the physical therapist workforce is similarly sensitive to economic shifts, as reported for physicians. For example, the Balanced Budget Act (BBA) of 1997 affected the physical therapist workforce significantly—especially in states with a high proportion of Medicare-eligible residents.<sup>40</sup> Analyses were otherwise hindered by lack of consistent and accurate physical therapist supply data. This lack of data prevented further exploration of the economic strategy for modeling future physical therapist utilization.

Zimelman et al<sup>29</sup> recently published a study that used variables of changes in age and population compared with supply as estimated by the US Department of Labor and predicted physical therapist shortages in all 50 states, with shortages more severe in the South and West regions of the United States. Over the last few decades, the physical therapist workforce in the United States has grown in both relative and absolute terms.<sup>41</sup> Physical therapy in the United States has one of the highest HHR ratios, that is, number of physical therapists to population of any country.<sup>42</sup> This growth in supply of physical therapists, however, does not inform the profession or other stakeholders whether these increases will meet, exceed, or fall short of current, or future, population demand for services.

The purpose of this study was to develop a modeling strategy that is simple and can be repopulated annually to project physical therapist workforce supply and demand data. In this article, the original model is presented based on 2010–2011 data (ie, the 2011 model) and the 2012 and 2013 models that integrate more current, updated variables.

## Method

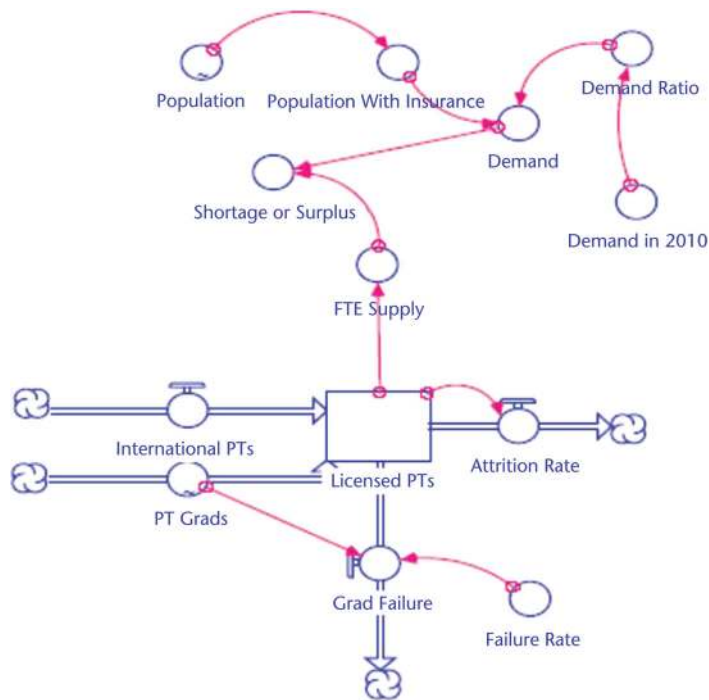
A traditional stock-and-flow HHR projection model was developed to account for changes in both supply and demand. The national supply of and demand for physical therapists in the United States was modeled over an 11-year period, from 2010 through 2020, using the most current data available in 2011. The initial

model design was based on an ongoing review of the literature and the expert advice of the APTA workforce task force. The model was designed to use a small number of variables based on an assumption that using a limited number of variables would result in less opportunity for error in the prediction. The variables were chosen as those most feasible to use based on the accuracy of data available and the likelihood of their impact on supply and demand. The 2011 model was created using STELLA software (isee systems, Lebanon, New Hampshire)<sup>43</sup> and was updated in 2012 and 2013. The 2014 model was in the process of development during the preparation of this manuscript.

The stock-and-flow workforce model is presented in diagram form in Figure 1, as produced by the STELLA software in building the model. A brief description of the relationships in the model is provided, followed by definitions of the variables with their data sources and changes in the variables over time. Italicized words represent the variables as depicted in the figure.

The *FTE supply* of physical therapists was calculated by starting with the known number of licensed physical therapists in the United States in 2010.<sup>44</sup> Additions to the supply of physical therapists included 2 types of new entrants: (1) numbers of physical therapy graduates (*PT grads*) newly licensed and (2) numbers of international physical therapists (*international PTs*) obtaining licenses. The *supply* was reduced by using the *graduate failure rate*, calculated from the total number of physical therapy graduates not passing the National Physical Therapy Examination (NPTE). An *attrition rate* also was used to estimate loss of licensed physical therapists (*licensed PTs*), defined as physical therapists permanently leaving the workforce. The remaining number of licensed physical therapists was then multiplied by an FTE constant ( $FTE_c$ ) to estimate the physical therapy supply of FTEs.

In short, the supply of physical therapists, in units of FTEs at time  $n+1$ , with  $n$  representing a specific year, was calculated as:



**Figure 1.** A representation of the supply and demand workforce model, as drawn with the STELLA software, to predict the numbers of physical therapists (PTs) required to meet the health care demands in the United States (2010–2020). FTE=full-time equivalent.

$$\begin{aligned} \text{Supply of } FTE_{n+1} &= FTE_c \\ &\times (\text{Licensed } PTs_n + \text{PT grads}_n \\ &- \text{grads never passing} \\ &\text{exam}_n) + \text{International} \\ &\text{physical therapists} - \text{Attrition}_n \end{aligned}$$

Annual *demand* for physical therapist services (in units of FTEs) was calculated by multiplying the projected US *population* with health care insurance (*population with insurance*) by the *demand ratio*. The demand ratio was calculated using the *demand in 2010* (2010 supply of physical therapists plus unfilled positions, in FTEs) divided by the 2010 insured population.

$$\begin{aligned} \text{Demand}_n &= (\text{US population}_n \\ &\times \text{Proportion insured}_n) \times (\text{Demand} \\ &\text{in 2010}/\text{2010 insured population}) \end{aligned}$$

The difference between supply of FTEs and demand for a given year estimated the *shortage* or *surplus* of physical therapists at that point in time.

### Supply Variables

**Licensed physical therapists.** The known number of licensed physical therapists was based on most current data supplied by the Federation of State Boards of Physical Therapy (FSBPT), which receives data from state licensing boards across the United States. For the original model, these data were for 2010.<sup>44</sup> This number is updated annually as new data become available.

**Physical therapy graduates.** The number of physical therapy graduates was increased annually. From 2011 through 2016, the number was based on the data provided by physical therapy education programs to the Commission on Accreditation in Physical Therapy Education (CAPTE) in their annual reports about their plans for admissions.<sup>45</sup> A growth rate of 4% per year, reflecting the growth rate then documented by CAPTE,<sup>46</sup> was used for 2017–2020.

**Internationally educated physical therapists.** The number of internationally educated physical therapists who were licensed in 2010 (N=535) was used to estimate the number of internationally educated physical therapists joining the American workforce each year. This number was provided in a conversation with Mark Lane, Vice President of FSBPT, in November 2011 based on the number of internationally educated physical therapists passing the NPTE in 2010. We assumed this number will remain constant in future years.

**Graduate failure and failure rate.** The *failure rate* of graduates from CAPTE-accredited physical therapy education programs on the NPTE was 3% for the 2011 model, 2% for the 2012 model, and 2% for the 2013 model. For each of the models, the failure rate remained constant for future years. All percentages are based on information provided by the FSBPT.<sup>47</sup> The number of physical therapy graduates was reduced by this percentage to identify the graduate failure number, reducing the number of physical therapy graduates joining the number of licensed physical therapists comprising the workforce.

**Attrition rate.** As there were no available data on attrition among physical therapists, attrition rates for the model were chosen based on data about other health care occupations. The Healthcare Association of New York State (HANY) estimated that the attrition rate among nurses in New York was 4.2%.<sup>48</sup> A national study of physician assistants estimated an attrition rate of 5%.<sup>27</sup> A recent study of health care workers reported an attrition rate of 1.5% in 2009.<sup>49</sup> As no attrition estimate was available that was specific to physical therapists and variation in this value may affect the results, projections were run in 2011 using a rough average of these 3 percentages (3.5%), as well as a conservative estimate of 1.5% in order to demonstrate an upper and lower limit of presumed attrition or exit rate. In 2012, a decision was made to use 3 values of attrition rate (ie, 3.5%, 2.5%, and 1.5%) to demonstrate the differences that resulted with variance in attrition rates.

**Supply of FTEs.** In order to account for the mix of physical therapists in the workforce working full-time versus part-time, a constant was developed based on data derived from the APTA Physical Therapist Member Demographic Profile.<sup>50</sup> According to the 2010 Practice Profile, approximately 85% of the workforce practices full-time, and 15% practices part-time. Those practicing part-time personnel worked a mean of 24 hours a week of an operationally defined 35-hour full-time workweek, or a 69% rate. Therefore, the number of licensed physical therapists was calculated as: (licensed physical therapists × 0.85) + (licensed physical therapists × 0.15 × 0.69). This variable remained constant across years.

**Demand Variables**

**Population.** The population was calculated for 2010 through 2020 using US Census Bureau 2008 population projections.<sup>51</sup> The population is updated annually as new data become available.<sup>52</sup>

**Population with insurance.** The population with insurance was calculated by multiplying the estimated annual population by the percentage of the US population who had health insurance (83.7% in 2010; 84.3% in 2011–2020), as reported in the US Census “Bureau’s Income, Poverty, and Health Insurance Coverage in the United States: 2011” report.<sup>53</sup> Because rehabilitation is a mandated service under the ACA, it was determined that enactment of the ACA would increase the demand for physical therapist services. In order to factor in the increase in the population with insurance after the implementation of ACA in 2014, the Congressional Budget Office’s (CBO) estimates of the millions of Americans expected to gain insurance coverage were added in the 2012 and 2013 models for the years 2014–2020.<sup>54</sup>

**Demand projections in 2010.** The demand in 2010 was measured by the number of physical therapists, measured in FTEs, working in 2010, plus the number of unfilled vacancies. The 2010 vacancy rate reported in 3 settings in which physical therapists practice was 11%, as reported in the vacancy rate studies conducted by APTA in 2010.<sup>50</sup>

**Table.**

Projected Undersupply and Oversupply of Physical Therapists in 2020 Based on the Best Available Data in Years 2011, 2012, and 2013 and Across 3 Attrition Rates

Model Generated in Each of the Following Years	Attrition Rates		
	3.5%	2.5%	1.5%
2011	–25,295 (deficit)	<sup>a</sup>	+8,460 (surplus)
2012	–40,934 (deficit)	–25,795 (deficit)	–9,385 (deficit)
2013	–27,822 (deficit)	–13,638 (deficit)	+1,530 (surplus)

<sup>a</sup> No model was generated for a 2.5% attrition rate during 2011.

**Demand ratio.** The demand ratio is a constant that was calculated using the demand in 2010 divided by the 2010 insured population.

**Results**

The predictions for supply and demand from 2010 to 2020 for physical therapists in the United States varied across the model. In the following text, projection models generated across these first 3 years (ie, 2011, 2012, and 2013) are presented, and 3 different assumed attrition rates (ie, 3.5%, 2.5%, and 1.5%) are applied. Assumptions vary across the models, as policy and data changes occurred, thereby producing different overall projections.

**Supply of Physical Therapists**

The Table provides an overview of the projected national supply for physical therapists across the 3 different assumed attrition rates.

**Predictions of the 2011 Model**

Using the best available data on supply and demand (assumptions as identified in the description of the variables) in 2011, the projected model for physical therapists (2010–2020) using a 3.5% attrition rate suggests an increasing shortage of physical therapists during the entire 11-year period, with a gap of about 20,000 in 2010 growing to 25,295 in 2020 (Fig. 2). The potential effects of the ACA are not factored into this scenario. Reducing the attrition rate to 1.5%, still without the potential effects of the ACA, produces a shortage through 2017, changing to a surplus of 8,460 by 2020. The potential effects of the ACA are not factored into this model. When this model factors a potential increase in insured people due to the ACA, assuming

a 3.5% attrition rate and an increase in the percentage of Americans with health insurance from 84% in 2014 to 92% in 2020, the model results in a shortage of 46,595 therapists by 2020.

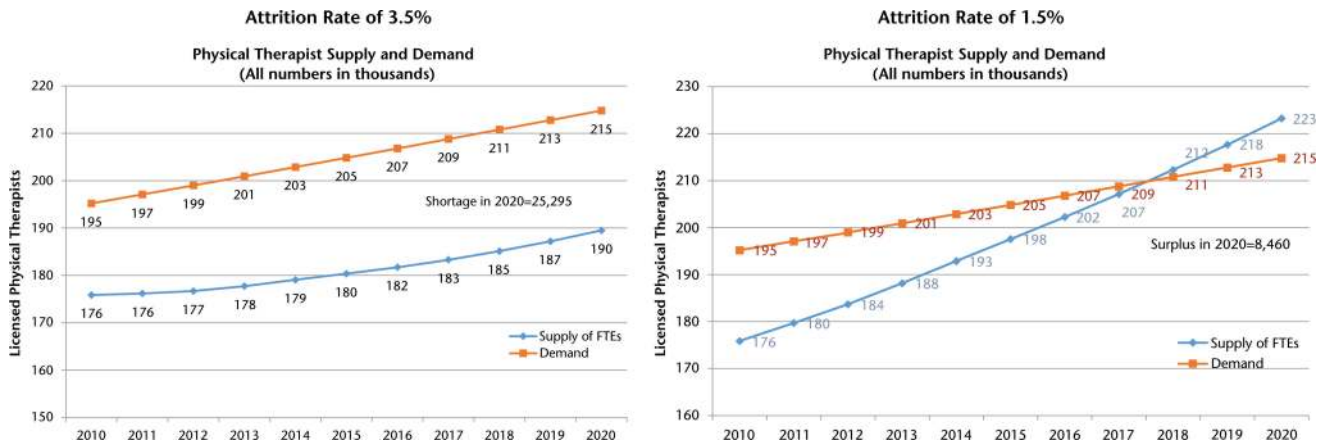
**Predictions of the 2012 Model**

Changed assumptions in the 2012 model include the following: (1) the rate of failure on the NPTE by graduates of CAPTE-accredited programs dropped to 2%, and (2) the ACA was projected from implementation in 2014; therefore, projected increases were inserted into the forecasts beginning in 2014. Rather than a percentage increase, these projections were made based on adding numbers of covered people, using the CBO estimates,<sup>54</sup> ranging from 14,000,000 in 2014 to 29,000,000 in 2020. A third attrition rate (eg, 2.5%) was built into the projections, due, in part, to the responsiveness of the 2011 model to changes in attrition and the continued uncertainty about actual attrition rates. These 3 forecasts resulted in the following: (1) at an attrition rate of 3.5%, shortages continue through to 2020, resulting in a supply gap approximately equal to 40,934 in 2020; (2) at an attrition rate of 2.5%, the supply gap is reduced to approximately 25,795 in 2020; and (3) at an attrition rate of 1.5%, the shortage is approximately equal to 9,385 by 2020. The projections of the 2012 model are shown in Figure 3.

**Predictions of the 2013 Model**

In 2013, several assumptions change and affect the projection model from the year before. First, on the demand side, the US population growth slowed and the number of people expected to be added to insurance rolls under the ACA declined from the assumptions made in the 2012

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**Figure 2.** Projections of the 2011 model. FTEs=full-time equivalents.

model. Second, the supply of physical therapists increased, primarily due to growth in new graduates. The projections of the 2013 model are shown in Figure 4.

Again, 3 projections were made, using the 3 attrition rate estimates and the new assumptions affecting supply and demand. At an attrition rate of 3.5%, the model predicts shortages of physical therapists approximately equal to 27,822; at 2.5%, the projected shortage in 2020 is approximately 13,638. Applying an attrition rate of 1.5% predicts a supply surplus approximately equal to 1,530 in 2020.

Overall, the result of the physical therapist projection models out to 2020 varies based on the best available data across 2011, 2012, and 2013, respectively. The models assume attrition is a significant factor. Based on the results, striking a balance between supply and demand

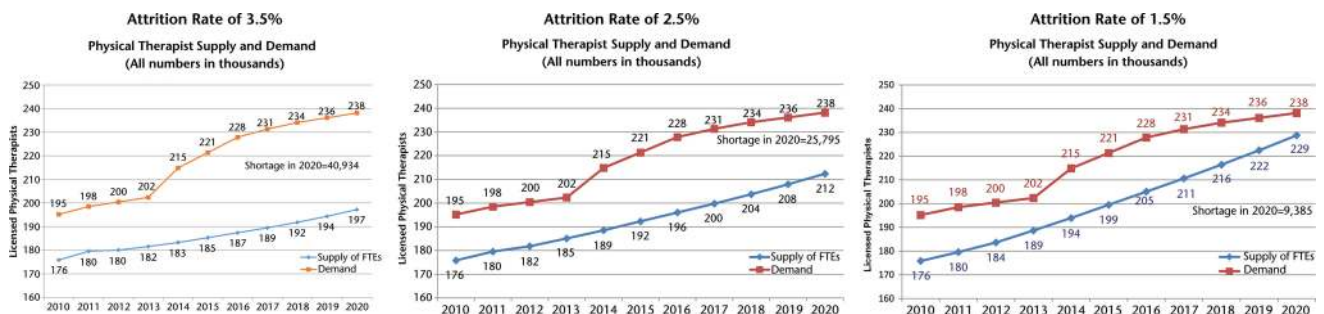
into the future is linked to management and reduction of attrition rates.

### Discussion

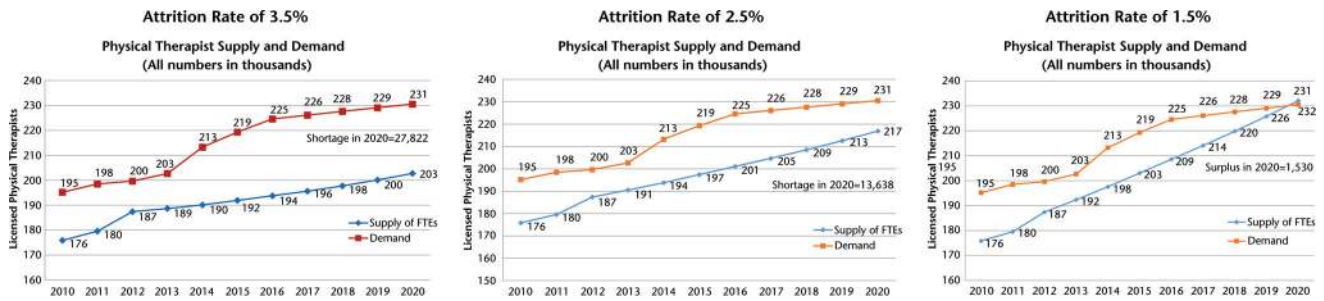
The proposed model for projecting physical therapist workforce indicates that the US supply of physical therapists appears to be headed toward a shortfall, and this shortfall is projected to persist, with or without any increased demand related to the ACA. These findings are in line with those of Zimelman et al,<sup>29</sup> who predicted shortages of physical therapists across all US states through 2030.

Supply and demand models appear to be sensitive to policy changes that affect funding or payment; if policies are enacted to increase access to funding for health services, these same services would be expected to increase proportionately. As our examples of workforce forecasts show, increased access to insurance that includes coverage for

physical therapist services will increase demand for those services. The variations from 2011 to 2013 demonstrate the responsiveness of the model to changes in estimates of the insured population. For instance, in 2012, projections demonstrate somewhat different trends from 2011 and 2013, which in large measure can be attributable to the differences in the estimated number of insured people who are expected to reside in the country. It will be important to observe the absolute and relative number of people who gain insurance (and, therefore, access to services) as a result of the ACA as future models are developed. Although our results are similar to those of Zimelman et al,<sup>29</sup> we also have explored the extent to which the ACA will affect demand for physical therapists and have estimated that when all other workforce variables are held constant, the gap between supply and demand for physical therapists will almost double if the assumptions surrounding the effect



**Figure 3.** Projections of the 2012 model. FTEs=full-time equivalents.



**Figure 4.** Projections of the 2013 model. FTEs=full-time equivalents.

of ACA on physical therapist services occur.

If we assume that there will be an under-supply in 2020 of somewhere between 25,000 and 46,000 physical therapists, the next logical policy question becomes how to address this shortfall or “bend the curve” in terms of human resources. In this study, attrition emerged as a variable that is potentially controlled via enacting strategies to retain physical therapists in the workforce. Our data have highlighted that reducing attrition rates offers a partial solution to the predicted shortfall; based on our model, if the attrition can be reduced to 1.5% (from a currently estimated 3.5%), there might be an opportunity to balance supply and demand by 2020.

On the supply side of the equation, decisions to magnify the number and size of physical therapist education programs can expand or constrict the number of physical therapy graduates entering the profession. Often these decisions are made by individual entities, such as colleges and universities, often acting in their own best interest to maintain a competitive position, rather than by society to choose a position that best meets collective needs.<sup>55</sup> Data from CAPTE indicate that the environment is experiencing increases in both the number and size of physical therapy education programs.<sup>45</sup>

Another example of an area of potential change on the supply side is the number of internationally educated physical therapists who become licensed and practice in the United States. Currently, US policy, through visa regulation, favors such

activity, as do many individual employers; at the same time, another aspect of society, the US licensing system, with a mission of protecting the health and safety of each state’s citizens, can and does set up barriers to employment through precicensure screening requirements. It is unclear what the “right” number of internationally educated physical therapists entering the US system actually is and how these 2 countervailing forces work to produce that number. It will be important to monitor changes in all of these supply factors to ensure as much accuracy as possible in future models. In our model, we assumed a constant rate of international graduates across the years, which may have introduced some error. In addition, we assumed a constant FTE ratio across the years to account for the proportion of part-time and full-time physical therapists. This constant, too, may have introduced error. Vacancy rate also was assumed to be constant; the accuracy of this assumption will need to be tested in future research, as there may be a tendency to overestimate or underestimate vacancies based on natural and temporary unemployment, such as when people temporarily retire or transition to new employment settings.

Implementation of new policies within the physical therapy profession that affect the workforce retention are equally important as strategies that increase the numbers of providers. Tran et al<sup>56</sup> alluded to this notion when they investigated recruitment and retention strategies among rehabilitation professionals. They concluded that there are 3 major areas of focus for HHR retention: (1) quality of worklife and work environment, (2) financial incentives, and (3)

professional development. Tran et al remarked that if the rehabilitation sector is expected to grow, there is a need to implement evidence-based strategies to retain providers in order to meet future demand. In the aggregate, it is far less costly to retain a provider than it is to produce, or educate, a replacement provider.

Our projection models appear to support this notion, and we have provided some evidence that reducing the rates of permanent exits out of the profession by a few percentage points can make an important long-term difference in balancing supply and demand into the future. Reducing attrition or “exit” rates from a defined workforce also has been reported by Tomblin Murphy et al, who stated that “based on current circumstances [shortages in Canadian nursing workforce] . . . can be resolved in the short and medium terms through modest improvements in RN [registered nurse] retention, activity and productivity.”<sup>18(p192)</sup>

On the demand side of the equation, other emerging factors can affect the outcomes.<sup>19</sup> One such factor that has received attention is the “aging of America.”<sup>57,58</sup> Although it is known that the proportion of the population over the age of 65 years is increasing, it is not known explicitly what impact this will have on demand, as many countervailing forces may interact to keep costs for this portion of the population under control.<sup>59</sup> Therefore, this factor was not included in the model. However as we learn more about society’s response to the needs of a growing number of people who are aging healthily and the number

of older people with frailty, it may be possible to refine the model to reflect this knowledge.

Overall, future work on this annual projection model will continue to strive to refine the information available to support and challenge the assumptions. Furthermore, as additional data sources are identified, the goal is to become more granular, so that projections can be made for smaller geographic regions, by population density, or for known areas of underserved needs. It also would be helpful into the future to be able to apply the model to particular types of practice, as previous work has shown that surpluses or shortages may vary by practice type.<sup>60</sup> Moreover, future models will be required to grasp the eventual outcomes related to the existing and potentially expanding role of physical therapist assistants in delivering care.

Rather than simply reflecting what is happening in the policy world that exists external to the profession and in which the profession is only one part, the model presented here can be used to help the physical therapy profession make evidence-informed decisions about setting or advocating for policies that best meet the needs of society. The current forecasts suggest several lines of future research that can help add more data to these policy decisions. For example, attrition rates are important, but it is necessary to learn much more about actual retirement decisions, the loss of practitioners during and after childbearing years, and loss due to work-related injuries, and future inflow of internationally trained physical therapists also would be valuable. If the data support that the projected shortages are real and will be sustained, it will be important to understand the most cost-effective ways to recruit and retain physical therapists, including recognizing internal and external motivators for becoming and remaining a physical therapist in direct clinical practice. Understanding how sustained shortages may affect the actual nature of the work of the physical therapist is important, as is understanding the effect of such physical therapist shortages on substitution of other professionals. It also will be important to continue to study

the ways in which other substitutes for physical therapist services are managed. As nursing workforce research has demonstrated,<sup>17</sup> solutions for shortages and surpluses must be designed to prevent damaging short cycle shifts, as these shortages and surpluses often result in workforce disruption without counterbalancing improvements in patient care.

All of these additional data can and should be used to develop policy used internally by the profession. Such data would help set an advocacy agenda to encourage federal, state, and local policies, as well as international efforts that result in improved access to physical therapist services. Continued use of a simple and reliable model for workforce projections, such as the one presented here, will provide the basis for much future research in workforce issues and invaluable guidance for policy development and adoption. Most, if not all, major health care professions are generating these same types of data. Therefore, physical therapists must continue to collect, analyze, and disseminate these data to maintain their current role, or perhaps enhance their role in the provision of health services in the future. Without these data, the most effective health care likely cannot be provided to those individuals requiring services. The health of the patient requires that workforce trends be monitored both now and in the future.

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## Workforce Projections 2010–2020

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