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Research Brief

Number of Practicing Dentists per Capita in the United States Will Grow Steadily

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Key Messages

- *We update our estimates of the future supply of dentists in the U.S. by incorporating expected shifts in average age and gender composition. These shifts will impact hours worked and volume of patients seen, an aspect we did not address in our earlier modeling.*
- *Under what we consider to be the most probable scenario, the per capita supply of dentists in the United States, adjusted for hours worked and patient visits, is projected to increase through 2035.*
- *Understanding the future evolution of the total supply of dentists contributes only partially to the central policy question of whether the dental workforce will be able to meet population needs. The issue of provider adequacy is far more complex and further research is needed.*

Introduction

With any type of health care service, having a sufficient number and distribution of providers is critical in ensuring that the population can access the care it needs. In the dental care sector, there is intense debate at the federal level as well as in many states concerning the adequacy of the dentist workforce in terms of meeting current and future population needs. The Health Resources and Services Administration (HRSA), for example, estimates that there is a current shortage of 7,300 dentists in the United States.[1] Several dental schools that have opened in recent years cite insufficient supply of dentists as a key reason why more dental school graduates are needed.[2] The aging of the dentist workforce is another perceived link to the looming shortage of dentists in the United States, with retirements and reduced hours worked commonly cited as factors driving down the labor supply of dentists.[3]

Assessing the adequacy of the dentist workforce, of course, is not simply a supply-side issue. The demand for dental care on the part of the population, the mix of patients in terms

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of type of payer and geographic location, and a host of other factors all influence the judgment of whether the current and future dentist workforce is sufficient. For example, the aggregate supply of dentists may be adequate in size when compared to the aggregate demand for dental care. However, there may be an insufficient number of dentists relative to need or demand for dental care among disadvantaged populations or in certain geographic areas. The issue of dentist workforce adequacy is complex and further conceptual and empirical work is needed. This is true not just of dentistry, but other types of health care services.[4]

In this research brief, we project the number of dentists in the United States through 2035. However, we extend our previous analysis by adjusting for hours worked as well as the volume of patient visits. We do not attempt to make any judgments on the adequacy of the future dentist workforce. This would require much further investigation, incorporating demand-side factors and a host of other issues. Nevertheless, we feel our analysis is a major contribution to the evidence base as it leverages unique data and builds modeling scenarios based on empirical analyses of dentist behavior. It also incorporates the effect of a dentist workforce with a shifting age and gender profile on dentists' hours worked and volume of patient visits.

Results

In 2015, there were 195,722 practicing dentists in the United States.[5] This translated to 60.9 dentists per 100,000 population.

Our workforce projection model uses historical trends in inflows of dentists to and outflows of dentists from the workforce to inform various assumptions about future inflows and outflows. We defined our "baseline" modeling scenario on assumptions that we feel are most probable: that future outflow rates would be the same as those for 2010-2015 and that the annual number of U.S. dental school graduates would increase through 2020 and then remain constant. Under this scenario, the unadjusted number of dentists per 100,000 population increases from 60.9 in 2015 to 65.7 in 2035.

Dentists vary by gender and age group in the number of hours they work and the number of patients they treat per week. To account for this, we adjusted our projections for hours worked and number of patient visits. Our baseline modeling scenario seen in Figure 1 indicates that the projected number of dentists per 100,000 population will increase even after adjusting for hours worked and patient visits. In other words, the number of "full-time-equivalent" dentists per capita is expected to grow.

Figure 2 takes the same data from Figure 1 but summarizes changes over time from 2015 to 2035. The projected growth rate of the number of dentists per capita between 2015 and 2035 is 7.9 percent. Adjusting for expected shifts in hours worked due to the age and gender profile of the future dentist workforce, the growth rate of the supply of "full-time-equivalent" dentists is lower, at 6.5 percent. Replicating the same adjustment for patient visits, the growth rate is 4.5 percent. These two adjusted growth rates are lower because of the projected decline in average hours worked per dentist.

As our methods section describes, we defined three assumptions about future inflows of dentists into the workforce and three assumptions about future outflows of dentists from the workforce, as seen in Table 1. By pairing these assumptions in all possible combinations, we generated nine possible scenarios of workforce projections. Table 2 contains all nine scenarios adjusted for expected shifts in hours worked. Table 3 contains the scenarios adjusted for expected shifts in the number of patient visits per dentist. The baseline

scenario denotes what we feel is the most probable scenario.

Taken together, the nine scenarios in Table 2 suggest that the dentist workforce per capita, adjusted for hours worked, will increase in 20 years under all of our modeling scenarios: from 55.1 to some range between 56 and 61. This range of outcomes is greatly influenced by choice of assumption of the future number of U.S. dental school graduates. If the number of graduates increases or decreases by more than 1 percent per year (for 20 years), the future supply of dentists would fall outside the bounds described in Table 2.

The same principle applies to Table 3 where results are adjusted for expected shifts in patient visits. The nine scenarios on Table 3 suggest that the adjusted dentist workforce per capita will change in 20 years from 53.3 to a number between 53 and 58. If future conditions fall outside the bounds defined by our assumptions, the future dentist supply would fall outside the bounds of these scenarios.

Our baseline scenario also projects a change in the trend of an aging dentist workforce. From 2005 to 2015, the share of dentists aged 55 and older increased from 31 percent to 40 percent.[6] We project this share will decrease to 39 percent in 2020 and to 36 percent in 2035. This finding originates from the opening of ten new dental schools[7] in recent years and the resulting additional graduates entering the workforce.

Discussion

We developed a model to project the supply of practicing dentists in the U.S. that incorporates various sources of outflows from and inflows to the dentist workforce. The model, while conceptually straightforward, has the potential to generate numerous alternative scenarios based on different assumptions. We have taken considerable care to focus our analysis on what we feel are the most reasonable assumptions and have based this on extensive analysis of the best available empirical data. We emphasize, however, that different sets of assumptions will yield different results and we plan on updating the model as market conditions change.

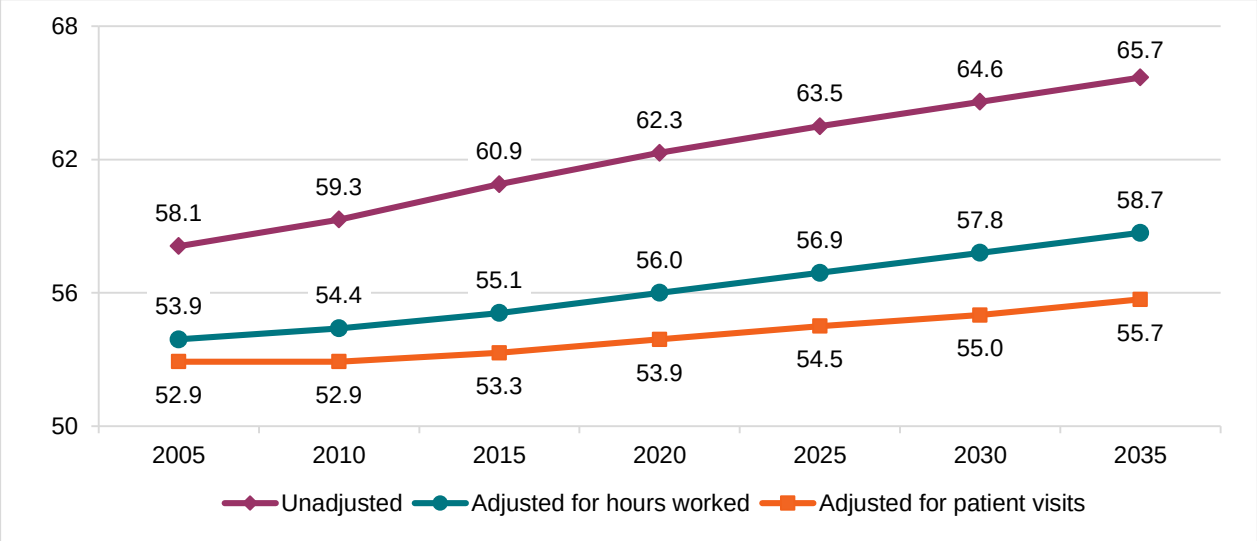
Our main finding is that under what we consider to be the most likely scenario, the per capita supply of dentists in the United States is projected to increase through 2035. More importantly, even after adjusting for expected reductions in hours worked and patient visits per dentist resulting from the age and gender profile of the dentist workforce, the supply of dentists is still expected to increase. Total inflows to the dentist workforce are expected to exceed total outflows, and this net gain is expected to outpace the projected growth of the U.S. population. Looking at alternative scenarios to what we feel is most probable, the vast majority still predict a stable or increasing supply of dentists.

As we note in the introduction, our analysis needs to be interpreted carefully. Understanding how the total supply of dentists might evolve only partially contributes to the central policy question of whether or not there is likely to be a shortage of dentists in the United States. The issue of provider adequacy is far more complex and, even at the most aggregate level, requires some type of assessment of the demand for dentists. The future demand for dentists, in turn, will depend on the future demand for dental care among the population, the future evolution of productivity and efficiency of dentists, and potential changes in the workforce mix within dental care delivery models. A recent analysis predicts that dental spending in the United States is expected to grow at much lower rates than in previous decades,[8] even after taking into

account the aging of the population. At the same time, the Affordable Care Act could expand dental coverage for certain groups, mainly children and low-income adults, and this is likely to increase demand for dental care among these groups. While further work is needed, our results suggest that, at the aggregate level, the United States could be entering a period of expanding supply of dentists and flattening demand for dental care. The shifts in the age and gender profile of the dentist workforce do not affect these conclusions.

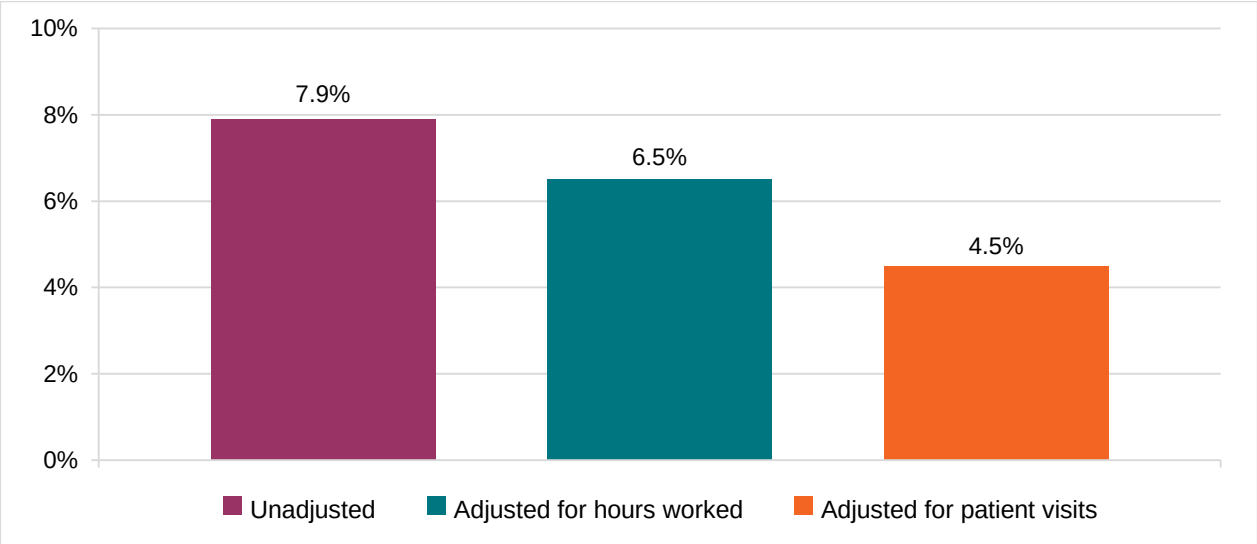
As we noted, highly aggregated national-level analyses like ours do not entirely address a key concern of oral health advocates: is the supply of providers adequate to meet the needs of key segments of the population? These key segments of the population are typically thought of according to geography (e.g. populations in rural versus urban areas), or by payer type (e.g. populations with Medicaid dental benefits versus commercial dental benefits). Answering this question requires much more sophisticated small-scale geographic analyses and comprehensive data on where Medicaid-accepting dentists are located. The Health Policy Institute is leading a comprehensive research agenda that is exploring such an analysis, and we hope other future research on this topic contributes empirical evidence on this important policy issue.

Figure 1: Historical and Projected Dentists per 100,000 Population in the U.S., Baseline Scenario



Sources: ADA Health Policy Institute analysis of ADA masterfile; ADA Survey of Dental Practice; ADA Survey of Dental Education; U.S. Census Bureau, Intercensal Estimates and National Population Projections. **Notes**: Data for 2005, 2010 and 2015 are based on the ADA masterfile. Results after 2015 are projected. Assumes (a.) U.S. total annual dental school graduates will increase until 2020 and then remain constant (b.) future outflow rates are same as 2010-15 historical percentages.

Figure 2: Percentage Increase in Projected Dentists per 100,000 Population in the U.S. from 2015 to 2035, Baseline Scenario



Sources: ADA Health Policy Institute analysis of ADA masterfile; ADA Survey of Dental Practice; ADA Survey of Dental Education; U.S. Census Bureau, Intercensal Estimates and National Population Projections. **Notes**: Data for 2005, 2010, and 2015 are based on the ADA masterfile. Results after 2015 are projected. Assumes (a.) U.S. total annual dental school graduates will increase until 2020 and then remain constant (b.) future outflow rates are same as 2010-2015 historical percentages.

Table 1: Assumptions for Inflows and Outflows Used in the Model

Three Inflow Assumptions
U.S. total annual dental school graduates will increase until 2020 and then increase 1% per year.
U.S. total annual dental school graduates will increase until 2020 and then remain constant.
U.S. total annual dental school graduates will increase until 2020 and then decrease 1% per year.
Three Outflow Assumptions
Outflow rates will be similar to those observed 2010 - 2015.
Outflow rates will be the composite of those observed 2005 - 2010 and 2010 - 2015.
Outflow rates will be similar to those observed 2005 - 2010.

Table 2: Summary of Workforce Projection under Nine Scenarios for Dentists per 100,000 Population, Adjusted for Hours Worked

Assumptions			Projections				
Inflow rate	Outflow rate same as	2015	2020	2025	2030	2035	Description
1% annual growth in graduates per year after 2020	2010 - 2015	55.1	56.0	57.2	58.7	60.7	Highest outcome
	Composite of 2005 - 2010 and 2010 - 2015	55.1	55.9	57.0	58.4	60.3	
	2005 - 2010	55.1	55.9	56.9	58.2	60.0	
Graduates per year remain constant after 2020	2010 - 2015	55.1	56.0	56.9	57.8	58.7	Baseline scenario
	Composite of 2005 - 2010 and 2010 - 2015	55.1	55.9	56.7	57.5	58.3	
	2005 - 2010	55.1	55.9	56.6	57.2	57.9	
1% annual decline in graduates per year after 2020	2010 - 2015	55.1	56.0	56.7	56.9	56.8	
	Composite of 2005 - 2010 and 2010 - 2015	55.1	55.9	56.5	56.6	56.4	
	2005 - 2010	55.1	55.9	56.3	56.3	56.0	Lowest outcome

Sources: ADA Health Policy Institute analysis of ADA masterfile; ADA Survey of Dental Practice; ADA Survey of Dental Education; U.S. Census Bureau, Intercensal Estimates and National Population Projections. **Notes**: Data for 2015 are based on the ADA masterfile. Results after 2015 are projected.

Table 3: Summary of Workforce Projection under Nine Scenarios for Dentists per 100,000 Population, Adjusted for Patient Visits

Assumptions			Projections				
Inflow rate	Outflow rate same as	2015	2020	2025	2030	2035	Description
1% annual growth in graduates per year after 2020	2010 - 2015	53.3	53.9	54.8	56.0	57.7	Highest outcome
	Composite of 2005 - 2010 and 2010 - 2015	53.3	53.8	54.6	55.7	57.3	
	2005 - 2010	53.3	53.7	54.4	55.4	57.0	
Graduates per year remain constant after 2020	2010 - 2015	53.3	53.9	54.5	55.0	55.7	Baseline scenario
	Composite of 2005 - 2010 and 2010 - 2015	53.3	53.8	54.3	54.8	55.3	
	2005 - 2010	53.3	53.7	54.2	54.5	55.0	
1% annual decline in graduates per year after 2020	2010 - 2015	53.3	53.9	54.3	54.2	53.9	
	Composite of 2005 - 2010 and 2010 - 2015	53.3	53.8	54.1	53.9	53.5	
	2005 - 2010	53.3	53.7	53.9	53.6	53.1	Lowest outcome

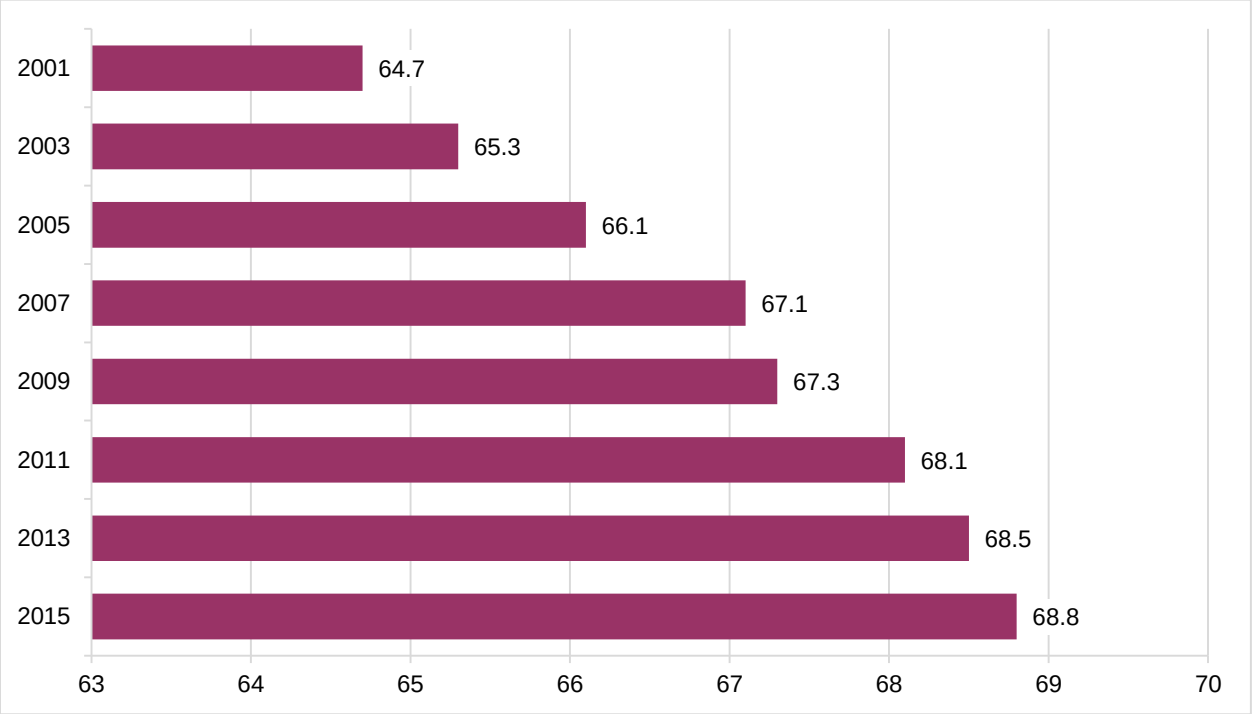
Sources: ADA Health Policy Institute analysis of ADA masterfile; ADA Survey of Dental Practice; ADA Survey of Dental Education; U.S. Census Bureau, Intercensal Estimates and National Population Projections. **Notes**: Data for 2015 are based on the ADA masterfile. Results after 2015 are projected.

Table 4: Historical Outflow Rates

	Total 5-year Outflow Rates from Workforce		
	2005 - 2010	2010 - 2015	Composite of 2005 - 2010 and 2010 - 2015
Age under 35	2.5%	2.0%	2.2%
Age 35 - 44	2.9%	2.0%	2.5%
Age 45 - 54	4.4%	3.4%	3.9%
Age 55 - 64	14.8%	14.7%	14.7%
Age 65 - 74	38.8%	40.7%	39.9%
Age 75 - 84	59.3%	61.7%	60.7%
Age 85 - 99	80.7%	96.3%	89.9%

Source: ADA Health Policy Institute analysis of ADA masterfile; ADA Distribution of Dentists.
Note: Total outflow rates denote the percentage of dentists who had retired, whose license had lapsed, or who were deceased.

Figure 3: Dentists' Average Age at Retirement, 2001-2015



Source: ADA Health Policy Institute analysis of ADA masterfile.

Table 5: Historical Dentist Inflows, 2005-2010

	U.S. Dental School Graduates	Foreign-trained Dentists	Relicensed Dentists	Dentists Returned from Retirement	Total
Age under 35	20,071	519	6	1	20,597
Age 35 - 44	3,269	1,050	359	22	4,700
Age 45 - 54	226	604	551	67	1,448
Age 55 - 64	15	154	382	136	687
Age 65 - 74	2	29	109	118	258
Age 75 - 84	0	2	19	73	94
Age 85 - 99	0	0	1	6	7
Total	23,583	2,358	1,427	423	27,791

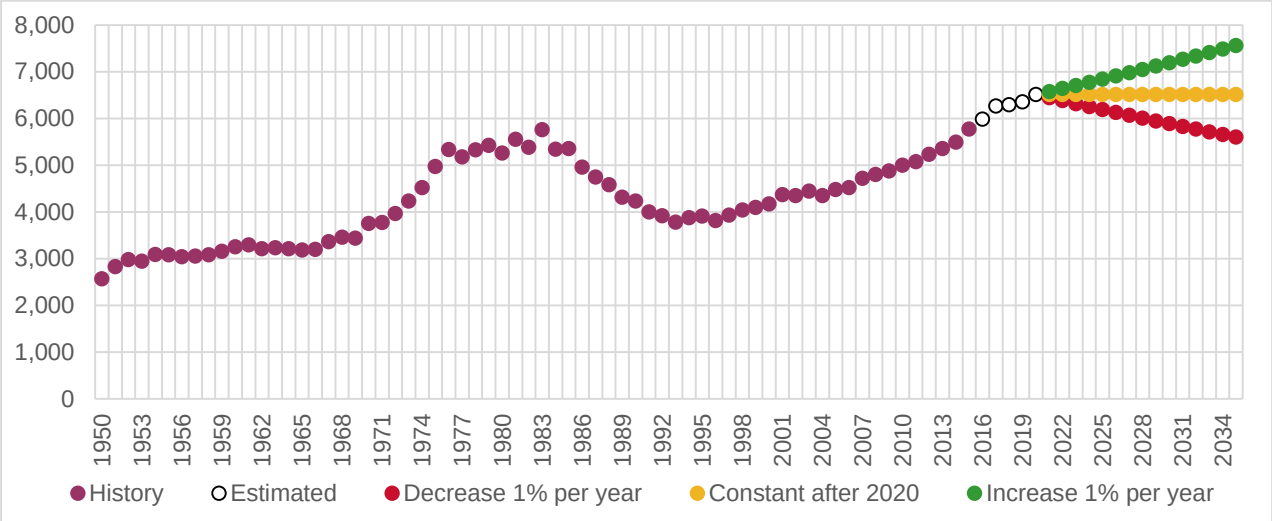
Source: ADA Health Policy Institute analysis of ADA masterfile. **Notes:** Dentists counted toward inflow totals when they were on record with both a degree in dentistry and a license to practice.

Table 6: Historical Dentist Inflows, 2010-2015

	U.S. Dental School Graduates	Foreign-trained Dentists	Relicensed Dentists	Dentists Returned from Retirement	Total
Age under 35	22,919	571	0	1	23,491
Age 35 - 44	3,586	1,078	286	12	4,962
Age 45 - 54	274	458	437	42	1,211
Age 55 - 64	17	182	378	88	665
Age 65 - 74	1	62	133	75	271
Age 75 - 84	0	9	27	28	64
Age 85 - 99	0	2	3	3	8
Total	26,797	2,362	1,264	249	30,672

Source: ADA Health Policy Institute analysis of ADA masterfile. **Notes:** Dentists counted toward inflow totals when they were on record with both a degree in dentistry and a license to practice.

Figure 4: U.S. Dental School Graduates per Year, Historical and Three Projected Scenarios



Sources: ADA Health Policy Institute Survey of Dental Education, ADA Health Policy Institute projected scenarios. **Notes:** Data for years 1950-2015 are historical. Estimates for 2016-2020 assume that all dental schools in operation in 2016 will maintain current or expected levels of graduates per year until 2020. Results after 2020 are projected scenarios.

Table 7: Example of Workforce Model Projection, 2015-2020, for Baseline Scenario (Unadjusted)

	Column A	Column B	Column C	Column D	Column E	Column F	Sum of Columns D, E, F
	Professionally active dentists, 2015	Assumed five-year outflow rate	Apply five-year outflow rate	Apply aging logic to Column C to yield 2020 age distribution	Inflow of new U.S. grads	Inflow of foreign-trained, relicensed, & unretired dentists	Professionally active dentists, 2020
Age under 35	31,137	2.0%	30,527	8,548	26,782	651	35,980
Age 35 - 44	44,604	2.0%	43,707	43,396	4,270	1,519	49,185
Age 45 - 54	42,120	3.4%	40,700	41,420	345	927	42,692
Age 55 - 64	48,587	14.7%	41,429	46,843	0	746	47,589
Age 65 - 74	24,614	40.7%	14,600	26,377	0	442	26,820
Age 75 - 84	4,267	61.7%	1,635	5,672	0	116	5,787
Age 85 - 99	393	96.3%	15	358	0	12	370
Total	195,722		172,614	172,614	31,397	4,412	208,423

Sources: ADA Health Policy Institute analysis of ADA masterfile; ADA Survey of Dental Education. **Notes**: Data for 2015 are based on the ADA masterfile. Results after 2015 are projected. Totals in the projection may not appear to match the sum of subgroups due to the rounding of fractional numbers produced by the model. Assumes (a.) U.S. total annual dental school graduates will increase until 2020 and then remain constant (b.) future outflow rates are the same as 2010-2015 historical percentages. Outflow rate in Column B is the percentage of dentists who had retired, whose license had lapsed, or who were deceased.

Table 8: Historical and Projected Female Share of U.S. Dentist Workforce

	2005	2010	2015	2020	2025	2030	2035
Age under 35	38.6%	43.6%	47.9%	50.0%	50.0%	50.0%	50.0%
Age 35 - 44	31.5%	36.0%	39.9%	45.0%	48.4%	50.0%	50.0%
Age 45 - 54	17.9%	25.6%	32.8%	36.6%	41.2%	46.7%	48.8%
Age 55 - 64	5.6%	10.9%	18.1%	25.6%	32.8%	36.6%	41.2%
Age 65 - 74	2.7%	3.8%	6.4%	12.4%	19.2%	27.2%	34.0%
Age 75 - 99	1.9%	2.0%	2.9%	4.5%	8.6%	15.3%	22.2%
All ages	20.0%	24.1%	28.9%	34.3%	38.9%	42.6%	45.1%

Source: ADA Health Policy Institute analysis of ADA masterfile. **Notes**: Data for 2005, 2010, and 2015 are historical. Results after 2015 are projected and assume that the female share will level off at 50% for each age cohort.

Table 9: Dentist Hours Worked by Dentist Gender and Age Group

	Average Annual Hours Worked		Indexed to Male, Age under 35	
	Male	Female	Male	Female
Age under 35	1,818.7	1,591.9	1.000	0.875
Age 35 - 44	1,815.8	1,550.5	0.998	0.853
Age 45 - 54	1,782.1	1,576.3	0.980	0.867
Age 55 - 64	1,672.4	1,555.2	0.920	0.855
Age 65 - 74	1,403.3	1,444.2	0.772	0.794
Age 75 - 99	1,181.3	857.9	0.650	0.472

Source: ADA Health Policy Institute, 2000-2014 results from the Survey of Dental Practice.

Table 10: Patient Visits per Week (Excluding Hygienist Visits) by Dentist Gender and Age Group

	Average Patient Visits Per Week (Excluding Hygienist Visits)		Indexed to Male, Age under 35	
	Male	Female	Male	Female
Age under 35	61.9	51.0	1.000	0.824
Age 35 - 44	63.4	50.6	1.024	0.817
Age 45 - 54	60.7	46.6	0.981	0.753
Age 55 - 64	55.3	46.0	0.893	0.743
Age 65 - 74	46.1	34.8	0.745	0.562
Age 75 - 99	33.9	19.8	0.548	0.320

Source: ADA Health Policy Institute, 2000-2014 results from the Survey of Dental Practice.

Data & Methods

Data Sources and Methodological Approach

We used five data sources in our analysis. The American Dental Association (ADA) masterfile contains the most up-to-date information on dentists in the United States. The masterfile is a database of all dentists, practicing and non-practicing, in the United States. It is updated through a variety of methods including reconciliation with state licensure databases, death records, and various surveys and censuses of dentists carried out by the ADA. We used the masterfile's archived datasets from December of 2005, 2010 and 2015 to gather historical information on the the dentist population profile, including dentists' ages, dental school graduation years, licensure status, practice location, retirement dates and deceased dates. This provides us with a "snapshot" for each of our study years. In addition, through various unique identifiers, we are able to track critical information for each dentist over time.

As a supplement to the ADA masterfile, we used the ADA Health Policy Institute's Distribution of Dentists (DOD) survey data from 1998 through 2013. This rolling census is sent to all dentists in the United States using a panel methodology. All dentists are assigned to one of three panels. Each year, one panel is surveyed for their location, practice status and demographic information. The survey's response rates for the three most recent years were 75.9 percent, 68.4 percent, and 72.0 percent.

To calculate historical measures of dentists per 100,000 population, we used U.S. Census Bureau population counts.[9] To calculate future estimates of dentists per 100,000 population, we combined our future dentist supply modeling results with the U.S. Census Bureau's national population projections.[10]

We relied on the ADA's Survey of Dental Education for historical data on the number of graduates of U.S. dental schools.[11]

To gauge the variation in dentists' working hours and number of patient visits, we used the ADA's Survey of Dental Practice results from 2000 through 2014.

The workforce projection model uses historical trends in inflows of dentists to and outflows of dentists from the workforce to inform various assumptions about future inflows and outflows. We defined three types of outflows of dentists: (1) those who retired, (2) those whose license expired, and (3) those who died before retirement. We do not have data on dentists who migrate from the United States to other countries, but expect most of these cases to entail a license expiration which our data account for.

We defined four types of inflows of dentists: (1) new U.S. dental school graduates who became licensed to practice in the U.S., (2) foreign-trained dentists who became licensed to practice in the U.S., (3) dentists who reactivated an expired license, and (4) dentists who returned from retirement to the workforce.

We analyzed seven age groups of dentists separately to capture important differences in behaviors across the life cycle (e.g., propensity to graduate or retire). The age groups are: under 35, 35 to 44, 45 to 54, 55 to 64, 65 to 74, 75 to 84, and 85 to 99.

Calculation of historical outflows

We analyzed historical data on outflows across two five-year periods: 2005 to 2010 and 2010 to 2015. We also analyzed the composite of these two historical periods for our modeling. For each of these three outflow definitions, we calculated outflow rates for each age group. For example, for dentists in the workforce

who were ages 55 to 64 in 2010, we calculated the proportion who were retired in 2015. This provided a retirement rate for the 55 to 64 age group for the period 2010-2015. We also calculated the proportions who were deceased or whose license was expired in 2015.

We calculated the outflow rates using the ADA masterfile and DOD surveys. By analyzing and combining results from both sources, we computed total outflow rates (the combined shares of dentists who had retired, whose license had lapsed, or who were deceased). Table 4 displays the total outflow rates for the three outflow definitions in our analysis.

We generated projections of outflows based on these three outflow definitions. Our overall baseline scenario corresponds to the assumption that future outflow rates would be the same as those observed in 2010-2015. This interval corresponds to a time of higher retirement ages, a trend that preceded the recession (see Figure 3). It is also based on recent research showing the dental economy is unlikely to return to pre-recession growth levels and, therefore, we feel retirement patterns are not likely to return to pre-recession levels.[8]

Calculation of historical inflows

We analyzed historical data on inflows for the periods 2005-2010 and 2010-2015 (Tables 5 and 6). We also estimated the number of U.S. dental school graduates from 2016 through 2020 based on known enrollment and expected attrition of dental school students. The estimates account for the opening of ten dental schools since 2008. We incorporated the estimate of 2016-2020 graduates into all scenarios; we assume that all dental schools in operation this year will maintain current or expected levels of graduates per year at least until 2020.

We developed three scenarios for the future inflows of dentists into the workforce based on three assumptions for the number of future graduates from 2020 to 2035. The medium scenario assumed that after 2020, the annual number of dental school graduates would remain constant at the level estimated for 2020. The high and low scenarios assumed that after 2020, the annual number of graduates would increase or decrease, respectively, at the rate of 1 percent per year. Figure 4 displays both historical and projected numbers of graduates per year under these three assumptions.

We generated future projections of inflows based on these high, medium and low numbers of new graduates joining the workforce. Our overall baseline scenario assumed that the medium inflow projection would apply, meaning the annual number of graduates would increase until 2020 and then remain constant. Our choice of inflow projection is based on the assumption that, while we can reasonably estimate the number of graduates through 2020, uncertainty increases thereafter.

We recognize that the future number of dental school graduates is subject to intense debate and speculation. On one hand, there are dental schools that have recently opened. On the other hand, the flattening of dentist earnings in recent years[12] combined with increases in educational debt could place downward pressure on the number of dental school applicants, as suggested in previous research.[13,14]

Historically, at least 80 percent of inflows have been new U.S. dental school graduates with remaining inflows coming from foreign-trained dentists, established dentists who reactivated an expired license, and dentists who came out of retirement. Tables 5 and 6 show that these smaller subsets of inflows have been a variable proportion of the total supply of dentists. Therefore, to minimize the number of scenarios under consideration, we designed the model to project this smaller subset of inflows as a constant percentage of active licensed dentists. We

feel this is a reasonable assumption and our sensitivity analysis shows alternative assumptions have no relevant impact on overall results.

Combining outflows and inflows in the model for unadjusted dentist estimates

The model started with the 2015 active licensed dentist workforce broken down into seven age groups. We applied various assumptions for outflows per age group to calculate the number of these dentists still working in 2020. We applied aging logic, based on masterfile historical patterns of how these seven age groups move from younger to older groups in a five-year period, to yield an updated age distribution for 2020. To this total, we added the estimated inflows of new dental school graduates, foreign-trained dentists, and relicensed and unretired dentists by age group.

Table 7 summarizes the basic working of the model and shows results for our baseline scenario of the projected dentist workforce (unadjusted) in 2020. We repeated the process to calculate projections for 2025, 2030 and 2035.

Female share of the dentist workforce

We examined the historical trends of females as a share of dental school graduates and the dentist workforce. From 1975 to 2015, the female share of U.S. dental school graduates grew dramatically from 3.1 percent to 48.0 percent.[15,16]

The increase in female dental school graduates since the 1970s affects the dentist workforce today. Among active dentists aged 35 or younger, the female share grew from 38.6 percent (2005) to 43.6 percent (2010) to 47.9 percent (2015). In other words, the female share grew by 5.0 percent (2005-2010) and then by 4.3 percent (2010-2015).

For active dentists ages 55 to 64, by comparison, the female share grew from 5.6 percent (2005) to 10.9 percent (2010) to 18.1 percent (2015).

After analyzing the historical growth of females in all dentist age cohorts, we projected the future female share of each cohort, as summarized in Table 8. These projections assume that the female share will level off at 50 percent of the workforce.

We applied these projected percentages of women in the dentist workforce to our total workforce projection, yielding projections of the dentist workforce by gender and age group.

Adjusted projections

For each dentist gender and age group, we calculated the average annual hours worked. We then calculated an index of hours worked that compared every gender and age group to male dentists aged under 35 – the group with the highest average and the group we use as the reference group. For example, the “hours worked” index for females aged under 35 was 0.875 because their average annual hours worked was 87.5 percent of the level for males aged under 35 (see Table 9).

We performed similar calculations for all dentist gender and age groups based on average patient visits per week (excluding hygienist visits), as seen in Table 10.

Using these indices per gender and age group as multipliers to the projection of the dentist workforce by gender and age group, we calculated the adjusted projections of dentists per 100,000 population seen in Tables 2 and 3. Both tables show the nine scenarios we selected to display a variety of combinations of assumptions of future inflows of dentists to and outflows of dentists from the workforce.

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