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A National Study of the Practice Characteristics of Women in Dentistry and Potential Impacts on Access to Care for Underserved Communities

OHWRC
Oral Health Workforce Research Center

Center for Health Workforce Studies
School of Public Health
University at Albany, State University of New York

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PREFACE

The Oral Health Workforce Research Center (OHWRC) at the Center for Health Workforce Studies (CHWS) at the University at Albany's School of Public Health completed a research project to understand how demographic changes within the dental profession, including aging and gender distribution, are affecting dental practice characteristics and practice locations.

For this, project, OHWRC collaborated with the American Dental Association (ADA) in order to access and analyze its Masterfile and Survey of Dental Practice (SDP) data. This project also included an extensive literature review. The goal of the study was to understand differences in practice characteristics by gender and to anticipate changes in the professional workforce that might affect the availability of dental serivces in underserved areas.

Simona Surdu, Margaret Langelier, and Nubia Goodwin prepared this report for OHWRC. Yuhao Liu completed the data analyses for the Masterfile and SDP datasets. Leanne Keough and Matt Allegretti completed layout design.

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The mission of OHWRC is to provide accurate and policy-relevant research on the impact of the oral health workforce on oral health outcomes. The research conducted by OHWRC informs strategies designed to increase access to oral health services for vulnerable populations. OHWRC is based at CHWS at the School of Public Health, University at Albany, State University of New York (SUNY), and is the only research center uniquely focused on the oral health workforce.

The views expressed in this report are those of OHWRC and do not necessarily represent positions or policies of the American Dental Association, School of Public Health, University at Albany, or SUNY.

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ACKNOWLEDGMENTS

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Institutional Review Board

The plan for this study was reviewed and designated exempt from further review by the Institutional Review Board of the New York State Department of Health (Study No. 1199770-1).

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BACKGROUND

Although health services professions and occupations have long attracted women to their ranks, in the past, the majority of women were found in those considered "semi-professions"[1] or mid-level professions, such as nursing, physical therapy, dental hygiene, and social work, or in support or paraprofessional occupations including dental assisting, home health aides, and nursing aides. Many of these professions, including dental hygiene, occupational therapy, and speech pathology, remain mostly female, although male presence in nursing and physical therapy, for instance, has increased.[1] For many reasons, historically, females were not represented proportionately in higher-paying clinical disciplines such as medicine, dentistry, and veterinary medicine.

Barriers to entry to these professions have decreased over time due to societal and economic forces, including emerging workforce shortages in health care professions and changes in the business models for health services delivery, resulting in improved access for women to professional pipelines. Some attribute the increase in female participation in these professions to higher enrollments of women in college, leading to increased participation in postgraduate professional education programs and/or to increased enrollment of males in science, technology, engineering, and math (STEM)–related professions that divert them from health professions.[2]

For myriad reasons, the participation of females in higher-paying health professions has increased. Currently, approximately 50% of veterinarians are female,[3] 35% of physicians are female,[4] and 31% of dentists are female.[5] Female participation in these professions will likely grow as the percentage of female graduates from medical (48.5% of graduates in 2017[6]) and dental (46.3% of graduates in 2017[7]) education programs either stabilize at current levels or continue to increase and as many older, predominately male professionals depart the workforce. While the reasons for gender diversification can be attributed to a variety of endogenous and exogenous factors, the long-term impact of professional diversification is not yet well understood.

Women are thought variously to work fewer hours, to be more likely to work part time, to choose specialties that are more consultative than surgical in nature, and to provide more empathetic services than men.[1,8-13] Prior research has also shown that female dentists were more likely than male dentists to work in public health settings and to treat low-income patients.[11,14,15]

Understanding changing practice patterns is useful in determining how a system of care might respond contextually to anticipated gaps in care using innovative service delivery models, workforce incentives, or alternative workforce as providers of services or novel points of entry and referral to the oral health care system. Equipping primary care medical practices to assess the oral health status of patients is one such

strategy; expanding scopes of practice for other dental professionals is another. Encouraging greater use of mobile dentistry or teledentistry and providing workforce incentives for practice in underserved areas are additional possible initiatives.

While there is discussion that the increasing gender diversity in dentistry will affect practice models, work hours, and the availability of specialty dentists or dentists in less populated areas, there is limited research that describes variation in characteristics of dental practice by gender. The lack of information on the subject makes it difficult to assess the impact of the increase in female dentists on workforce capacity. The objective of this research was to describe trends in practice preferences by gender that might result in alterations in the dental services delivery system, the availability of dental services, or the distribution of dental professionals, especially in rural areas or for underserved communities.

METHODS

The present study consisted of 3 major parts:

1. **Literature review.** An extensive review of peer-reviewed journal articles and other published documents was conducted to better understand the impact of gender diversification in dentistry on dental services delivery.

2. **Secondary data analysis of the ADA Masterfile.** This study used ADA Masterfile data from 2010, 2012, 2014, and 2016 to describe trends in the demographics and practice characteristics of the US dental workforce across years.

3. **Secondary data analysis of the ADA Survey of Dental Practice (SDP).** The study used data from the SDP conducted in 2017 (describing practice patterns in 2016) to evaluate differences in the practice patterns of female and male dentists.

Data Sources

The ADA Masterfile is a comprehensive database of all dentists, practicing and non-practicing, in the US.[16] The ADA Masterfile compiles demographic information, dental specialty, year of graduation, dental school of graduation, and practice type and location. The ADA updates the Masterfile annually and collaborates with outside sources of information.[17] The ADA also uses the ADA Survey of Dental Graduates and survey data accrued through research conducted by its own research arm, the Health Policy Institute (HPI), to maintain the currency of the Masterfile.[5,17] The breadth of the information in the ADA Masterfile has been used to support and inform workforce policy regarding oral health access.[18]

Researchers also used data from the ADA's annual Survey of Dental Practice (SDP). The SDP surveys a nationally representative, random sample of professionally active licensed dentists in private practice regardless of membership status in the ADA, including general practitioners and specialists throughout the US.[5] The ADA uses the SDP to monitor private practice income and expenses, the characteristics of private dental practices, and employment of dental practice personnel.[19] The SDP also provides specific information about the characteristics of dentists and their patients in the year preceding survey completion.

Data Analysis

The data analyses for this project used descriptive and multivariable statistical methods (eg, percentage change, chi-square test, t test, Mann–Whitney U test, multilevel logistic and Poisson regressions) to

estimate differences in practice patterns between male and female dentists by age cohort. In addition, data analysis of the SDP was conducted using data from a subgroup of solo practitioners who were sole proprietors (ie, the only owners of their practice) and the only dentists in the practice treating patients. This strategy allowed researchers to estimate differences in practice capacity (ie, patient volume change and percentage of patients by age and dental insurance type) by gender and age. The estimates generated from the analysis of the SDP data were weighted to account for oversampling of specialists and potential nonresponse bias.

Study findings were considered statistically significant if the P value was less than .05. All analyses were conducted in SAS v9.4 (SAS Institute Inc., Cary, North Carolina).

KEY FINDINGS

In 2016, nearly 30% of all dentists in the US were female.

- In 2016, among 192,260 dentists in the US with information on gender, 29.8% were female. Utah, Idaho, Wyoming, Arkansas, and Montana had the lowest proportions while Maryland, Massachusetts, and DC had the highest proportions of female dentists.

In 2016, the female dentist population was younger and more racially/ethnically diverse than the male dentist population.

- The mean age of female dentists (43.9 years) was significantly lower than the mean age of male dentists (52.8 years). Statistically significant higher proportions of female than male dentists were Asian (23.4% vs 21.1%), Hispanic (7.9% vs 4.2%). or black or African American (6.0% vs 2.9%).

From 2010 to 2016, there was an increase in gender and racial/ethnic diversity in the dental workforce.

- Between 2010 and 2016, the proportion of female dentists increased from 24.5% to 29.8% (21.7% change). Over the study period, there was an increase in the proportion of Asian female dentists (5.1% change) as well as Asian (16.5% change) and Hispanic (8.3% change) male dentists.

Female dentists were more likely to be foreign trained, to have a postgraduate education, and to work in pediatric dentistry.

- The majority of female and male dentists were US-trained, did not complete an advanced dental education residency program, and worked as general practitioners. However, a statistically significant larger proportion of female than male dentists were foreign-trained (8.3% vs 4.4.%), completed a dental residency (39.2% vs 32.0%) particularly in pediatric dentistry (15,6% vs 7.0%) and general practice dentistry (54.1% vs 41.1%), and worked as pediatric dentists (6.1% vs 2.8%).

Female dentists were more likely to be employees or independent contractors, to work part-time, and to practice in suburban/urban areas.

- The majority of female and and male dentists owned their practice, worked full-time in private practice, and practiced in suburban/urban areas. However, the likelihood of female dentists working as employees or independent contractors and working part time was 1.5 to 4 times greater than male dentists in all age cohorts ≤65 years. In contrast, the likelihood of female dentists practicing in small towns or rural areas was 17% to 40% lower compared with male dentists. Findings were adjusted for dentists' race/ethnicity, location of training, residency, speciality, rurality of state where primary practice was located, and year of data.

From 2010 to 2016, there was an increase in dental residency participation, specialty practice, employee status, and urban practice of dental workforce.

- Between 2010 and 2016, the proportion of dentists who completed residencies increased by 10.4% among women and by 16.6% among men. The proportion of dentists working in pediatric dentistry and oral surgery increased among women (44.3% and 30.0% change, respectively) and men (21.7% and 15.9% change, respectively). Similarly, the proportion of employed dentists and dentists working in metropolitan areas increased among both women (11.9% and 6.1% change, respectively) and men (19.8% and 5.8% change, respectively).

Female dentists were more likely to report less time worked in the primary practice; however, they were more likely to report a higher level of busyness in their practice than male dentists.

- In 2016, among 2,258 professionally active dentists in private practice in the US with information on gender, female dentists spent statistically significant fewer average hours per week in the dental office (34.3 vs 35.7). Female dentists also spent fewer hours per week treating patients (30.4 vs 31.4) than male dentists. A statistically signifcant larger proportion of female than male dentists reported being too busy to treat all of the people requesting care (7.6% vs 4.9%) or providing care to all who requested services but being overworked (20.3% vs 18.6%).

Female dentists were more likely to report an increase in the patient volume in their practice in the last year and to treat children and publicly insured individuals than male dentists.

- Among a subset of 825 solo practitioners, a statistically significant larger proportion of female than male dentists reported an increase in patient volume in their practice during 2016 (44.9% vs 31.1%). The likelihood of female dentists providing services to patients <18 years of

age was 16% to 53% higher compared with male dentists in all age cohorts ≤65 years. Similarly, the likelihood of female dentists providing services to patients covered by public dental insurance was 30% to 80% higher compared with male dentists. Findings were adjusted for dentists' race/ethnicity, location of training, residency, specialty, and rurality of state where primary practice was located.

DISCUSSION

Ownership or Employment

Recent trends show an increase in group practices and changing business management models in dentistry[20] (eg, dental service and support organizations) that may provide practice options including employment in, rather than ownership of, dental practices. These models may offer more structured work hours and benefits (ie, flexibility) than are possible in small dental practices. Our study found that female dentists were significantly more likely to work as employees or independent contractors than male dentists in all age cohorts up to 65 years. The trend away from dental practice ownership to employment was similar for males and females between 2010 and 2016, but females were significantly more likely in all years to be employees. Preference for associate status/employment among female dentists was noted in several previous studies.[9,11,12]

Our study findings also showed that practice ownership increases with age among both male and female dentists. This suggests that the availability of employment as a work option and the commensurate flexibility may not be the sole reason for greater participation of females in the workforce. What these data do suggest is that having a broader range of practice options to tailor participation in practice to meet individual dentists' needs may encourage workforce diversification.

Work Hours

Workplace flexibility is also reflected in the availability of varying work schedules. Our study findings indicated that the percentages of female (90.2%) and male (89.2%) dentists who worked full time (defined as 30 or more hours per week) were similar. However, a statistically significant higher proportion of female dentists worked part time than male dentists in all age cohorts. The proportion of both female and male dentists working part time increased with age, suggesting that older professionals are availing themselves of workplace flexibility even more than younger professionals—an interesting finding considering the widely held perception that younger female dentists are more likely to work part time due to childbearing or family responsibilities related to children.

Patient Volume and Work Capacity

Proportionally more female than male dentists also reported being too busy to treat all of the people requesting appointments (7.6% vs 4.9%) or reported providing care to all who requested appointments but being overworked (20.3% vs 18.6%). Another interesting finding was that, although female dentists were significantly more likely to work part time, female dentists in private practice averaged

more weekly patient visits (53.4) than male dentists (50.9) in 2016, although the difference was not statistically significant. One reason for the variation in patient visits might be the diminished likelihood of female dentists owning a practice. Practice owners often have administrative responsibilities that would reduce the time available for clinical activities.

These data suggest that small differences in practice hours by gender may be compensated for by differences in patient volume. While differences in patient volume by gender are not easily explained, some of the variation might be attributed to differences in the services provided during patient visits. Previous research has suggested that female dentists are more likely than male dentists to focus on preventive therapies.[21] Another potential factor affecting patient volume may be related to patient age. Female dentists were more likely than male dentists to treat younger patients, for whom the type and duration of services may vary from those required for adults. Understanding differences in practice patterns by gender and the resulting impact on patient capacity would be a worthwhile area for future research.

Residency Participation

Women dentists were more likely to complete postgraduate dental residency programs than men but were less likely to participate in most dental specialties, with the exception of pediatric dentistry. More than half (54.1%) of the female dentists who competed a residency did so in general practice; 15.6% completed a postgraduate training program in pediatric dentistry. An earlier study of US dental students found that females exhibited a preference for residencies in pediatric dentistry and advanced education in general dentistry at entry to predoctoral dental education programs.[22] Although our findings suggest that some dental specialties (eg, oral and maxillofacial surgery) are persistently more "male," increasing rates of female participation in these areas suggest slower but progressive diversification even within these dental specialties.

Patient Populations

Our study also found that female solo practitioners in all age cohorts 65 years of age or younger were significantly more likely to provide dental services to children <18 years of age compared with male dentists. In 2016, a significantly higher proportion of females worked as pediatric dentists than males (6.1% vs 2.8%). In addition, the likelihood of female dentists aged 36 to 65 years treating patients covered by public insurance was higher than for male dentists in the same age cohorts. These are important findings relating to underserved populations and access to dental care.

Foreign-Trained Dentists

A previous study noted that a contributing factor to gender diversification was an increase in the number of foreign-trained dentists practicing in the US.[1] Dentistry was already predominantly female in many countries, especially in Eastern Europe, so that dentists migrating to the US were also proportionally more female. Our study found that proportionally more female dentists (8.3%) in the US were foreign trained than were male dentists (4.4%), suggesting other dimensions of diversification within the workforce contemporaneous with gender diversification (eg, language diversity, cultural diversity, racial and ethnic diversity).

Geographic Distribution

Female and foreign-trained dentists were similar in their preferences for suburban and urban practice. In 2016, the majority of female and male dentists (≥95%) worked in suburban and urban areas. Significantly more female dentists worked in suburban and urban areas compared with male dentists in all age cohorts. The findings from the present study relative to dentists' practice locations may have implications for the availability of dental services in less-populated areas in the US over time. However, economic/market forces may impact practice choices in the future independent of current geographic preferences.

LIMITATIONS

Findings in this report are subject to several limitations. First, missing data (ie, >10% missing information on dentists' employment situation and/or practice ZIP code in the Masterfile) or small sample size (ie, SDP) can reduce the statistical power of the study and may cause bias in the estimates. The potential limitations of SDP data collection were addressed by weighting the survey sample to achieve a representative profile of the national population of dentists. In addition, the findings were weighted to compensate for potential nonresponse bias with respect to dentist characteristics including age, specialty, ADA membership, and county of practice. Despite these data weaknesses, the ADA's Masterfile and annual SDP provide the most comprehensive data on US dentists and have been used in numerous oral health workforce studies.

Due to the nature of the secondary analysis of existing data, this study was not able to evaluate the influence of some other important factors not collected in the ADA Masterfile and SDP (eg, marital status, household annual income, number and age of children) on differences in practice patterns by gender among US dentists. Finally, the study's cross-sectional design precludes any causal inferences between gender diversity in dentistry and oral health practice patterns.

CONCLUSIONS

The findings from this study suggest that trends in the diversification of the dental workforce should be monitored over time so that pipeline programs, policy advocates, and professional stakeholders can be proactive in responding to changes in practice preferences, especially those related to the geography of dental practices. This study found small differences in practice hours by gender but compensating differences in patient volume, suggesting that concerns about substantial changes in capacity within the dental delivery system may be unfounded.

Gender diversification of the dental workforce is only one aspect of our changing health care and oral health care delivery systems. Dental professionals and others are making personal choices about work in the context of a fast-changing policy environment, so it is difficult to attribute changes in workforce preferences to gender alone. Many factors, including generational differences, will continue to affect the practice configurations in dentistry. It is important to continually monitor the workforce in order to ensure the adequate supply and appropriate distribution of dental professionals to meet the needs of the growing, aging, and also changing US population.

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Technical Report

BACKGROUND

Although health services professions and occupations have long attracted women to their ranks, in the past, the majority of women were found in occupations and professions considered "semi-professional"[1] or "mid-level", such as nursing, physical therapy, dental hygiene, and social work, or in support or paraprofessional occupations including dental assisting, home health aides, and nursing aides. Sociological literature suggests that many of these professions were designed based on historical gender relations, with professions such as nursing and dental hygiene being established as work for females under the direction of male doctors and dentists.[1] Many of these professions, including dental hygiene, occupational therapy, and speech pathology, remain mostly female, although male presence in nursing and physical therapy, for instance, has increased.[1] For many reasons, historically, females were not represented proportionately in higher-paying clinical disciplines such as medicine, dentistry, and veterinary medicine.

Barriers to entry to these professions have decreased over time due to societal and market/economic forces, including the feminist movement, emerging workforce shortages in health care professions, changes in the business models for health services delivery, and other factors, resulting in improved access for women to professional pipelines. Some attribute the increase in female participation in these professions to higher enrollments of women in college, leading to increased participation in postgraduate professional education programs and/or to increased enrollment of talented males in science, technology, engineering, and math (STEM)–related professions such as computer sciences that divert them from health professions.[2]

For myriad reasons, the participation of women in higher-paying health professions has increased. Currently, approximately 50% of veterinarians are female,[3] 35% of physicians are female,[4] and 31% of dentists are female.[5] Female participation in these professions will likely grow as the percentage of female graduates from medical (48.5% of graduates in 2017[6]) and dental (46.3% of graduates in 2017[7]) education programs either stabilize at current levels or continue to increase and as many older, predominately male professionals depart the workforce. While the reasons for gender diversification can be attributed to a variety of endogenous and exogenous factors, including delivery system remodeling, the long-term impact of professional diversification is not yet well understood.

Anecdotally and sterotypically, women are thought variously to work fewer hours, to be more likely to work part time, to choose specialties that are more consultative than surgical in nature, and to provide more empathetic services than men. These suggested or hypothetical differences are the topics of research published in numerous peer-reviewed journals described in the literature review for this project, with differences being either disproved or confirmed.[1,8-13]

Prior research has also shown that there are some differences in the practice characteristics of female and male dentists. For example, research found that female dentists were more likely than male dentists to work in public health settings and to treat low-income patterns.[11,14,15]

Concerns about changes in the gender composition of health professions often revolve around the impacts on workforce capacity to meet the healthcare needs of a growing and aging population. Questions arise as to whether practice preferences differ by gender and, if so, whether documented variation will affect the availability of health services for particular populations. This information is important for program planning and designing workforce recruitment strategies to mediate anticipated gaps in availability of services.

Understanding changing practice patterns is useful in determining how a system of care might respond contextually to anticipated gaps in care using innovative service delivery models, workforce incentives, or alternative workforce as providers of services or novel points of entry and referral to the oral health care system. Equipping primary care medical practices to assess the oral health status of patients is one such strategy; expanding scopes of practice for other dental professionals is another. Encouraging greater use of mobile dentistry or teledentistry and providing workforce incentives for practice in underserved areas are additional possible initiatives.

While there is discussion that the increasing gender diversity in dentistry will affect practice models, work hours, and the availability of specialty dentists or dentists in less populated areas, there is limited research that describes variation in characteristics of dental practice by gender. The lack of information on the subject makes it difficult to assess the impact of the increase in female dentists on workforce capacity.

The objective of this research was to describe trends in practice preferences by gender that might result in alterations in the dental services delivery system, the availability of dental services, or the distribution of dental professionals, especially in rural areas or for underserved communities. This study, completed by the Oral Health Workforce Research Center (OHWRC) in cooperation with the American Dental Association (ADA), represents a unique opportunity to use the ADA Masterfile and Survey of Dental Practice to describe differences by gender and to consider the overall impact for the future of the oral health workforce.

METHODS

The present study consisted of 3 major parts:

1. **Literature review.** An extensive review of peer-reviewed journal articles and other published documents was conducted to better understand the impact of gender diversification in dentistry on dental services delivery.

2. **Secondary data analysis of the ADA Masterfile.** This study used ADA Masterfile data from 2010, 2012, 2014, and 2016 to describe trends in the demographics and practice characteristics of the US dental workforce across years.

3. **Secondary data analysis of the ADA Survey of Dental Practice (SDP).** The study used data from the SDP conducted in 2017 (describing practice patterns in 2016) to evaluate differences in the practice patterns of female and male dentists.

The ADA Masterfile

The ADA Masterfile is a comprehensive database of all dentists, practicing and non-practicing, in the US.[16] The ADA Masterfile compiles demographic characteristics (ie, dentist gender, race/ethnicity, and age), dental specialty, year of graduation, dental school of graduation, and practice type and location. The ADA updates the Masterfile annually and collaborates with outside sources of information such as the United States Postal Service Change of Address Registry and state dental boards to support the currency of the file.[17] The ADA also uses the ADA Survey of Dental Graduates and survey data accrued through research conducted by its own research arm, the Health Policy Institute (HPI).[5,17] The breadth of the information in the ADA Masterfile has been used to support and inform workforce policy regarding oral health access. For example, in 2016, researchers with HPI found that the supply of dentists is expected to grow between 2015 and 2035.[18]

The 2017 Survey of Dental Practice

Researchers also used data from the ADA's annual Survey of Dental Practice (SDP). The SDP surveys a nationally representative, random sample of professionally active licensed dentists in private practice regardless of membership status in the ADA, including general practitioners and specialists throughout the US.[5] The ADA uses the SDP to monitor private practice income and expenses, the characteristics of private dental practices, and employment of dental practice personnel.[19] The SDP also provides specific information about the characteristics of dentists and their patients in the year preceding survey completion.

The 2017 sample comprised 11,160 general practitioners and 7,440 specialists in private practice in the US. The survey oversampled specialists to ensure an adequate number of responses for statistical analysis. The survey was available online or on paper. An invitation to complete the online survey was sent to dentists with an email address in the ADA Masterfile in April 2017. A paper survey was mailed to those who did not respond to the email solicitation and to all dentists in the sample who lacked a current email address in June 2017. A second paper survey was mailed to nonrespondents in July 2017. Data collection was completed in September 2017, resulting in a final adjusted overall response rate of 14.0%.

Data Analysis

The data analyses for this project used descriptive and multivariable statistical methods to estimate differences in practice patterns between male and female dentists by age cohort. In addition, data analysis of the SDP was conducted using data from a subgroup of solo practitioners who were sole proprietors (ie, the only owners of their practice) and the only dentists in the practice treating patients. This strategy allowed researchers to estimate differences in practice capacity (ie, patient volume change and percentage of patients by age and dental insurance type) by gender and age. The estimates generated from the analysis of the SDP data were weighted to account for oversampling of specialists and potential nonresponse bias.

Study findings were considered statistically significant if the P value was less than .05. All analyses were conducted in SAS v9.4 (SAS Institute Inc., Cary, North Carolina) as follows:

- Masterfile/SDP: Gender differences in age, race/ethnicity, dental education/training (ie, location of dental training, years since graduation, dental residency, and specialty), and dental practice patterns (ie, employment status, working hours, practice location, practice business, hours worked per year/week, patient visits per week, patient volume change, percentage of patients by age, and dental insurance type) in 2016 were described using frequencies and cross-tabulations and tested for statistical significance using the chi-square test for categorical variables and the t test and Mann–Whitney U test for continuous variables.

- Masterfile: Gender differences in age, race/ethnicity, dental education/training, and dental practice patterns in 2010, 2012, 2014, and 2016 were described using frequencies and cross-tabulations, and the variation from 2010 to 2016 was computed as a percentage change. Multilevel logistic regression models (odds ratios and 95% confidence intervals) were used to assess the association of dentists' employment status (employed or independent contractor vs practice owner), working hours (part-time vs full-time), and practice location (small town/rural areas vs suburban/urban areas) with gender by age cohort, adjusting for dentists' race/

ethnicity, location of training, residency, and specialty (Level 3), rurality of state in which practice was located (Level 2), and year of data (Level 1).

- SDP: Multilevel Poisson regression models (prevalence rate ratios and 95% confidence intervals) were used to assess the association of the percentage of patients who were children and the percentage of patients covered by public insurance or without dental insurance with the gender of solo practitioner dentists by age cohort, adjusted for dentists' race/ethnicity, location of training, residency, and specialty (Level 3), rurality of state in which practice was located (Level 2), and year of data (Level 1).

FINDINGS FROM THE LITERATURE REVIEW

The protocol for this literature review included an extensive search for available research on the topic of the characteristics of female dentists. Researchers employed the PubMed search engine almost exclusively, using the following word combinations during the search: women AND dentistry, oral health AND feminization, dentistry AND feminization, and women AND US AND dental. The research team also found other literature on these topics through review of citations/references within the articles found in the initial review. In total, researchers identified 25 relevant documents published between 1996 and 2017, 18 of which were peer-reviewed journal articles. Seven resources were not peer reviewed but provided valuable data. These documents included a summary report and graph published by the ADA, a PowerPoint presentation presented to pediatric oral health providers, an article published in an online economic journal, and 3 literature reviews on the subject of gender in health professions.

Methods

Previous research on the impact of women in dentistry used different methods to gather data. The most popular, used in 13 studies, was to conduct surveys to collect primary data. This format allowed researchers to focus on the overall dental practice characteristics and workforce trends among females working in dentistry or other professions as well as subgroups of the workforce. Survey methods included:

- 6 paper/mailed surveys[8,20-24]
- 4 Internet surveys[11,25-27]
- 3 surveys administered in place using a convenience sample[12,13,28]

Other studies in the literature review used secondary data. Secondary sources included state-level data, such as dental benefits claims data from the Washington Dental Service.[29] Other researchers used data from professional associations, including workforce data from the 2003 British Orthodontic Society,[30] data from the ADA,[9,31] data from the American Dental Education Association (ADEA),[32,33] and data from the American Academy of Pediatric Dentistry member database[34] to describe changes or differences by gender. A final study drew data from the US Bureau of Labor Statistics' Current Population Survey (CPS) for the period between 1979 and 1999.[35]

Response Rates

Survey response rates varied; several researchers described low response rates as a study limitation. Response rates to mailed surveys varied from a high of 78% for a universe survey of dentists in New Zealand[22] to 61% for a survey of a stratified sample of dentists in Canada[8] to 29% for a survey of a random sample of Canadian dentists.[21]

The response rates to Internet surveys ranged from 56% for a survey fielded to the universe of practicing female oral and maxillofacial surgeons in the US in 2008[26] to 10% for a survey of more than 17,000 dental students who graduated from US dental schools in 1996, 2001, 2006, and 2011.[11]

A survey that was administered onsite in dental schools to a convenience sample of students had an overall response rate (across the 6 participating schools) of 41%.[12] Another survey on patients' perceptions of gender differences among dentists using convenience samples of students at a liberal arts college, employees of an information technology (IT) firm, and government employees resulted in variable response rates ranging from 100% of solicited students to 85% of government employees and 80% of IT employees.[13]

Findings

The findings from the research varied with the topics of interest, which were all related to different aspects of gender diversification in the professional workforce. ADEA analyzed data describing dental school applicants by gender and found that the number of female dental school applicants increased from 5,624 in 2006 (45.0% of applicants) to 6,048 in 2016 (50.2%).[32] In an earlier report, the ADA found that the increases in female dental school applicants had ultimately resulted in an increase in the number of female dentists in the workforce.[9] The report discussed differences in practice by gender. Female dentists exhibited a greater inclination toward part-time rather than full-time work and associate status as opposed to practice ownership than did their male counterparts.[9]

The Pediatric Oral Health Research and Policy Center found that the percentage of female pediatric dentists had increased from 14% of the pediatric dentistry workforce in 1998 to 51% in 2015.[34] Reed and colleagues also found an increase in the number of women working on faculty in dental education programs from 1997–1998 (19.7% of total faculty) to 2007–2008 (28.2%).[33] Adams conducted a literature review on increasing gender diversification in health professions and concluded that there is little evidence that feminization is substantially altering previously male-dominated professions.[1]

Ayers and coauthors found that female dentists in New Zealand planned to retire earlier, were more likely to take a career break, and were somewhat less satisfied with their profession than male dentists.[22] Walton and colleagues found that having young children was a significant predictor of part-time work among female dentists in the US, with female dentists reporting, on average, about 4 fewer hours of weekly work than male dentists (36.2 vs 40.2 hours).[35] McKay and colleagues also found a difference in weekly working hours by gender, with male dentists working about 2 hours more per week than female dentists in Canada.[21] The study found that gender, age, and practice ownership were predictors of weekly working hours.[21]

Other studies described practice differences. Del Aguila et al conducted a study of practice patterns by gender among dentists in Washington State and found that the proportions of patients who were children or female were higher, on average, for female general practice dentists than for male dentists.[29] The authors noted that both males' and females' utilization of flexibility in their work schedules was based on age, family responsibilities, or other reasons.[29] A literature review by Pallavi and Rajkumar described gender differences in the professional careers of men and women dentists in various countries and concluded that some barriers to advancement in the profession still exist in many places.[36] Geibel and Mayer found that fewer female dentists in Germany performed surgery as part of their university training (64.9% of women vs 80.9% of men) or after graduation from dental school (24.6% vs 86.4%), with women more often rating dental surgery as risky or complicated.[20] In another article on dental surgery, Rostami and colleagues found that the proportion of female dentists, and particularly of racially diverse female dentists, in oral and maxillofacial surgery residency programs and in practice had increased between 1994 and 2002, but that women in the specialty continued to face discrimination and prejudice, with 29% of female residents and 38% of female practitioners reporting experiencing sexual harassment.[26]

Researchers have studied the motivations of students who enter dental education programs to better understand initial decisions to pursue a degree in dentistry. Scarbecz and Ross found that first-year dental students who were female rated business ownership as a less important motive for attending dental school than did first-year dental students who were male.[28] Additionally, on average, female students rated caring or helping motives more highly than did males.[28] In a subsequent study, the same authors found that female students in dental school expressed more interest in pediatric dentistry than did their male counterparts, and that more fourth-year female students planned to be associates in a dental practice than did male students in the same cohort.[12]

Researchers also noted differences in patient populations and clinical practices by gender. Nicholson and coworkers found that female and nonwhite dentists were more likely to accept poor patients than were male and white dentists.[11] Female dentists were also 22.5% less likely to own a dental practice.[11] Riley and coauthors found differences by gender in practices relative to caries management: female dentists used preventive therapies more often and at earlier stages of dental caries than did male dentists.[25]

Adams noted that there is increasing convergence relative to previously noted practice differences by gender in the dentistry profession; women in the profession currently practice in many ways similar to men in the profession.[1,8] Differences still prevail in such areas as earnings, so gender continues to be a relevant issue, but for different reasons than in the past. Adams also notes that one area for future research should be to examine how feminization or gender diversification is linked with trends in immigration and increasing ethnic diversity in the workforce.[1]

Smith and Dundes conducted a study to understand whether certain traits were considered more characteristic of male or female dentists.[13] The researchers surveyed students, government employees, and others to determine if patients attributed one or another of 7 traits more often to a single gender. The researchers found that while there were no significant differences in traits ascribed to male or female dentists, patients more often perceived some differences, including that female dentists practice with more empathy and that male dentists would be more likely to expect a patient to not complain about pain. The authors concluded that it is important for dentists to understand such stereotypes in order to better understand how patients' expectations might impact clinical interactions or patient relationships.[13]

A review of research discussing gender diversification in medical professions was also conducted in order to identify common trends across health professions. For example, in a study of physician assistants (PAs) in Utah, Coombs et al found that female PAs practiced differently than their male counterparts and had significantly lower odds of practicing in a rural area.[23] In a study of pharmacists, Tanner and Cockerill found both differences and similarities by gender—for example, female pharmacists were significantly younger than male pharmacists, but male and female pharmacists were similarly likely to work full time between 30 and 45 hours per week.[24] Finally, in a study on the attitudes and beliefs of pharmacy students, Janzen and colleagues found that new entrants to the profession believed that the number of women in pharmacy would have no negative impact on the profession.[27]

Some studies—several of which were conducted in other countries—discuss the numbers of women in the dental workforce and the impact on capacity, productivity, and workforce supply. Murphy and coworkers found a 17% difference in orthodontists' productivity by gender in the United Kingdom, despite having similar average weekly working hours.[30] In another study, Canadian researchers found that there were distinct practice differences by gender among Canadian dentists and that these differences would affect workforce capacity, possibly resulting in a 1.2% decline in the number of patients treated annually.[10] Solomon conducted a literature review to analyze feminization in dentistry from an economic perspective and reached similar conclusions, determining that gender differences affect the proportion of dentists' contributions to patient care, which could have supply implications in the future.[37] Finally, Vujicic et al found that female dentists in California did not work as many hours as their male counterparts, reducing the aggregate dental labor supply by 3.6%.[31]

Limitations

Few articles make specific projections about dental workforce capacity; many studies suggest that this is an important area for future research. Researchers conducting the reviewed studies cited many limitations, including recall/reporting biases among survey participants,[12,35] poor geographic dispersion resulting in nonrepresentative samples,[22,28] nonrandom samples,[25] and low response rates/small sample sizes preventing generalizability.[8,21,22] The study that modeled the impact of gender diversification among dentists in Washington cited a number of very specific statistical limitations, including the assumption of the model that the dental workforce and practice patterns were stagnant.[29] An additional limitation of that study was that data was sourced from only a single commercial dental benefits carrier; the analyses did not account for patients with public dental benefits or those without dental insurance coverage.[29]
Finally, there were 7 studies that examined trends in dentistry in foreign countries. It is possible that these studies are not generalizable to the US because of differences in delivery systems for dental services.[8,10,20-22,30,36]

RESULTS FROM THE STUDY

The following section summarizes, in narrative, tabular, and graphical format, the findings from the analyses of both the ADA Masterfile (years 2010, 2012, 2014, and 2016) and the 2017 SDP describing the characteristics of dental practices in 2016.

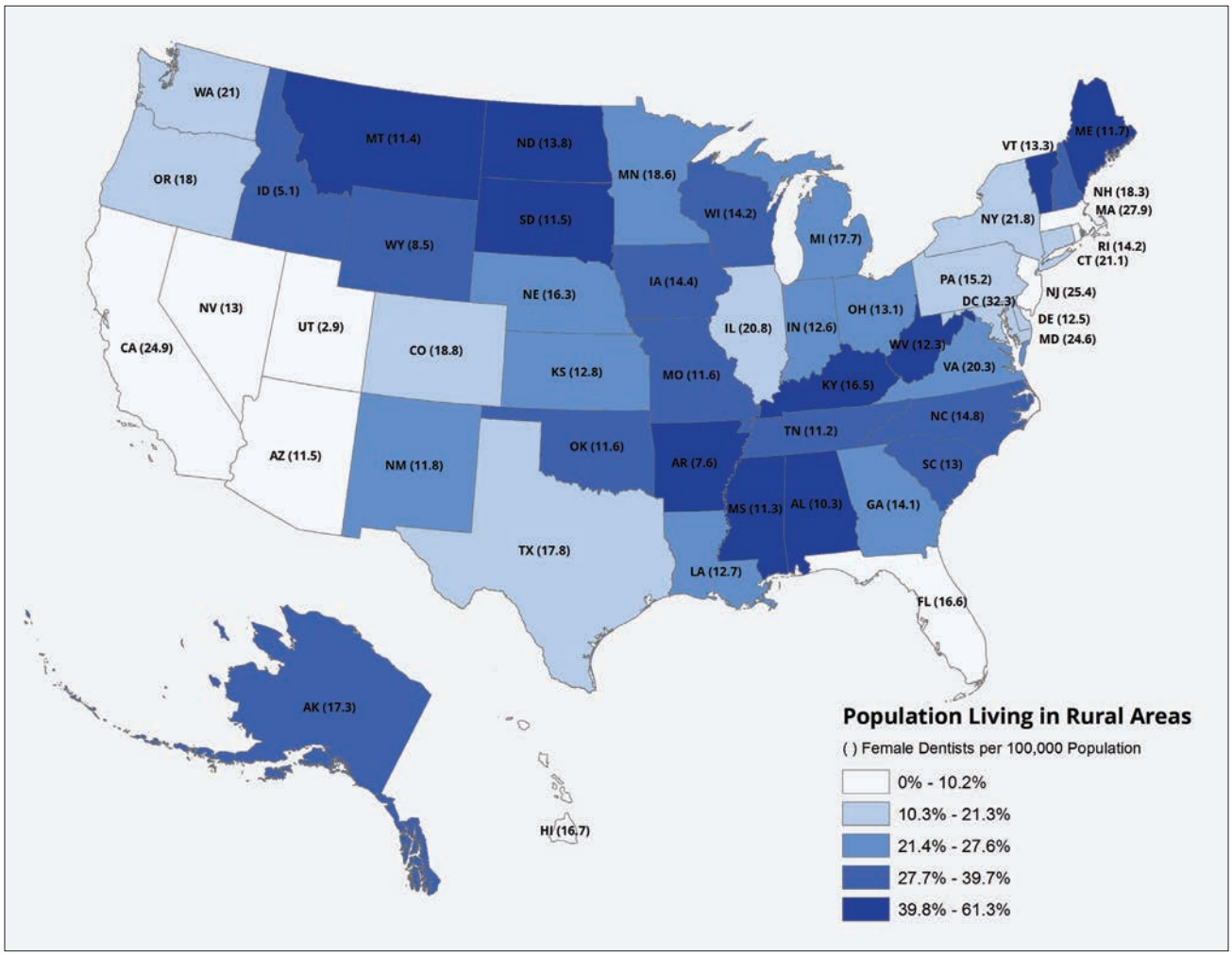
ADA MASTERFILE DATA

Demographics of Dentists

In 2016, the ADA Masterfile listed 192,260 professionally active dentists in the US with information on gender. Among them, 135,032 (70.2%) were male and 57,228 (29.8%) were female. The percentage of dentists who were female varied by state, from <20% in Utah, Idaho, Wyoming, Arkansas, and Montana to ≥35% in Maryland, Massachusetts, and DC (see Appendix).

The average number of female dentists per 100,000 population was 17.6 (see Appendix). The number of female dentists per 100,000 population varied from <10 in Utah, Idaho, Arkansas, and Wyoming to ≥25 in New Jersey, Massachusetts, and DC (Figure 1). The ratios were lower in rural states and higher in mostly urban states; however, the results did not indicate a consistent pattern.

Figure 1. Female Dentists per 100,000 Population by Percent of Population Living in a Rural Area, 2016



Source: American Dental Association Masterfile, 2016.

Age Groups

In 2016, the mean age of female dentists was significantly lower than that of male dentists (43.9 years vs 52.8 years; *P*<.0001) (Table 1). Significantly more female than male dentists were between 31 and 45 years of age (48.4% vs 28.2%). In contrast, proportionally more male than female dentists were ≥56 years of age (46.9% vs 17.6%).

Table 1. Distribution of Dentists' Age by Gender, 2016

Age (years)[a]	Female Dentists		Male Dentists	
	n	%	n	%
Age				
Mean (range)	43.9 (23, 94)		52.8 (22, 98)	
Age groups				
≤30	5,736	10.0%	5,679	4.2%
31–35	9,907	17.3%	11,295	8.4%
36–40	9,403	16.4%	12,792	9.5%
41–45	8,402	14.7%	13,901	10.3%
46–50	7,326	12.8%	13,255	9.8%
51–55	6,341	11.1%	14,773	10.9%
56–60	5,221	9.1%	18,465	13.7%
61–65	3,330	5.8%	20,295	15.0%
≥66	1,562	2.7%	24,577	18.2%
Total	**57,228**	**100.0%**	**135,032**	**100.0%**

[a] Gender differences were statistically significant at *P*<.0001.
Source: American Dental Association Masterfile, 2016.

Race/Ethnicity

The majority of female (60.9%) and male (79.8%) dentists were white (Table 2). A significantly (*P*<.0001) higher proportion of female than male dentists were Asian (23.4% vs 12.1%), Hispanic (7.9% vs 4.2%), black or African American (6.0% vs 2.9%), or of another race or ethnicity (1.8% vs 1.1%).

Table 2. Distribution of Dentists' Race/Ethnicity by Gender, 2016

Race/Ethnicity[a]	Female Dentists		Male Dentists	
	n	%	n	%
White	33,499	60.9%	105,395	79.8%
Asian	12,863	23.4%	16,012	12.1%
Hispanic	4,349	7.9%	5,499	4.2%
Black or African American	3,284	6.0%	3,826	2.9%
American Indian or Alaska Native, Native Hawaiian and/or other Pacific Islander	270	0.5%	465	0.4%
Other	706	1.3%	964	0.7%
Total	**54,971**	**100.0%**	**132,161**	**100.0%**

[a] Gender differences were statistically significant at *P*<.0001.
Source: American Dental Association Masterfile, 2016.

Professional Education and Training

Dental School and Dental Residency

In 2016, on average, male dentists had significantly more years in practice than female dentists (25.0 years vs 15.8 years; *P*<.0001) (Table 3). Proportionally more female than male dentists were foreign-trained (8.3% vs 4.4%; *P*<.0001), and more females than males completed a dental residency (39.2% vs 32.0%; *P*<.0001). A significantly higher proportion of female than male dentists completed a dental residency in general practice dentistry (54.1% vs 41.1%; P<.0001), pediatric dentistry (15.6% vs 7.0%; *P*<.0001), and dental public health (0.6% vs 0.4%; *P*<.0001).

Table 3. Distribution of Dentists' Training Characteristics by Gender, 2016

Dental Education and Training[a]	Female Dentists		Male Dentists	
	n	%	n	%
Dental school				
Years since graduation				
Mean (range)	15.8 (0, 67)		25.0 (0, 73)	
Location of training				
US-trained	52,436	91.7%	128,730	95.6%
Foreign-trained	4,724	8.3%	5,943	4.4%
Total	**57,160**	**100.0%**	**134,673**	**100.0%**
Dental residency				
No	34,397	60.8%	91,029	68.0%
Yes	22,168	39.2%	42,912	32.0%
Total	**56,565**	**100.0%**	**133,941**	**100.0%**
Dental residency specialty				
General practice	11,957	54.1%	17,586	41.1%
Orthodontics and dentofacial orthopedics	2,605	11.8%	5,968	13.9%
Oral and maxillofacial surgery	653	3.0%	6,381	14.9%
Pediatric dentistry	3,456	15.6%	3,011	7.0%
Endodontics	1,224	5.5%	4,274	10.0%
Periodontics	1,213	5.5%	3,122	7.3%
Prosthodontics	710	3.2%	2,107	4.9%
Dental public health	140	0.6%	171	0.4%
Oral and maxillofacial pathology	104	0.5%	162	0.4%
Oral and maxillofacial radiology	37	0.2%	38	0.1%
Total	**22,099**	**100.0%**	**42,820**	**100.0%**

[a] Gender differences were statistically significant at *P*<.0001.
Source: American Dental Association Masterfile, 2016.

Dental Specialty

In 2016, the majority of female (81.4%) and male (77.6%) dentists were general practitioners (Table 4). Significantly more male than female dentists worked in a dental specialty, particularly oral surgery (5.1% vs 1.2%; *P*<.0001). In contrast, a significantly higher proportion of female than male dentists worked as pediatric dentists (6.1% vs 2.8%; *P*<.0001) and public health dentists (0.5% vs 0.3%; *P*<.0001).

Table 4. Distribution of Dentists' Specialty by Gender, 2016

Specialty[a]	Female Dentists		Male Dentists	
	n	%	n	%
General practitioner	46,387	81.4%	104,537	77.6%
Orthodontics	2,702	4.7%	7,744	5.8%
Oral surgery	664	1.2%	6,856	5.1%
Pediatric dentistry	3,486	6.1%	3,707	2.8%
Endodontics	1,209	2.1%	4,265	3.2%
Oral pathology	134	0.2%	212	0.2%
Periodontics	1,306	2.3%	4,230	3.1%
Prosthodontics	756	1.3%	2,716	2.0%
Public health	279	0.5%	442	0.3%
Radiology	49	0.1%	65	0.1%
Total	**56,972**	**100.0%**	**134,774**	**100.0%**

[a] Gender difference was statistically significant at *P*<.0001.

Source: American Dental Association Masterfile, 2016.

Dental Practice Patterns

Employment Status

In 2016, a significantly larger proportion of male than female dentists owned a dental practice (83.8% vs 60.4%; *P*<.0001) (Table 5). These differences may be due, in part, to notable differences in age distribution by gender; female dentists were younger overall than male dentists. The proportion of female and male dentists owning a practice increased with age, from ≤20% in those 30 years of age or younger to >80% in those 56 and older. However, in the older cohorts of dentists, there were comparatively fewer women to evaluate differences.

Table 5. Distribution of Dentists' Employment Status by Gender and Age, 2016

Age Groups (years)	Female Dentists				Male Dentists			
	Employee or Independent Contractor[a,b]		Owner[a,b]		Employee or Independent Contractor[a,b]		Owner[a,b]	
	n	%	n	%	n	%	n	%
≤30	1,176	90.0%	131	10.0%	962	80.0%	240	20.0%
31–35	3,572	77.6%	1,032	22.4%	3,184	63.0%	1,871	37.0%
36–40	3,348	56.5%	2,575	43.5%	3,136	37.0%	5,337	63.0%
41–45	2,481	40.8%	3,595	59.2%	2,443	22.6%	8,352	77.4%
46–50	1,722	29.2%	4,180	70.8%	1,610	14.2%	9,753	85.8%
51–55	1,226	22.8%	4,161	77.2%	1,236	9.2%	12,179	90.8%
56–60	835	18.4%	3713	81.6%	1,131	6.6%	16,064	93.4%
61–65	487	16.7%	2424	83.3%	1,513	8.0%	17,510	92.0%
≥66	199	14.5%	1176	85.5%	2,568	11.0%	20,769	89.0%
Total	**15,046**	**39.6%**	**22,987**	**60.4%**	**17,783**	**16.2%**	**92,075**	**83.8%**

[a] "Employee" was defined as on a salary, commission, percentage, or associate basis; "owner" was defined as a solo proprietor (ie, the only owner/shareholder) or a partner (ie, one of 2 or more owners/shareholders). About 23% of observations were excluded from this analysis due to missing information on employment status.

[b] Gender differences were statistically significant at *P*<.0001.

Source: American Dental Association Masterfile, 2016.

Work Hours

In 2016, the majority of female (90.2%) and male (89.2%) dentists in private practice worked full time (≥30 hours per week) (Table 6). Overall, the percentages of female and male dentists working part time were comparable (9.8% and 10.8%, respectively). However, a significantly (*P*<.0001) higher proportion of female dentists worked part time compared with male dentists when analyzed by age cohort. The proportion of all dentists working part time increased with age from ≤1% to >25%.

Approximately 10% of dentists listed in the ADA Masterfile worked in academia, in the armed forces, in a health or dental organization, for a state or local government, or as hospital staff, or were graduate students, interns, or residents.

Table 6. Distribution of Dentists' Work Hours in Private Practice by Gender and Age, 2016

Age Groups (years)	Female Dentists				Male Dentists			
	Part-time[a,b]		Full-time[a,b]		Part-time[a,b]		Full-time[a,b]	
	n	%	n	%	n	%	n	%
≤30	51	1.0%	4,887	99.0%	21	0.4%	4,809	99.6%
31–35	268	3.0%	8,695	97.0%	84	0.8%	9,935	99.2%
36–40	392	4.6%	8,162	95.4%	148	1.3%	11,366	98.7%
41–45	520	6.7%	7,227	93.3%	276	2.2%	12,527	97.8%
46–50	588	8.7%	6,158	91.3%	304	2.5%	11,975	97.5%
51–55	843	14.6%	4,932	85.4%	1,134	8.3%	12,468	91.7%
56–60	1,111	24.2%	3,483	75.8%	2,264	13.4%	14,585	86.6%
61–65	850	30.0%	1,985	70.0%	3,054	16.8%	15,101	83.2%
≥66	431	32.3%	905	67.7%	5,945	26.9%	16,158	73.1%
Total	**5,054**	**9.8%**	**46,434**	**90.2%**	**13,230**	**10.8%**	**108,924**	**89.2%**

[a] "Part-time" was defined as <30 hours/week and "full-time" was defined as ≥30 hours/week of work in a private practice.
[b] Gender differences were statistically significant at *P*<.0001.
Source: American Dental Association Masterfile, 2016.

Practice Location

Practice location was determined by the ZIP code of the practice address (see footnote in Table 7). In 2016, the majority of female and male dentists (≥95%) worked in suburban and urban areas (ie, micropolitan, metropolitan, and large metropolitan areas) (Table 7). Significantly (*P*<.0001) more female than male dentists worked in suburban and urban areas in all age cohorts, particularly among dentists aged ≥61 years (97.0%–98.1% vs 94.1%–95.1%).

Table 7. Distribution of Dentists' Practice Location by Gender and Age, 2016

Age Groups (years)	Female Dentists				Male Dentists			
	Small Town/ Rural Areas[a,b]		Suburban/ Urban Areas[a,b]		Small Town/ Rural Areas[a,b]		Suburban/ Urban Areas[a,b]	
	n	%	n	%	n	%	n	%
≤30	138	3.5%	3,810	96.5%	177	4.6%	3,651	95.4%
31–35	238	3.0%	7,609	97.0%	347	3.8%	8,687	96.2%
36–40	223	2.8%	7,864	97.2%	441	3.9%	10,887	96.1%
41–45	159	2.1%	7,249	97.9%	387	3.1%	12,292	96.9%
46–50	157	2.4%	6,346	97.6%	421	3.4%	11,782	96.6%
51–55	107	1.9%	5,613	98.1%	482	3.5%	13,192	96.5%
56–60	133	2.8%	4,591	97.2%	726	4.2%	16,506	95.8%
61–65	90	3.0%	2,896	97.0%	1,105	5.9%	17,722	94.1%
≥66	26	1.9%	1,354	98.1%	1,121	4.9%	21,556	95.1%
Total	**1,271**	**2.6%**	**47,332**	**97.4%**	**5,207**	**4.3%**	**116,275**	**95.7%**

[a] Practice location was defined using Rural–Urban Commuting Area (RUCA) codes, a classification system based on practice location ZIP codes: small-town and rural areas (RUCA 7–10) and suburban/urban areas including micropolitan, metropolitan, and large metropolitan areas (RUCA 1–6). About 12% of observations were excluded from this analysis due to missing information on the practice ZIP code location.

[b] Gender differences were statistically significant at *P*<.0001.

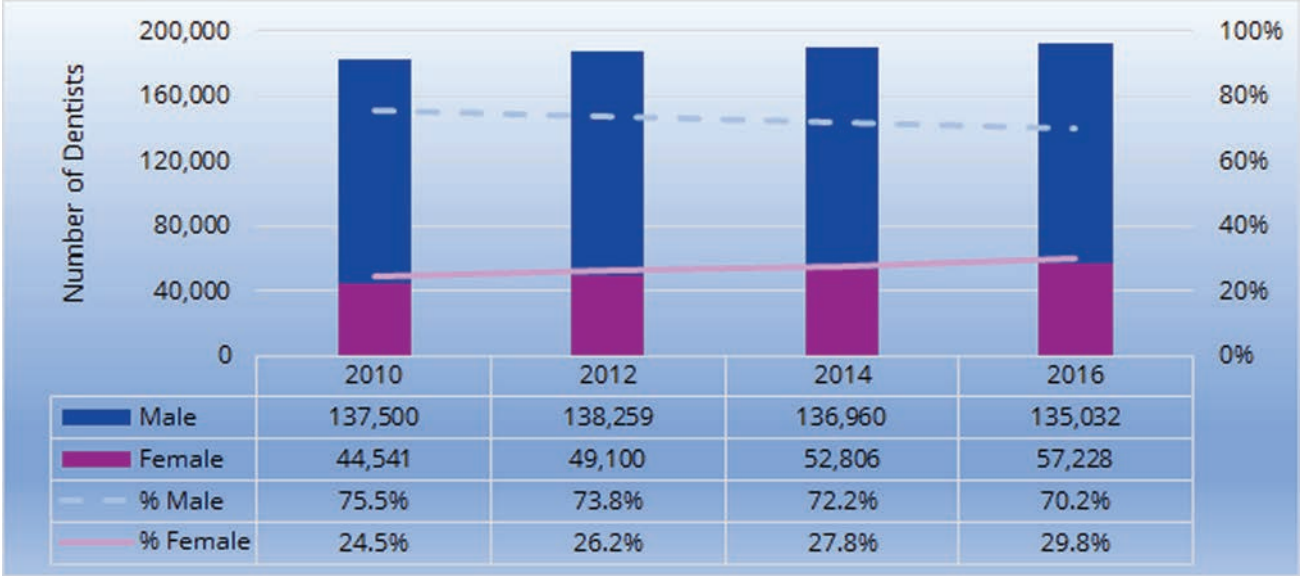
Source: American Dental Association Masterfile, 2016.

Changes in Demographics, 2010–2016

In 2010, the ADA Masterfile listed 182,041 professionally active dentists with information on gender. This count increased with the next 3 time points: In 2012, there were 187,359; in 2014, there were 189,766; and in 2016, there were 192,260 professionally active male and female dentists. The observations with missing information on gender varied between 0.6% and 2.1%.

Nationwide, over the 7-year study period between 2010 and 2016, the proportion of female dentists increased from 24.5% to 29.8% (21.7% change), while the proportion of male dentists decreased from 75.5% to 70.2% (-7.0% change) (Figure 2).

Figure 2. Distribution of Dentists' Gender by Year, 2010–2016



Source: American Dental Association Masterfile, 2010, 2012, 2014, 2016.

Age

Between the years of 2010 and 2016, the mean age of female dentists increased by 3.7%, from 42.4 years to 43.9 years (Table 8). During this same period, the mean age of male dentists increased by 2.1%, from 51.8 years to 52.8 years.

Table 8. Dentists' Age by Gender and Year, 2010–2016

Age (years)	Female Dentists					Male Dentists				
	2010	2012	2014	2016	% Change 2010–2016	2010	2012	2014	2016	% Change 2010–2016
Mean	42.4	42.9	43.5	43.9	3.7%	51.8	52.3	52.7	52.8	2.1%

Source: American Dental Association Masterfile, 2010, 2012, 2014, 2016.

Race/Ethnicity

Between 2010 and 2016, the proportion of Asian female dentists grew by 5.1% and the proportion of Asian male dentists grew by 16.5% (Table 9). During the same period, the proportion of Hispanic male dentists increased by 8.3%, while the proportion of Hispanic female dentists remained essentially the same. Between 2010 and 2016, both genders saw a >100% increase in the percentage of American Indians or Alaska Natives, Native Hawaiians and/or other Pacific Islanders, and/or other races/ethnicities, although the representation of these groups remained low (<2%).

Over the 7-year study period, female dentists were a much more diverse group than male dentists, as nearly a quarter of female dentists were Asian and >15% were Hispanic, black or African American, or of another race or ethnicity.

Table 9. Dentists' Race/Ethnicity by Gender and Year, 2010–2016

Race/Ethnicity	Female Dentists (%)					Male Dentists (%)				
	2010	2012	2014	2016	% Change 2010– 2016	2010	2012	2014	2016	% Change 2010– 2016
White	62.3%	61.8%	61.3%	60.9%	-2.2%	82.4%	81.7%	80.8%	79.8%	-3.2%
Asian	22.3%	22.6%	23.0%	23.4%	5.1%	10.4%	10.8%	11.5%	12.1%	16.5%
Hispanic	7.9%	7.7%	7.9%	7.9%	-0.3%	3.8%	3.8%	4.0%	4.2%	8.3%
Black or African American	6.7%	6.6%	6.4%	6.0%	-11.0%	3.0%	3.0%	3.0%	2.9%	-2.7%
Other[a]	0.8%	1.3%	1.4%	1.8%	137.3%	0.4%	0.8%	0.8%	1.1%	151.2%

[a] American Indian or Alaska Native, Native Hawaiian and/or other Pacific Islander, or other race/ethnicity.
Source: American Dental Association Masterfile, 2010, 2012, 2014, 2016.

Changes in Professional Education and Training, 2010-2016

The average length of time in practice since graduation increased among female dentists from 14.2 years in 2010 to 15.8 years in 2016 (11.1% change) and among male dentists from 23.9 years in 2010 to 25.0 years in 2016 (4.6% change) (Table 10). Over the 7-year study period, there was a slight increase in the proportion of female dentists (0.6% change) and a slight decrease in the proportion of male dentists (-0.4% change) who received their dental education and/or training in the US.

From 2010 to 2016, the proportion of dentists who had completed residencies increased by 10.4% among women (35.5% to 39.2%) and by 16.6% among men (27.5% to 32.0%) (Table 10).

Table 10. Dentists' Professional Education and Training by Gender and Year, 2010-2016

Dental Education and Training	Female Dentists (%, mean)					Male Dentists (%, mean)				
	2010	2012	2014	2016	% Change 2010–2016	2010	2012	2014	2016	% Change 2010–2016
Dental school										
Years since graduation										
Mean	14.2	14.7	15.3	15.8	**11.1%**	23.9	24.5	24.9	25	**4.6%**
Location of training										
US-trained	91.2%	91.4%	91.5%	91.7%	**0.6%**	96.0%	95.9%	95.7%	95.6%	-0.4%
Foreign-trained	8.8%	8.6%	8.5%	8.3%	-6.6%	4.0%	4.1%	4.3%	4.4%	**9.7%**
Dental residency										
No	64.5%	63.2%	61.9%	60.8%	-5.7%	72.5%	71.1%	69.5%	68.0%	-6.3%
Yes	35.5%	36.8%	38.1%	39.2%	**10.4%**	27.5%	28.9%	30.5%	32.0%	**16.6%**

Source: American Dental Association Masterfile, 2010, 2012, 2014, 2016.

Dental Specialty

Between 2010 and 2016, the proportion of specialty dentists increased among both female and male dentists (Table 11). The largest growth among female dentists was in pediatric dentistry (44.3% change) and oral surgery (30.0% change), followed by orthodontics (23.8% change). Among male dentists, the largest growth was in pediatric dentistry (21.7% change) and oral surgery (15.9% change).

Table 11. Dentists' Specialty by Gender and Year, 2010-2016

Specialty	Female Dentists (%)					Male Dentists (%)				
	2010	2012	2014	2016	% Change 2010–2016	2010	2012	2014	2016	% Change 2010–2016
General practitioner	85.6%	85.1%	81.9%	81.4%	-4.8%	79.8%	79.5%	77.8%	77.6%	-2.8%
Orthodontics	3.8%	4.0%	4.7%	4.7%	23.8%	5.5%	5.5%	5.8%	5.8%	5.3%
Oral surgery	0.9%	0.9%	1.1%	1.2%	30.0%	4.4%	4.5%	5.0%	5.1%	15.9%
Pediatric dentistry	4.2%	4.5%	5.9%	6.1%	44.3%	2.3%	2.3%	2.7%	2.8%	21.7%
Other specialty[a]	5.5%	5.6%	6.5%	6.6%	19.7%	8.1%	8.2%	8.8%	8.9%	9.7%

[a] Endiotics, oral pathology, periodontics, prosthodontics, public health, radiology.

Source: American Dental Association Masterfile, 2010, 2012, 2014, 2016.

Changes in Dental Practice Patterns, 2010-2016

From 2010 to 2016, the proportion of employed dentists increased by 11.9% (from 35.4% to 39.6%) among women and by 19.8% (from 13.5% to 16.2%) among men (Table 12). Over the 7-year study period, there was a slight increase in the proportion of dentists working full time (≥30 hours per week in a private practice) for both men and women; the percentage change for female dentists was 2.3% (from 79.3% to 81.1%), while the percentage change for male dentists was 6.3% (from 75.9% to 80.7%).

The proportion of dentists practicing in rural areas increased by 2.5% from 2010 to 2016 among both female and male dentists (Table 12). Over the 7-year study period, there was also an increase in the proportion of female dentists (6.1% change) and male dentists (5.8% change) working in metropolitan areas.

Table 12. Dentists' Practice Patterns by Gender and Year, 2010–2016

Dental Practice Patterns	Female Dentists (%)					Male Dentists (%)				
	2010	2012	2014	2016	% Change 2010–2016	2010	2012	2014	2016	% Change 2010–2016
Employment status[a]										
Employee or independent contractor	35.4%	35.0%	35.2%	39.6%	**11.9%**	13.5%	13.5%	14.2%	16.2%	**19.8%**
Owner	64.7%	65.1%	64.8%	60.4%	-6.5%	86.5%	86.5%	85.8%	83.8%	-3.1%
Working hours[b]										
Part-time	10.6%	9.4%	8.5%	8.8%	-16.5%	14.4%	13.3%	12.1%	9.8%	-32.0%
Full-time	79.3%	80.8%	81.4%	81.1%	**2.3%**	75.9%	77.2%	77.8%	80.7%	**6.3%**
Other	10.1%	9.8%	10.2%	10.0%	-0.7%	9.7%	9.5%	10.2%	9.5%	-1.4%
Practice location[c]										
Rural area	0.8%	0.8%	0.8%	0.8%	**2.5%**	1.2%	1.2%	1.3%	1.3%	**2.5%**
Small town	1.8%	1.9%	1.8%	1.8%	-0.6%	3.2%	3.1%	3.1%	3.0%	-3.8%
Micropolitan	4.3%	4.3%	4.4%	4.4%	**3.0%**	7.1%	7.0%	6.9%	6.9%	-3.0%
Metropolitan	3.3%	3.3%	3.3%	3.5%	**6.1%**	3.6%	3.7%	3.8%	3.8%	**5.8%**
Large metropolitan	89.9%	89.7%	89.7%	89.5%	-0.4%	84.9%	84.9%	84.9%	85.0%	0.1%

[a] "Employee" was defined as on a salary, commission, percentage, or associate basis; "owner" was defined as a solo poprietor (ie, the only owner/shareholder) or a partner (ie, one of 2 or more owners/shareholders). About 22% of observations were excluded from this analysis due to missing information on employment status.

[b] "Part-time" was defined as <30 hours/week and "full-time" was defined as ≥30 hours/week of work in a private practice; "other" includes factulty, armed forces, part-time faculty/part-time practice, graduate-student/intern/resident, other federal service, health/dental organization, state/local government, or hospital staff.

[c] Practice location was defined using Rural-Urban Commuting Area (RUCA) codes, a classification system based on practice location zip codes: rural area (RUCA 10), small town (RUCA 7–9), micropolitan area (RUCA 4–6), metropolitan area (RUCA 2–3), and large metropolitan area (RUCA 1). About 13% of observations were excluded from this analysis due to missing information on the practice ZIP code location.

Source: American Dental Association Masterfile, 2010, 2012, 2014, 2016.

Influence of Gender and Age on Dentists' Practice Patterns

Employment Status

Adjusted point estimates (odds ratio [OR] and 95% confidence interval [CI]) showed that female dentists were significantly more likely to work as employees or independent contractors compared with male dentists in all age cohorts ≤65 years (Table 13). The likelihood of female dentists working as employees or independent contractors generally increased with age. Female dentists who were ≤35 years of age were twice as likely as male dentists in the same age cohort to work as employees or independent contractors, while those aged 51 to 55 years were 3 times more likely than male dentists in that age cohort to be employed or contracted.

US-trained dentists (OR: 1.33, 95% CI: 1.16–1.52) and general practitioners (OR: 1.49, 95% CI: 1.45–1.53) were more likely to work as employees or independent contractors than foreign-trained dentists and specialists (Table 13). In contrast, white dentists (OR: 0.78, 95% CI: 0.77–0.79) and dentists who had not completed a residency (OR: 0.73, 95% CI: 0.71–0.74) were less likely to work as employees or independent contractors than dentists of other races/ethnicities and those who had completed a residency.

Table 13. Adjusted Odds Ratio for Dentists' Employment Status (Employed or an Independent Contractor Versus Practice Owner) in Association With Gender and Age, 2012-2016

Characteristics of Dentists[a]	Employment Status: Employed or Independent Contractor Versus Practice Owner		
	Odds Ratio	95% Confidence Interval	
		Lower Limit	Upper Limit
Female (reference: male)			
≤30 years of age	1.95	1.74	2.19
31–35 years of age	2.03	1.94	2.12
36–40 years of age	2.23	2.15	2.32
41–45 years of age	2.4	2.31	2.5
46–50 years of age	2.62	2.51	2.74
51–55 years of age	2.96	2.82	3.11
56–60 years of age	2.63	2.49	2.77
61–65 years of age	1.96	1.82	2.1
≥66 years of age	0.94	0.85	1.05
White (reference: other race/ethnicity[b])	0.78	0.77	0.79
US-trained (reference: foreign-trained)	1.33	1.16	1.52
No residency (reference: residency)	0.73	0.71	0.74
General practitioner (reference: specialist[c])	1.49	1.45	1.53

[a] The multilevel logistic regression model estimated the effect of gender by age, adjusting for dentists' race/ethnicity, location of training, residency, and specialty (Level 3), rurality of state where primary practice was located (Level 2), and year of data (Level 1). About 22 % of observations were excluded from this analysis due to missing information on the outcome. The interaction term (gender x age) and all variables were statistically significant at $P<.0001$.

[b] Asian, Hispanic, Black/African American, American Indian/Alaska Native, Hawaiian/Other Pacific Islander, other.

[c] Orthodontics, oral surgery, pediatric dentistry, periodontics, endodontics, public health, oral pathology, radiology.

Source: American Dental Association Masterfile, 2010, 2012, 2014, 2016.

Work Hours

Female dentists were significantly more likely to work part time than male dentists in all age cohorts (Table 14). The likelihood of female dentists working part time was approximately 3.5 to 4 times greater than male dentists in the age cohorts ≤40 years and approximately 1.5 to 2 times greater among dentists aged 41–65 years. Female dentists aged ≥66 years were 3 times more likely to work part time than male dentists in the same age cohort.

White dentists (OR: 1.22, 95% CI: 1.20–1.25), US-trained dentists (OR: 2.28, 95% CI: 2.04–2.55), dentists who had not completed a residency (OR: 1.24, 95% CI: 1.21–1.27), and general practitioner dentists (OR: 1.17, 95% CI: 1.14–1.21) were more likely to work part time than dentists of other races or ethnicities, foreign-trained dentists, those who had completed a residency, and dental specialists, respectively (Table 14).

Table 14. Adjusted Odds Ratios for Dentists' Work Hours (Part-time Versus Full-time) in Association With Gender and Age, 2012–2016

Characteristics of Dentists[a]	Work Hours: Part-time Versus Full-time		
	Odds Ratio	95% Confidence Interval	
		Lower Limit	Upper Limit
Female (reference: male)			
≤30 years of age	3.6	2.92	4.43
31–35 years of age	4.25	3.74	4.82
36–40 years of age	3.48	3.19	3.8
41–45 years of age	1.69	1.6	1.78
46–50 years of age	1.83	1.75	1.9
51–55 years of age	2.15	2.06	2.24
56–60 years of age	2.03	1.92	2.14
61–65 years of age	1.47	1.37	1.59
≥66 years of age	3.06	1.89	4.96
White (reference: other race/ethnicity[b])	1.22	1.2	1.25
US-trained (reference: foreign-trained)	2.28	2.04	2.55
No residency (reference: residency)	1.24	1.21	1.27
General practitioner (reference: specialist[c])	1.17	1.14	1.21

[a] The multilevel regression model estimated the effect of gender by age, adjusting for dentists' race/ethnicity, location of training, residency, and specialty (Level 3), rurality of state where primary practice was located (Level 2), and year of data (Level 1). Outcome: "Part-time" was defined as <30 hours/week and "full-time" was defined as ≥30 hours/week of work in a private practice; other work settings (ie, faculty, armed forces, part-time faculty/part-time practice, graduate student/intern/resident, other federal service, health/dental organization, state/local government, or hospital staff) were excluded from this analysis (10%). The interaction term (gender x age) and all variables were statistically significant at $P<.0001$.

[b] Asian, Hispanic, Black/African American, American Indian/Alaska Native, Native Hawaiian/Other Pacific Islander, other.

[c] Orthodontics, oral surgery, pediatric dentistry, periodontics, endodontics, public health, oral pathology, radiology.

Source: American Dental Association Masterfile, 2010, 2012, 2014, 2016.

Practice Location

Female dentists were significantly less likely to work in small towns or rural areas than male dentists in all age cohorts (Table 15). The likelihood of female dentists working in small towns or rural areas compared with male dentists was lowest between 41 and 65 years of age (24%-40%).

White dentists (OR: 3.54, 95% CI: 3.35–3.74), US-trained dentists (OR: 6.22, 95% CI: 4.80–8.06), dentists who had not completed a residency (OR: 1.58, 95% CI: 1.52–1.65), and general practitioner dentists (OR: 3.62, 95% CI: 3.36–3.89) were more likely to work in small towns or rural areas than dentists of other races or ethnicities, foreign-trained dentists, those who had completed a residency, and dental specialists, respectively (Table 15).

Table 15. Adjusted Odds Ratios for Dentists' Practice Location (Small Town/Rural Area Versus Suburban/ Urban Area) in Association With Gender and Age, 2012-2016

Characteristics of Dentists[a]	Practice Location: Small Town/Rural Area Versus Suburban/Urban Area		
	Odds Ratio	95% Confidence Interval	
		Lower Limit	Upper Limit
Female (reference: male)			
≤30 years of age	0.83	0.76	0.91
31–35 years of age	0.82	0.74	0.89
36–40 years of age	0.8	0.72	0.88
41–45 years of age	0.67	0.61	0.75
46–50 years of age	0.74	0.67	0.82
51–55 years of age	0.69	0.62	0.76
56–60 years of age	0.6	0.52	0.7
61–65 years of age	0.76	0.6	0.96
≥66 years of age	0.92	0.82	1.04
White (reference: other race/ethnicity[b])	3.54	3.35	3.74
US-trained (reference: foreign-trained)	6.22	4.8	8.06
No residency (reference: residency)	1.58	1.52	1.65
General practitioner (reference: specialist[c])	3.62	3.36	3.89

[a] The multilevel logistic regression model estimated the effect of gender by age, adjusting for dentists' race/ethnicity, location of training, residency, and specialty (Level 2) and year of data (Level 1). About 13% of observations were excluded from this analysis due to missing information on the outcome. The interaction term (gender x age) and all variables were statistically significant at *P<.0001.*

[b] Asian, Hispanic, Black/African American, American Indian/Alaskan Native, Native Hawaiian/Other Pacific Islander, other.

[c] Orthodontics, oral surgery, pediatric dentistry, periodontics, endodontics, public health, oral pathology, radiology.

Source: American Dental Association Masterfile, 2010, 2012, 2014, 2016.

SURVEY OF DENTAL PRACTICE DATA

The following tables describe the analysis of the ADA's Survey of Dental Practice (SDP), 2017 which collected practice data for 2016. The survey data were weighted to represent the population of professionally active dentists in private practice; however, the percentages may vary somewhat from those reported using Masterfile data. The Masterfile is a summary file including all dentists in the US while the SDP describes only a sample of those dentists who are professionally active in private practice.

Demographics of Dentists

The data from the SDP were provided by 2,258 professionally active dentists in private practice with information on gender; 1,673 (74.1%) were male and 585 (25.9%) were female.

In 2016, a significantly higher proportion of female than male dentists in private practice were from underrepresented minority groups (Hispanic, black of African American, American Indian or Alaska Native, Native Hawaiian and/or other Pacific Islander, 7.9% vs 5.4%; *P*<.0001) (Table 16). In addition, a significantly higher proportion of female than male dentists were Asian (22.3% vs 9.8%; *P*<.0001). The distribution of dentists' races/ethnicities was similar in the 2 data sets (SDP and ADA Masterfile).

Table 16. Dentists' Demographics by Gender, 2016

Demographics[a]	Female Dentists		Male Dentists	
	n	%	n	%
Age (years)				
Mean (range)	43.8 (26, 82)		53.3 (28, 89)	
Age groups (years)				
≤35	174	29.7%	176	10.6%
36–45	155	26.5%	328	19.6%
46–55	164	28.0%	380	22.7%
56–65	76	13.0%	486	29.0%
≥66	16	2.8%	303	18.1%
Total	**585**	100.0%	**1,673**	100.0%
Race/Ethnicity				
White	375	64.1%	1,392	83.2%
Asian	130	22.3%	164	9.8%
Hispanic	30	5.1%	66	3.9%
Black or African American	15	2.6%	20	1.2%
American Indian or Alaska Native, Native Hawaiian and/or other Pacific Islander	1	0.2%	4	0.3%
Other, not reported	33	5.7%	27	1.6%
Total	**585**	100.0%	**1,673**	100.0%

[a] Gender differences were statiscally significant at *P*<.0001.

Source: American Dental Association Health Policy Institute, Survey of Dental Practice, 2017.

Professional Education and Training

In 2016, on average, male dentists had significantly more years of practice than female dentists (25.8 years vs 16.0 years; *P*<.0001) (Table 17). In contrast, proportionally more female than male dentists were foreign-trained (8.3% vs 4.2%; *P*<.0001) and had completed a residency (44.4% vs 32.7%; *P*<.0001). These differences were similar to those noted in the ADA Masterfile.

In 2016, the majority of both female (77.0%) and male (76.9%) dentists were general practitioners (Table 17). Significantly more female dentists worked as pediatric dentists (8.3% vs 2.7%; *P*<.0001), while proportionally more male dentists worked in oral surgery (5.4% vs 0.7%; *P*<.0001). Again, these results were consistent with differences noted in the ADA Masterfile.

Table 17. Dentists' Dental Education and Training by Gender, 2016.

Dental Education and Training[a]	Female Dentists		Male Dentists	
	n	%	n	%
Dental school				
Years since graduation				
Mean (range)	16.0 (1, 55)		25.8 (1, 62)	
Location of training				
US-trained	536	91.7%	1601	95.8%
Foreign-trained	48	8.3%	70	4.2%
Total	**585**	**100.0%**	**1671**	**100.0%**
Dental residency				
No	325	55.6%	1125	67.4%
Yes	260	44.4%	546	32.7%
Total	**585**	**100.0%**	**1671**	**100.0%**
Specialty				
General practitioner	450	77.0%	1286	76.9%
Orthodontics	45	7.8%	108	6.4%
Oral surgery	4	0.7%	90	5.4%
Pediatric dentistry	48	8.3%	45	2.7%
Other	37	6.3%	144	8.6%
Total	**585**	**100.0%**	**1673**	**100.0%**

[a] Gender differences were statiscally significant at *P*<.0001.

Source: American Dental Association Health Policy Institute, Survey of Dental Practice, 2017.

Dental Practice Patterns

Employment Status, Work Hours, and Practice Location

In 2016, a significantly larger proportion of female than male dentists were employees or independent contractors (37.3% vs 12.6%; *P*<.0001) (Table 18). Similar to the findings in the ADA Masterfile, these differences may be due, in part, to notable differences in the age distribution of female dentists, with female dentists being younger overall than male dentists.

In 2016, the distribution of work hours (ie, part-time or full-time) in private practice was similar among female and male dentists (Table 18). Proportionally more female than male dentists worked in suburban or urban areas (97.0% vs 94.9%; *P*=.0491).

Table 18. Dentists' Practice Patterns by Gender, 2016

Dental Practice Patterns[a]	Female Dentists		Male Dentists	
	n	%	n	%
Employment status[b]				
Employee or independent contractor	213	37.3%	208	12.6%
Owner	359	62.7%	1,444	87.4%
Total	**572**	**100.0%**	**1,651**	**100.0%**
Work hours[c]				
Part-time	62	10.6%	199	11.9%
Full-time	523	89.4%	1,474	88.1%
Total	**585**	**100.0%**	**1,673**	**100.0%**
Practice location[d]				
Small town/rural areas	17	3.0%	81	5.1%
Suburban/urban areas	533	97.0%	1,511	94.9%
Total	**550**	**100.0%**	**1,591**	**100.0%**

[a] Gender differences were statiscally significant for employment status at *P*<.0001 and for practice location at *P*=.0491.

[b] "Employee" was defined as on a salary, commission, percentage, or associate basis; "owner" was defined as a solo proprietor (ie, the only owner/shareholder) or a partner (ie, one of 2 or more owners/shareholders).

[c] "Part-time" was defined as <30 hours/week and "full-time" was defined as ≥30 hours/week of work in a private practice.

[d] Practice location was defined using Rural–Urban Commuting Area (RUCA) codes, a classification system based on practice location ZIP codes: rural area (RUCA 10), small town (RUCA 7–9), micropolitan area (RUCA 4–6), metropolitan area (RUCA 2–3), and large metropolitan area (RUCA 1). About 5% of observations were excluded from this analysis due to missing information on the practice ZIP code location.

Source: American Dental Association Health Policy Institute, Survey of Dental Practice, 2017.

Practice Busyness

In 2016, dentists' self-perceptions of the level of busyness in their primary practice varied significantly (P=.0076) by gender (Table 19). Proportionally more female than male dentists reported being too busy to treat all of the people requesting appointments (7.6% vs 4.9%) or reported providing care to all who requested appointments but being overworked (20.3% vs 18.6%). In contrast, proportionally more male dentists (28.7%) than female dentists (22.2%) reported being not busy enough (ie, could have treated more patients).

Table 19. Dentists' Perception of Their Busyness by Gender, 2016

Perceived Busyness[a,b]	Female Dentists		Male Dentists	
	n	%	n	%
Too busy	39.1	7.6%	76.2	4.9%
Overworked	105.1	20.3%	289.3	18.6%
Not overworked	258.5	49.9%	744.7	47.8%
Not busy	115.2	22.2%	447.3	28.7%
Total	**517.9**	**100.0%**	**1,557.6**	**100.0%**

[a] Dentists' perceptions of their level of busyness in the primary work setting were defined as follows: too busy to treat all people requesting appointments; provided care to all who requested appointments but was overworked; provided care to all who requested appointments but was not overworked; and not busy enough, could have treated more patients.

[b] Gender difference was statistically significant at *P*=.0076.

Source: American Dental Association Health Policy Institute, Survey of Dental Practice, 2017.

Work Capacity

In 2016, there were small but statistically significant differences by gender in the amount of reported time worked in the primary practice (Table 20). The average number of weeks worked per year was slightly lower for female dentists than for male dentists (47.1 vs 47.8 weeks/year; *P*=.0306). On average, female dentists spent less time in the dental office (34.3 vs 35.7 hours/week; *P*=.0054) and less time treating patients (30.4 vs 31.4 hours/week; *P*=.0184) than male dentists. This finding is consistent with previous literature, which suggests that women practice differently than their male counterparts.

In 2016, female dentists reported slightly more patient visits per week, on average, than male dentists (53.4 vs 50.9 patient visits/week); however, this difference was not statistically significant (Table 20). Female and male dentists saw approximately the same average number of emergency and walk-in patients per week (5.7 vs 5.6 patient visits/week).

Table 20. Dentists' Work Capacity by Gender, 2016

Characteristics	Female Dentists		Male Dentists		*P*
	n	Mean (range)	n	Mean (range)	
Hours worked					
Weeks per year	508	47.1 (2, 52)	1,529	47.8 (11, 52)	0.0306
Hours per week	511	34.3 (7, 65)	1,510	35.7 (3, 70)	0.0054
Hours per week treating patients	501	30.4 (6, 54)	1,486	31.4 (3, 70)	0.0184
Patient visits					
Patient visits treated per week	448	53.4 (5, 500)	1,305	50.9 (2, 320)	0.4318
Emergency and walk-in patient visits treated per week	436	5.7 (0, 30)	1,285	5.6 (0, 50)	0.7243

Source: American Dental Association Health Policy Institute, Survey of Dental Practice, 2017.

Patient Population in the Primary Practice of Solo Practitioner Dentists

Data analysis to describe the patients who visited the dentists' primary practices in 2016 was conducted using data from a subset of 825 solo practitioners (ie, the only owner of the practice) who also reported no other dentists working in their practice.

Change in Patient Volume

A significantly larger proportion of female than male dentist practice owners reported an increase in patient volume in their practice during 2016 (44.9% vs 31.1%; *P*=.0056) (Table 21). In contrast, proportionally more male dentists (47.3%) than female dentists (34.5%) reported no change in patient volume in the past year.

Table 21. Change in Patient Volume in the Primary Practice of Solo Practitioner Dentists by Dentists' Gender During 2016

Patient Volume Change[a]	Female Dentists		Male Dentists	
	n	%	n	%
Increase	60	44.9%	206	31.1%
No change	46	34.5%	314	47.3%
Decrease	27	20.7%	143	21.6%
Total	**132**	**100.0%**	**663**	**100.0%**

[a] Gender difference was statistically significant at *P*=.0056.

Source: American Dental Association Health Policy Institute, Survey of Dental Practice, 2017.

Characteristics of Patients

In 2016, a significantly higher percentage of patients of female solo practitioners than of male solo practitioner dentists were children under the age of 18 years (Table 22). Female dentists reported that, on average, 32.1% of their patient population was younger than 18 years of age, while male dentists reported that 20.8% of their patients were below the age of 18 (*P*=.0004). Conversely, the proportion of the patient caseload consisting of adults aged 18–64 years (61.2% vs 53.9%; *P*=.0048) and ≥65 years (18.0% vs 14.0%; *P*=.0058) was significantly higher for male than for female dentists.

In 2016, a significantly higher percentage of the patients of female dentists than of male dentists were publically insured (17.1% vs 9.0%; *P*=.0012) (Table 22). Male dentists reported that, on average, 29.3% of their patient population was not covered by insurance, while female dentists reported that 25.3% of their patients were uninsured (*P*=.0257). The proportion of the patient caseload with private insurance was similar for female and male dentists.

Table 22. Distribution of Patients' Age and Insurance Coverage in the Primary Practice of Solo Practitioner Dentists by Dentists' Gender, 2016

Characteristics of Patients (% of All Patients in the Primary Practice)	Female Dentists		Male Dentists		*P*
	n	Mean	n	Mean	
Age (years)					
<18	111	32.1%	571	20.8%	0.0004
18–64	111	53.9%	571	61.2%	0.0048
≥65	111	14.0%	571	18.0%	0.0058
Dental insurance coverage					
Private insurance	121	57.6%	624	61.7%	0.0533
Public assistance	121	17.1%	624	9.0%	0.0012
No insurance	121	25.3%	624	29.3%	0.0257

Source: American Dental Association Health Policy Institute, Survey of Dental Practice, 2017.

Influence of Gender and Age of Solo Practitioner Dentists on Patient Population

Patients' Age

Adjusted point estimates (prevalence rate ratio [PRR] and 95% confidence interval [CI]) showed that female solo practitioners were significantly more likely to provide dental services to children less than 18 years of age compared with male dentists in all age cohorts ≤65 years of age (Table 23). The likelihood of female dentists treating children in comparison with male dentists was highest (PRR: 1.53, 95% CI: 1.44–1.63) among those dentists aged 46–55 years.

White dentists (PRR: 0.76, 95% CI: 0.73–0.80) and general practitioners (PRR: 0.35, 95% CI: 0.33–0.36) were less likely to treat children younger than 18 years of age compared with dentists of other races/ethnicities and dental specialists (Table 23). In contrast, dentists who had not completed residency training (PRR: 1.11, 95% CI: 1.06–1.16) were slightly more likely to provide dental services to children than dentists who had completed residency training. There was no statistically significant difference between US-trained and foreign-trained dentists.

Table 23. Adjusted Prevalence Rate Ratios of Percentage of Patients Less Than 18 Years of Age Among Solo Practitioner Dentists in Association With Their Gender and Age, 2016

Characteristics of Dentists[a]	Percentage of Patients <18 Years of Age		
	Prevalence Rate Ratio	95% Confidence Interval	
		Lower Limit	Upper Limit
Female (reference: male)			
≤35 years of age	1.31	1.15	1.49
36–45 years of age	1.22	1.13	1.31
46–55 years of age	1.53	1.44	1.63
56–65 years of age	1.16	1.05	1.28
≥66 years of age	0.98	0.82	1.18
White (reference: other race/ethnicity[b])	0.76	0.73	0.80
US-trained (reference: foreign-trained)	1.10	0.95	1.28
No residency (reference: residency)	1.11	1.06	1.16
General practitioner (reference: specialist[c])	0.35	0.33	0.36

[a] The multilevel Poisson regression model estimated the effect of gender by age, adjusting for dentists' race/ethnicity, location of training, residency, and specialty (Level 2) and ruralty of state in which the primary practice was located (Level 1). The interaction term (gender x age) and all variables except for the location of training were statistically significant at $P<.0001$.

[b] Asian, Hispanic, Black/African American, American Indian/Alaska Native, Native Hawaiian/Other Pacific Islander, other.

[c] Orthodontics, oral surgery, pediatric dentistry, periodontics, endodontics, public health, oral pathology, radiology.

Source: American Dental Association Health Policy Institute, Survey of Dental Practice, 2017.

Patients' Insurance Type

Female solo practitioners were significantly more likely to provide dental services to patients covered by public dental insurance compared with male dentists in the age cohorts of 36–65 years (Table 24). The likelihood of female dentists treating patients covered by public insurance was nearly 2 times higher than for male dentists among those dentists aged 56–65 years (PRR: 1.80, 95% CI: 1.60–2.03).

White dentists (PRR: 0.36, 95% CI: 0.34–0.38), US-trained dentists (PRR: 0.54, 95% CI: 0.39–0.74), and general practitioners (PRR: 0.46, 95% CI: 0.43–0.50) were less likely to treat patients covered by public insurance than dentists of other races/ethnicities, foreign-trained dentists, and specialists, respectively (Table 24). In contrast, dentists who had not completed residency training were 2.5 times more likely to provide dental services to patients covered by public insurance than dentists who had completed residency training (PRR: 2.48, 95% CI: 2.32–2.66).

Table 24. Adjusted Prevalence Rate Ratios of Percentage of Patients Covered by Public Insurance Among Solo Practitioner Dentists in Association With Their Gender and Age, 2016

Characteristics of Dentists[a]	Percentage of Patients Covered by Public Insurance		
	Prevalence Rate Ratio	95% Confidence Interval	
		Lower Limit	Upper Limit
Female (reference: male)			
≤35 years of age	0.84	0.70	1.02
36–45 years of age	1.72	1.53	1.94
46–55 years of age	1.30	1.20	1.40
56–65 years of age	1.80	1.60	2.03
≥66 years of age	0.55	0.39	0.76
White (reference: other race/ethnicity[b])	0.36	0.34	0.38
US-trained (reference: foreign-trained)	0.54	0.39	0.74
No residency (reference: residency)	2.48	2.32	2.66
General practitioner (reference: specialist[c])	0.46	0.43	0.50

[a] The multilevel Poisson regression model estimated the effect of gender by age, adjusting for dentists' race/ethnicity, location of training, residency, and specialty (Level 2) and ruralty of state in which the primary practice was located (Level 1). The interaction term (gender x age) and all variables except for the location of training were statistically significant at $P \leq .0001$.

[b] Asian, Hispanic, Black/African American, American Indian/Alaska Native, Native Hawaiian/Other Pacific Islander, other.

[c] Orthodontics, oral surgery, pediatric dentistry, periodontics, endodontics, public health, oral pathology, radiology.

Source: American Dental Association Health Policy Institute, Survey of Dental Practice, 2017.

Female solo practitioners were significantly less likely to provide dental services to patients without dental insurance compared with male dentists in the age cohort of 36–45 years (Table 25). The likelihood of female dentists treating patients without dental insurance was 2% to 12% higher than for male dentists among those dentists aged ≤35 years and ≥56 years; however, these differences were not statistically significant.

White dentists (PRR: 1.78, 95% CI: 1.69–1.87) and general practitioners (PRR: 1.05, 95% CI: 1.01–1.09) were more likely to treat patients not covered by dental insurance than dentists of other races/ethnicities and specialists (Table 25). In contrast, dentists who had not completed residency training were less likely to provide dental services to patients without dental insurance than dentists who had completed residency training (PRR: 0.87, 95% CI: 0.84–0.90). There was no statistically significant difference between US-trained and foreign-trained dentists.

Table 25. Adjusted Prevalence Rate Ratios of Percentage of Patients Without Insurance Among Solo Practitioner Dentists in Assocation With Their Gender and Age, 2016

Characteristics of Dentists[a]	Percentage of Patients without Insurance		
	Prevalence Rate Ratio	95% Confidence Interval	
		Lower Limit	Upper Limit
Female (reference: male)			
≤35 years of age	1.07	0.95	1.21
36–45 years of age	0.88	0.80	0.97
46–55 years of age	0.97	0.90	1.03
56–65 years of age	1.02	0.95	1.11
≥66 years of age	1.12	0.98	1.28
White (reference: other race/ethnicity[b])	1.78	1.69	1.87
US-trained (reference: foreign-trained)	0.91	0.81	1.02
No residency (reference: residency)	0.87	0.84	0.90
General practitioner (reference: specialist[c])	1.05	1.01	1.09

[a] The multilevel Poisson regression model estimated the effect of gender by age, adjusting for dentists' race/ethnicity, location of training, residency, and specialty (Level 2) and ruralty of state in which the primary practice was located (Level 1). The interaction term (gender x age) and all variables except for the location of training were statistically significant at $P<.0001$.

[b] Asian, Hispanic, Black/African American, American Indian/Alaska Native, Native Hawaiian/Other Pacific Islander, other.

[c] Orthodontics, oral surgery, pediatric dentistry, periodontics, endodontics, public health, oral pathology, radiology.

Source: American Dental Association Health Policy Institute, Survey of Dental Practice, 2017.

DISCUSSION

The present study focused on dentists' practice characteristics and choices by gender but did not assess differences in pay/compensation. The latter topic is prominently discussed in recently published peer-reviewed literature, especially that produced by the ADA's Health Policy Institute (HPI). HPI found gaps in pay equity by gender after accounting for differences in age and hours worked.[38] The wage gap is not specific to dentistry; it is present in several similar professions, including medicine, law, and pharmacy.[39,40]

Ownership or Employment

One possible factor advanced by researchers to explain changes in the gender composition of higher-paying professions is an increase in workplace flexibility.[28] Researchers describe workplace flexibility as the ability to work fewer hours or part time, to have scheduling flexibility in a workday, and/or to interrupt work for a period of time to meet family needs, including childbearing.[41] The self-employment/private practice construct in professions such as dentistry has historically limited workplace flexibility.

Business models in medicine, dentistry, veterinary medicine, and pharmacy have changed with the consolidation of practices and the growth in group practice or corporate management models, which are likely to afford greater structural flexibility than the historical small private practice model typical of dental practice. Recent trends show an increase in group practices and changing business management models in dentistry[42] (eg, dental service and support organizations) that may provide practice options including employment in, rather than ownership of, dental practices. These models may offer more structured work hours and benefits (ie, flexibility) than are possible in small dental practices.

Our study found that female dentists were significantly more likely to work as employees or independent contractors than male dentists in all age cohorts up to 65 years. The trend away from dental practice ownership to employment was similar for males and females between 2010 and 2016, but females were significantly more likely in all years to be employees. Female dentists who were 35 years of age or younger were twice as likely as male dentists in the same age cohorts to be employed or contracted in their place of practice. Female dentists between the ages of 51 and 55 years were 3 times more likely than their male counterparts to be employed or independently contracted.

A significantly larger proportion of male than female dentists owned their practices (83.8% vs 60.4%). On average, 39.6% of female dentists were employees or independent contractors in their place of work, while only 16.2% of male dentists indicated employment or independent contracting as their work status. Preference for associate status/employment among female dentists was noted in several previous studies.[9,11,12]

Ownership differences may be due, at least in part, to notable variation in the age distribution of female dentists, with female dentists being younger overall than male dentists. However, previous research found that first-year dental students who were female rated ownership of a dental practice as a less important reason for entering dental school than did their male counterparts.[28] The present findings suggest that those attitudes may prevail in subsequent practice.

Our findings also showed that practice ownership increases with age among both male and female dentists. This suggests that the availability of employment as a work option and the commensurate flexibility may not be the sole reason for greater participation of females in the workforce. What these data do suggest is that having a broader range of practice options to tailor participation in practice to meet individual dentists' needs may encourage workforce diversification.

Work Hours

Workplace flexibility is also reflected in the availability of varying work schedules. Walton and colleagues found that workforce participation among both male and female dentists was high in the years between 1979 and 1999.[35] Workforce participation declined with the age of male dentists (the sample size of female dentists in older age groups was too small during those years to make meaningful comparisons).[35]

Our study had similar findings. The percentages of female (90.2%) and male (89.2%) dentists who worked full time (defined as 30 or more hours per week) were similar. However, a significantly higher proportion of female dentists worked part time compared with male dentists in all age cohorts. The proportion of both female and male dentists working part time increased with age, suggesting that older professionals are availing themselves of workplace flexibility even more than younger professionals—an interesting finding considering the widely held perception that younger female dentists are more likely to work part time due to childbearing or family responsibilities related to children.

Patient Volume and Work Capacity

Proportionally more female than male dentists also reported being too busy to treat all of the people requesting appointments (7.6% vs 4.9%) or reported providing care to all who requested appointments but being overworked (20.3% vs 18.6%). Another interesting finding was that, although female dentists were significantly more likely to work part time, female dentists in private practice averaged more weekly patient visits (53.4) than male dentists (50.9) in 2016 (though the difference was not statistically signifcant). The range of average weekly patient visits for female dentists (5-500) also was larger than the range for male dentists (2-320). One reason for the variation in patient visits might be the diminished likelihood of female dentists owning a practice. Practice owners often have administrative responsibilities that would reduce the time available for clinical activities.

Related findings from the SDP suggest that other factors also might impact patient volume. Female dentists who were solo practitioners and also practice owners reported an increase in patient volume in their practices during 2016 significantly more often than did their male counterparts (44.9% vs 31.1%).

These data suggest that small differences in practice hours by gender may be compensated for by differences in patient volume. While differences in patient volume by gender are not easily explained, some of the variation might be attributed to differences in the services provided during patient visits. Previous research has suggested that female dentists are more likely than male dentists to focus on preventive therapies.[25] Another potential factor affecting patient volume may be related to patient age. Female dentists were more likely than male dentists to treat younger patients, for whom the type and duration of services may vary from those required for adults. Understanding differences in practice patterns by gender and the resulting impact on patient capacity would be a worthwhile area for future research.

Residency Participation

Women dentists were more likely to complete postgraduate dental residency programs than men but were less likely to participate in most dental specialties, with the exception of pediatric dentistry. Female dentists were more likely to complete a general practice (GPR) or advanced education in general dentistry (AEDG) residency than their male counterparts. More than half (54.1%) of the female dentists who competed a residency did so in general practice; 15.6% completed a postgraduate training program in pediatric dentistry. An earlier study of US dental students found that women exhibited a preference for residencies in pediatric dentistry and advanced education in general dentistry at entry to predoctoral dental education programs.[28]

One researcher described the preference for general versus specialty practice as "internal segregation"[8] when female participation in specialty practice is uneven. The research on women in health professions suggests that women are more likely to participate in primary care and in specialties considered to be "female," such as obstetrics, pediatrics, or (in this case) pediatric dentistry. Although our findings suggest that some dental specialties (eg, oral and maxillofacial surgery) are persistently more "male," increasing rates of female participation in these areas suggest slower but progressive diversification even within these dental specialties.

Patient Populations

Our study also found that female solo practitioners in all age cohorts 65 years of age or younger were significantly more likely to provide dental services to children less than 18 years of age compared with male dentists. In 2016, a significantly higher proportion of female dentists worked as pediatric dentists than male dentists (6.1% vs 2.8%).

In addition, the likelihood of female dentists aged 36 to 65 years treating patients covered by public insurance was higher than for male dentists in the same age cohorts. This study also found that solo practitioner dentists who had not completed residency training, regardless of gender, were 2.5 times more likely to provide dental services to patients covered by public insurance than dentists who had completed a residency training program. In 2016, the majority of female (81.4%) and male (77.6%) dentists were general practitioners. These are important findings relating to underserved populations and access to dental care.

Foreign-Trained Dentists

A previous study noted that a contributing factor to gender diversification was an increase in the number of foreign-trained dentists practicing in the US.[1] The gender composition of the dental profession is already predominately female in many countries, especially in Eastern Europe, so that dentists migrating to the US are also proportionally more female. Our study found that proportionally more female dentists (8.3%) in the US were foreign trained than were male dentists (4.4%), suggesting other dimensions of diversification within the workforce contemporaneous with gender diversification (eg, language diversity, cultural diversity, racial and ethnic diversity).

In our study, the practice preferences of foreign-trained dentists were generally concordant with those of female dentists. Female dentists aged 36 to 65 years were significantly more likely than male dentists in those age cohorts to provide dental services to patients with public dental insurance; likewise, foreign-trained dentists were more likely than US-trained dentists to treat patients with public insurance coverage. However, foreign-trained dentists were also more likely to be owners of dental practices than US-trained dentists, whereas female dentists overall were more likely to be employees or contractors in their practices.

Geographic Distribution

Female and foreign-trained dentists were similar in their preferences for suburban and urban practice. In 2016, the majority of female and male dentists (≥95%) worked in suburban and urban areas (ie, micropolitan, metropolitan, and large metropolitan areas). Significantly more female dentists worked in suburban and urban areas compared with male dentists in all age cohorts, particularly among dentists 61 years of age and older (97.0%–98.1% vs 94.1%–95.1%). The proportion of dentists practicing in rural areas increased by 2.5% from 2010 to 2016 among both female and male dentists, though the actual percentages of dentists in those areas remained relatively small. Similarly, the proportion of female and male dentists working in metropolitan areas increased by 6.1% and 5.8%, respectively, between 2010 and 2016.

US-trained dentists were more than 6 times as likely to work in small towns or rural areas as foreign-trained dentists. This was a particularly interesting finding, as the reverse is true in medicine. A 2012 study found that 19.3% of primary care physicians practicing in rural areas of the US were international medical graduates.[43] The findings from the present study relative to dentists' practice locations may have implications for the availability of dental services in less-populated areas in the US over time. However, economic/market forces may impact practice choices in the future independent of current geographic preferences.

STUDY LIMITATIONS/STRENGTHS

Findings in this report are subject to several limitations. The influence of gender and age on dentists' practice patterns was assessed using ADA Masterfile data, 2010–2016. The effect estimates on employment status excluded about 22% of dentists in the ADA Masterfile data who lacked employment situation information. The effect estimates on geographic location of the practice excluded about 13% of dentists in the ADA Masterfile data who lacked practice ZIP code information. However, there is no reason to suspect that information collected on employment status and/or practice ZIP code would vary systematically between female and male dentists. Therefore, the exclusion of dentists without employment status and/or ZIP code information is not expected to bias the gender analysis findings. Despite its limitations, the ADA Masterfile provides the most comprehensive data on US dentists (regardless of ADA membership) that is continually updated with information from numerous data sources.

The influence of gender and age on dentists' practice patterns was calculated using the 2017 Survey of Dental Practice (SDP). The data analysis was limited to the following cohorts of survey respondents: (1) 2,258 professionally active dentists in private practice (full time or part time) with gender information and (2) a subset of 825 solo practitioners (ie, the only owner of the practice) who also reported no other dentists working in their practice. The limitations of the data include a response rate of 14% and a small sample size that may likely have an impact on the statistical power of the study and the generalizability of the study findings. Selection bias, which may result when an overrepresentation of dentists occurs by particular practice characteristics, can also impact study findings. However, we weighted the study sample to achieve a representative profile of the national population of dentists. In addition, we weighted the findings to compensate for potential survey nonresponse bias with respect to dentist characteristics such as age group, general practitioner or specialist status, ADA membership status, and county population corresponding to the dentist's location.

Another potential limitation of the SDP self-reported data is related to recall bias. However, it is unlikely that there were systematic differences in completeness or accuracy of information reported by the survey respondents between female and male dentists, and, therefore, the study findings are not expected to be affected by this bias. Information from the ADA's annual SDP has been used in numerous oral health workforce studies, as it collects the most comprehensive and reliable annual data available on US dentists (regardless of ADA membership), including demographics and various practice characteristics such as work schedules, patient visits, patient characteristics, nondentist staff employment, expenses, income, and wages.

Due to the nature of the secondary analysis of existing data, this study was not able to evaluate the influence of some other important factors not collected in the ADA Masterfile and SDP (eg, marital status, household annual income, number and age of children) on differences in practice patterns by gender among US dentists.

Finally, the study's cross-sectional design precludes any causal inferences between gender diversity in dentistry and oral health practice patterns.

CONCLUSIONS

The findings from this study suggest that trends in the diversification of the dental workforce should be monitored over time so that pipeline programs, policy advocates, and professional stakeholders can be proactive in responding to changes in practice preferences, especially those related to the geography of dental practices. This study found small differences in practice hours by gender but compensating differences in patient volume, suggesting that concerns about substantial changes in capacity within the dental delivery system may be unfounded.

Gender diversification of the dental workforce is only one aspect of our changing health care and oral health care delivery systems. Dental professionals and others are making personal choices about work in the context of a fast-changing policy environment, so it is difficult to attribute changes in workforce preferences to gender alone. Many factors, including generational differences, will continue to affect the practice configurations in dentistry. It is important to continually monitor the workforce in order to ensure the adequate supply and appropriate distribution of dental professionals to meet the needs of the growing, aging, and also changing US population.

Appendix

APPENDIX: ADDITIONAL STATE-LEVEL DATA

Supplemental Table 1. Dentists per 100,000 Population by State, 2016

State	Female Dentists	Male Dentists	Percent of Female Dentists	Percent of Male Dentists	Female Dentists per 100,000 Population	Male Dentists per 100,000 Population	US Population	Percent of Population Living in Rural Areas
Alabama	499	1604	23.7%	76.3%	10.3	33	4,860,545	41.0%
Alaska	128	417	23.5%	76.5%	17.3	56.2	741,522	34.0%
Arizona	795	2857	21.8%	78.2%	11.5	41.4	6,908,642	10.2%
Arkansas	227	1001	18.5%	81.5%	7.6	33.5	2,988,231	43.8%
California	9795	18974	34.0%	66.0%	24.9	48.3	39,296,476	5.0%
Colorado	1040	2756	27.4%	72.6%	18.8	49.8	5,530,105	13.8%
Connecticut	756	1839	29.1%	70.9%	21.1	51.3	3,587,685	12.0%
Delaware	119	298	28.5%	71.5%	12.5	31.3	952,698	16.7%
District of Columbia	221	363	37.8%	62.2%	32.3	53	684,336	0.0%
Florida	3430	7079	32.6%	67.4%	16.6	34.3	20,656,589	8.8%
Georgia	1451	3268	30.7%	69.3%	14.1	31.7	10,313,620	24.9%
Hawaii	238	845	22.0%	78.0%	16.7	59.1	1,428,683	8.1%
Idaho	86	845	9.2%	90.8%	5.1	50.3	1,680,026	29.4%
Illinois	2672	5824	31.5%	68.5%	20.8	45.4	12,835,726	11.5%
Indiana	834	2211	27.4%	72.6%	12.6	33.3	6,634,007	27.6%
Iowa	450	1149	28.1%	71.9%	14.4	36.7	3,130,869	36.0%
Kansas	373	1079	25.7%	74.3%	12.8	37.1	2,907,731	25.8%
Kentucky	730	1638	30.8%	69.2%	16.5	36.9	4,436,113	41.6%
Louisiana	597	1634	26.8%	73.2%	12.7	34.9	4,686,157	26.8%
Maine	155	504	23.5%	76.5%	11.7	37.9	1,330,232	61.3%
Maryland	1482	2678	35.6%	64.4%	24.6	44.4	6,024,752	12.8%
Massachusetts	1902	3239	37.0%	63.0%	27.9	47.5	6,823,721	8.0%
Michigan	1760	4330	28.9%	71.1%	17.7	43.6	9,933,445	25.4%
Minnesota	1026	2236	31.5%	68.5%	18.6	40.5	5,525,050	26.7%
Mississippi	336	919	26.8%	73.2%	11.3	30.8	2,985,415	50.6%
Missouri	704	2219	24.1%	75.9%	11.6	36.4	6,091,176	29.6%
Montana	118	508	18.8%	81.2%	11.4	48.9	1,038,656	44.1%
Nebraska	310	904	25.5%	74.5%	16.3	47.4	1,907,603	26.9%
Nevada	381	1131	25.2%	74.8%	13	38.5	2,939,254	5.8%
New Hampshire	244	579	29.6%	70.4%	18.3	43.4	1,335,015	39.7%
New Jersey	2279	4798	32.2%	67.8%	25.4	53.4	8,978,416	5.3%
New Mexico	247	778	24.1%	75.9%	11.8	37.3	2,085,432	22.6%
New York	4328	9826	30.6%	69.4%	21.8	49.5	19,836,286	12.1%
North Carolina	1504	3602	29.5%	70.5%	14.8	35.5	10,156,689	33.9%
North Dakota	104	310	25.1%	74.9%	13.8	41	755,548	40.1%
Ohio	1521	4474	25.4%	74.6%	13.1	38.5	11,622,554	22.1%

Supplemental Table 1. Dentists per 100,000 Population by State, 2016 (Cont.)

State	Female Dentists	Male Dentists	Percent of Female Dentists	Percent of Male Dentists	Female Dentists per 100,000 Population	Male Dentists per 100,000 Population	US Population	Percent of Population Living in Rural Areas
Oklahoma	454	1461	23.7%	76.3%	11.6	37.3	3,921,207	33.8%
Oregon	737	1988	27.0%	73.0%	18	48.7	4,085,989	19.0%
Pennsylvania	1941	5640	25.6%	74.4%	15.2	44.1	12,787,085	21.3%
Rhode Island	150	405	27.0%	73.0%	14.2	38.3	1,057,566	9.3%
South Carolina	643	1709	27.3%	72.7%	13	34.5	4,959,822	33.7%
South Dakota	99	349	22.1%	77.9%	11.5	40.5	861,542	43.3%
Tennessee	744	2504	22.9%	77.1%	11.2	37.7	6,649,404	33.6%
Texas	4964	9561	34.2%	65.8%	17.8	34.3	27,904,862	15.3%
Utah	88	1781	4.7%	95.3%	2.9	58.5	3,044,321	9.4%
Vermont	83	264	23.9%	76.1%	13.3	42.4	623,354	61.1%
Virginia	1710	3489	32.9%	67.1%	20.3	41.5	8,414,380	24.5%
Washington	1531	3649	29.6%	70.4%	21	50.1	7,280,934	15.9%
West Virginia	225	640	26.0%	74.0%	12.3	35	1,828,637	51.3%
Wisconsin	820	2404	25.4%	74.6%	14.2	41.6	5,772,917	29.8%
Wyoming	50	250	16.7%	83.3%	8.5	42.7	584,910	35.2%
United States	**57,081**	**134,810**	**29.8%**	**70.3%**	**17.6**	**41.7**	**323,405,935**	**19.3%**

Sources:

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