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Future growth of physicians and non-physician providers within the U.S. Dermatology workforce

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Authors
Sargen, Michael R
Shi, Lucy
Hooker, Roderick S
et al.

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The Dermatology Workforce Supply Model: 2015-2030

Michael R. Sargen[1] MD, Lucy Shi[2] BA, Roderick S. Hooker[3] PhD MBA PA, Suephy C. Chen[2],[4] MD MS

Affiliations: [1]Departments of Dermatology and Pathology, Stanford University, Stanford, California, [2]Department of Dermatology, Emory University, Atlanta, Georgia, [3]Retired Physician Assistant and health policy analyst, Ridgefield, Washington, [4]Department of Dermatology, Atlanta Veterans Affairs Medical Center, Decatur, Georgia

Corresponding Author: Michael Sargen, MD, Department of Pathology - H2110, Stanford Medical Center, 300 Pasteur Drive, Stanford, CA 94305, Email: msargen@stanford.edu

Abstract

Trends in the training, supply, availability, career decisions, and retirement of US dermatology physicians are not well delineated. The current study evaluates whether growth in the dermatology workforce will keep pace with population expansion in the United States. A dermatologist supply model was projected to 2030 drawing on data from the American Academy of Dermatology, American Medical Association, Bureau of Labor Statistics, American Association of Medical Colleges, and other associations. The clinically active dermatologist workforce in 2015 was 36 per capita (1,000,000); entry following postgraduate training was age 30 with career separation at age 65 on average. Added to the provider model are physician assistants and nurse practitioners in dermatology practices. A linear regression micro simulation model based on age cohorts produced a per capita supply of dermatology providers of 61 (±3) per 1,000,000 by 2030, up from 47 in 2016. The dermatology workforce is growing faster than population expansion. Workforce estimates could be affected by changing trends in retirement and training of dermatology providers. Investments in training of nurse practitioners and physician assistants, in addition to training more doctors, may be an effective strategy for increasing access to care in populations with low dermatologist density.

Keywords: dermatology workforce, dermatologists, physician assistants, nurse practitioners, physician shortages, patient access

Introduction

In the United States, demand for physician services is increasing for many specialties and primary care. The expansion of health insurance coverage with health care reform, an aging population, sustainability of chronic diseases, and advancing technology all contribute to the growing demand for medical care in the US, a phenomenon likely to continue over the next several decades [1]. These trends impact patient access to healthcare services in general and specialty services in particular [2-6].

Dermatology is a medical service with supply and demand requirements that are only partially known. Resneck and Kimball found that the average wait time nationally for a new patient visit decreased from 36 to 33 days between 2002 and 2007 [7, 8]. However, wait times in dermatology have varied considerably according to population density (rural vs. urban), [7, 8]. The supply of clinical dermatologists has grown slowly and as of 2015 is approximately 11,500. With a population of 320 million, the per capita estimate is 36 per 1,000,000 [9]. The US Census Bureau estimates that the US population will grow to approximately 360 million by 2030 with the population older than 65 increasing by more than 40% during that timespan [10, 11]. As a result of population growth and aging demographics, the American Association of Medical Colleges (AAMC) estimates that demand for medical specialties will increase by 20% between 2014 and 2025 [10].

In an effort to meet the expected growing patient demand, the specialty of dermatology has transitioned to a team-based care delivery model, similar to many other specialties (e.g, orthopedics,
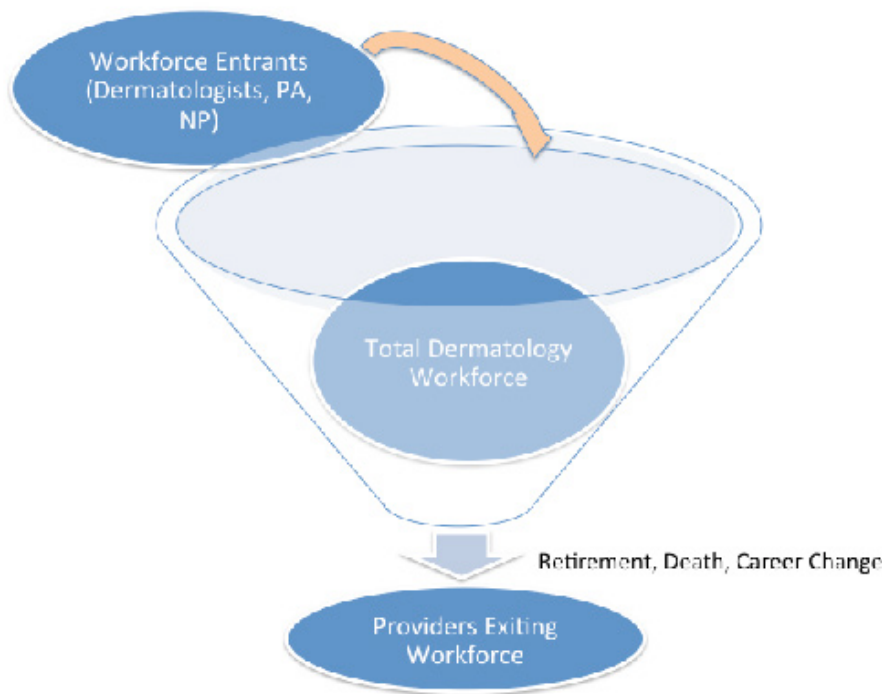
Figure 1. *Stock and Flow Model for U.S. Dermatology Workforce*

family medicine, surgery, neurology, and others). The strategy used throughout American medicine incorporates physician assistants (PAs) and nurse practitioners (NPs), into team-based practices [12]. Although their utilization is speculated to help meet demand in a number of areas their use in dermatology is only vaguely known [13].

In this study, the 2015 trends in training, entering, and departing the workforce for dermatologists were calculated. Added to this was a growing cadre of PA/NPs in order to estimate per capita supply of dermatology providers in the United States through the year 2030. The purpose was to compare future supply of dermatology providers to baseline years and to determine if dermatology workforce growth can keep pace with population expansion.

Methods

A stock and flow projection model was constructed to estimate per capita supply of dermatology providers in the United States from 2016 through 2030. The work builds on approaches used in workforce projection models of the nation and of medical and surgical specialties in particular [6, 10, 14, 15]. Stock and flow models use the current number of providers (the stock), add projected new providers (inflows), and subtract anticipated exits resulting

from death, retirement, and career breaks (outflows) to project the future number of dermatologists (**Figure 1**). A stock and flow model was selected because non-linear systems such as health workforce dynamics require the input of multiple variables (education/ training, retirement, death) to estimate future workforce size. Similar analytic approaches are commonly employed to estimate economic growth and by physicians to evaluate future workforce supply, such as in general surgery and pediatric surgery [14, 16].

Three models were developed to estimate future dermatology workforce size: no growth in residency positions (low growth), 23 new dermatology residency positions annually (2015 trend model), and 46 new dermatology residency positions annually (high growth model based on calls for increased funding for training of specialists and primary care physicians), [17]. The "no growth" projection assumes there will remain cuts in federal funding for residency education in dermatology and the "high growth" projection assumes significant public and private investment in residency education.

In the US, the dermatology medical workforce includes licensed physicians (MD, DO) and licensed PA/NPs. Thus, we explored two models, one without licensed PA/NPs (dermatologists only) and one with all three professions (dermatologists, PAs, NPs). The estimated clinician supply is reported as the number of dermatology providers per 1,000,000 persons.

Inflow of providers: Provider Supply
The Physician Supply Model and Physician Requirements Model maintained by HRSA Bureau of Health Professions provided the estimated age of graduation from medical school and completing postgraduate education [18]. The total number of licensed dermatologists includes those working greater than 20 hours per week in patient care, administration, medical teaching, and/or research. Each job contributes directly or indirectly to the delivery of dermatology care and/or the training of

future dermatologists. Physician data was available for the years 2002 through 2013 [19, 20] and trends were continued forward to the baseline year of 2015 [9]. It was assumed that one third of the total residents in a given year would enter the dermatology workforce based upon the average length of dermatology residency (3 years). The dermatology supply model assumes that on average all graduates have entered the workforce as independently licensed dermatologists by age 30 and does not account for fellowship training, which would delay workforce entry by 1-2 years. However, postgraduate trained fellows entering the workforce each year should roughly equal the number of residency graduates entering into fellowship. For the years 1998 through 2013, there was an average increase of 23 new dermatology residency positions per year [19, 20].

Added to the physician component of the supply model is the PA/NP workforce. We assumed that 3.3% of all certified PAs are in the dermatology workforce based on 98,470 licenses PAs in 2015 [21-23]. A projection model was created for PA supply in which the workforce would grow by 30% over the next 10 years (through 2024) with the growth trajectory extended out to 2030 based upon Bureau of Labor Statistics (BLS) data (http://www.bls.gov/ooh/healthcare/physician-assistants.htm).

NP participation in dermatology was based on 0.3% of all NPs reporting they were in dermatology in 2014 [24]. BLS labor force participation rates were used to estimate growth and attrition (http://www.bls.gov/oes/current/oes291171.htm). Unlike the physician model with clinician versus non-clinicians, all dermatology PAs and NPs were assumed to be directly involved in patient care. No adjustments were made for employment status, type of office arrangement, or scope of practice regulations.

Outflow of providers:

Provider Exits from Workforce

The Physician's Worklife Survey provided the estimated career separation data needed for this model [25]. Taking into account that attrition rates differ for male and females and differ by specialty, Dall and colleagues estimated the median retirement age for all physicians (primary care and specialists) is approximately 65 years old (half retire before and half after that age, HS/AAMC 2016). Based on average age of completing a residency (median age 30 years) the median career duration of a dermatologist was estimated at 35 years (AAMC 2016) with all dermatologists out of the workforce by age 70. Fixed career duration was used to estimate workforce attrition for dermatologists in the baseline year of 2015. The population of dermatologists over the age of 65 was estimated to contract by 20% annually with all physicians out of the workforce by age 70, or working <20 hours per week.

Results

Model 1: Dermatologists Per Capita

The low growth, current trend, and high growth models estimate 43, 46, and 49 dermatologists per 1,000,000 persons in 2030, respectively, which are increases in per capita supply of 23%, 31%, and 40% respectively, compared to 2016 (**Figure 2**).
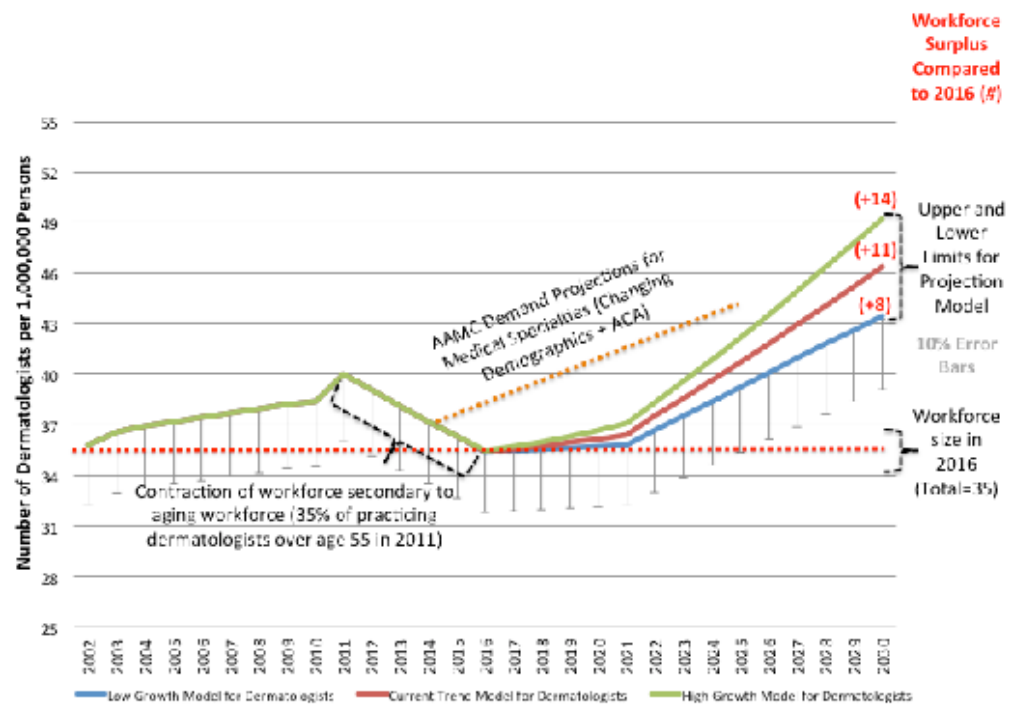

Figure 2. *Per Capita Number of Dermatologists in the United States, 2016-2030*

The estimated surplus of dermatology providers compared to 2016 is maintained in the low growth model even with a 10% overestimation of supply. For illustrative purposes, the AAMC demand model for medical specialties, accounting for aging demographics and insurance coverage, was applied to dermatology with a 20% increase in demand from 2014 to 2025. This demand model likely underestimates the starting point for demand

Figure 3. *Per Capita Number of Dermatology Providers in the United States, 2016-2030*

by assuming there are no shortages in 2014 and all demand projections underestimate the true shortage of dermatologists from 2014 through 2025 by roughly the size of the current national shortage (unknown). Under the AAMC model, dermatology shortages are projected through 2025.

Model 2: Dermatology Physicians and PA/NPs Per Capita

The low growth, current trend, and high growth models estimate a per capita supply of dermatology providers of 58, 61, and 64, which translates into a 23%, 30% and 36% increase in the size of the dermatology workforce respectively, compared to 2016 (**Figure 3**). The low growth model maintains a workforce surplus compared to 2016 even with a 10% overestimation of supply.

Discussion

The stock and flow model forecasts that the dermatology workforce will grow faster than population expansion in the US from 2016 to 2030 and that shortages of dermatologists (**Figure 1**) may be averted by growth in physician extenders (PAs/NPs). By 2030, the per capita dermatology workforce in the United States will be 23% to 36% larger than in 2016.

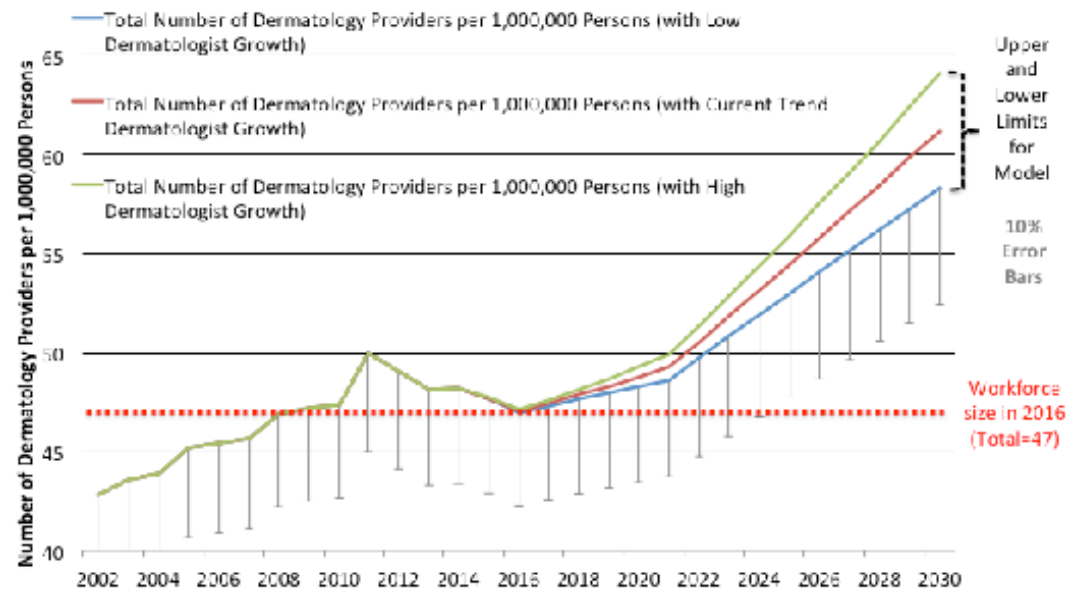The estimated increase in dermatology providers does not predict whether the workforce will be

adequate to meet demand. Overall demand for medical specialties is estimated to increase by 20% between 2014 and 2025 according to a 2016 AAMC analysis [10]. Demand for dermatology care may grow at an even higher rate over the next decade because of trends in skin cancer incidence along with growing popularity for cosmetic treatments; 5 in 10 Americans in a 2014 ASDS survey were considering paying for cosmetic interventions such as chemical peels, laser treatments, or body sculpting procedures [26].

Greater reliance on PA/NPs in order to avoid a specialty shortage will require dermatologists to adopt a team approach in their utilization of these providers in their skills to diagnose, perform office-based procedures, and prescribe biologics and other systemic medications for complex medical conditions. There are adequate models to suggest this occurs in specialties such as rheumatology, endocrinology, and neurology [27-29]. Appropriate oversight by physicians will help to alleviate potential safety concerns of patients and dermatologists [30, 31]. Although the concern by dermatologists regarding unsupervised PAs and NPs providing dermatology care has been raised by some, the evidence of their malpractice and adverse outcomes is considerably less than physicians in all fields [32].

Labor force participation rates may underestimate workforce involvement or attrition and shortening

physician career arcs are already being observed [33]. One study on retirement trends of anesthesiologists showed a separation age at 62.7 years [34]. In another study, physician burnout surveys suggest that such a phenomenon may be occurring earlier and more frequently and may signal an early departure from a medical career [35]. Reasons for career burnout are numerous and missing from the dermatology literature.

This supply model also assumes that all three providers contribute the same amount of effort (work hours per annum) as previous generations of physicians [10]. However, annual productivity may be declining as younger physicians seek fewer work weeks per year . In family medicine group practices the annual visit and RVUs may be higher for PAs and NPs than physicians[38]. Whether this is true for dermatology has not been assessed. Therefore, estimates of supply may overestimate the productivity of the dermatology workforce, and predicted surpluses could decrease significantly if younger (millennial age) dermatology providers continue to work fewer annual hours than their predecessors [39]. The number of women in dermatology is also increasing rapidly with approximately two thirds of dermatology residents in 2013 being female [40]. Female dermatologists have historically worked fewer hours than their male counterparts, which may affect aggregate workforce productivity.

Growth in the per capita number of dermatology providers is unlikely to address the physician mal-distribution problem in the United States [8]. Proposed strategies to reach underserved communities may require increased investment in telemedicine and shared care models with dermatologists coordinating care with local primary care physicians in underserved communities lacking a dermatologist [7, 8].

Lastly, in estimating the future supply of dermatologists, potential cuts in residency funding ("low growth" model) as well as increased investment in education ("high growth" model) are important externalities that may have an influence on availability of provider resources.

Limitations

All micro simulation models have limitations and this

is no exception. The physician supply model (PSM) formed the basis of separation data for physicians but distinct retirement rates for dermatologists are missing. In some instances the Career Change Module in the PSM is used to "retire" physicians at earlier ages for high-intensity specialties such as emergency medicine. However, other variables such as sex, type of training (MD, DO, IMG), disability, leaves of absence, part-time, and net worth are factors mitigating age of retirement that can be further influenced by economic cycles and practice trends [42].

Although age is the most common single predictor of when physicians leave the workforce, age is simply a proxy for many factors that increase the propensity of physicians to retire [18]. Better predictor variables have been sought including net worth, specialty, sex, ethnicity, population density, gross domestic product (GDP), type of practice, health status, and burnout.

This projection model differs from other trend models. For example, the trend analysis approach used by Cooper and colleagues estimated that the correlation between a proxy for the demand for physician services (they use physician-to-population ratios under the assumption that historically, supply has equaled demand) and factors hypothesized to be major determinants of demand. Cooper used aggregate-level, time-series data to estimate the relationship between physicians-per-population and a hypothesized determinant: per capita GDP and demographics to control for population growth and aging. The modelers concluded that there is a trend to desiring a higher level of care (specialist care, in particular) that is limited primarily by a society's ability and willingness to pay [6, 43-45]. The 75-year correlation of GDP to medical service demand trend, beginning in 1930, remained faithful to 2005. However, beginning in the new century it became clear that demand was outstripping supply and would continue to do so in spite of a growing ratio of PA/NPs to physicians [6].

Conclusion

This study uses a labor economic stock and flow model, which relies on historical trends in growth to predict future events and to estimate future supply of dermatology providers in the United States. Although the supply of dermatology providers is growing

faster than the population, it is unknown whether the workforce is keeping pace with the growing demand for medical and cosmetic dermatology services in the United States. The dermatology workforce would likely face considerable shortages without continued growth in PAs and NPs. Increased investment in the training of nurse practitioners and physician assistants may be one effective strategy for addressing provider shortages within the specialty of dermatology.

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