A Reassessment of Orthodontic Residents' Demographics, Educational Experiences, and Future Plans

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Abstract

Introduction/Objective: The purpose of this study was to conduct a follow-up survey to assess orthodontic residents' demographics, educational experiences, and future plans. The survey was based on one conducted by Stoker et al. in 2018[1] but modified to incorporate questions about the importance of diversity and inclusion to decisions about residency programs, future work environments, and the effects the COVID-19 pandemic had on orthodontic residents.

Materials and Methods: An anonymous, electronic survey was distributed via e-mail to orthodontic residents in August 2024. It was a 41-question survey with three overall categories: Demographics, Program Specific Questions, and Future Goals. Collected data were analyzed via Wilcoxon and Fisher's exact tests to compare females versus males and ≤$300,000 versus >$300,000 total educational debt, where significance was defined as $p < 0.05$. Once collected and analyzed, the survey data from 2024 were compared to survey data from 1992, 2003, and 2018 to identify changes and trends that have emerged.

Results: Of 270 respondents, 61% were female while 39% were male. Thirty-nine% had ≤$300,000 while 61% had >$300,000 total educational debt. Significantly different proportions of females versus males rated responses as extremely to not important for program cost, diverse/inclusive environment, future work plans and location. Those with ≤$300,000 versus >$300,000 total educational debt showed significant differences for importance of program cost, sources of financial support and first job choice. Compared to 2018, there were more females and more with >$300,000 debt by 10% and 14% respectively.

Conclusions: This study captured an updated profile of orthodontic residents' demographics, educational experiences, and future plans. Some significant differences were found between male and female respondents as well as between those with ≤$300,000 versus >$300,000 total educational debt. Comparison with previous survey results since 1992 revealed trends, in particular, a sustained rise in female representation and a progressive increase in educational debt.

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Introduction

Background of Project

Over the past forty years, results from eight main surveys have been published to inform on various aspects of orthodontic residency programs. The first of these surveys included information from programs' department chairs regarding the amount of clinical experience, research opportunities, cost of tuition, number and experience of faculty members, as well as program length. [2-5] Follow up and new surveys were created to assess specifically the experience and demographics of orthodontic residents to capture their unique perspectives and evaluate trends emerging in orthodontic education. [1,6-8] The survey results to date have shown changes regarding the preferences, priorities, and challenges faced by orthodontic residents over the past four decades. These results have helped to inform prospective and current orthodontists, orthodontic residents, those in industries supporting orthodontic care delivery, and the public.

The first survey given to assess orthodontic graduate programs was distributed in 1983 by Sinclair and Alexander out of Baylor College of Dentistry. [4] This survey, sent to all sixty-one graduate programs in the United States and Canada, covered eight major categories including program organization, graduate students, faculty, facilities and staff, clinical details, treatment techniques, research, and curriculum. The goal of their survey was to give insight into the curriculum in orthodontic programs, evaluate strengths and weaknesses of these programs, and provide foundation for future research. This survey was sent directly to program chairs for their participation and forty-nine of the sixty-one chairs responded, giving a response rate of roughly 80%. At this time most residencies were two-year programs, with durations ranging from 20 to 24 months. The average resident spent about $9,000 in total to complete their graduate education, and the authors emphasized the importance of finding ways to decrease the burden of

this cost. Most residents at this time started an average of 29 cases and ended up with an average caseload of around 58 patients after receiving transfer patients. On average, schools charged $1,170 for full treatment which was approximately half the cost of full treatment in most private practices at that time. The survey found that very little research completed during graduate programs went on to be published, with a 9.3% publication rate of papers published per number of residents.

In 1989, Sinclair and Rudolph distributed a second survey like the one first given in 1983.[5] They aimed to compare the findings to the results of the prior survey and identify trends that may be emerging in orthodontic education. Similar to the 1983 survey, this 1989 survey was sent directly to program chairs for their participation and forty-two of the sixty-one chairs responded, giving a response rate of roughly 69%. One of the first notable trends they found was the increase in programs' durations towards 3 years. By 1989, "nearly a third (31%) of programs had extended their curriculum to 30 months or more."[5] This was compared to only 6% of programs in 1983. Sinclair and Rudolph also noted a sizable increase in the tuition paid by residents since the previous survey. In-state tuition increased by about 50%, while out-of-state tuition increased by around 66%. It was noted that 80% of programs did not pay residents any stipends, with only 10% of programs paying stipends of $5,000 or more. Another important change seen over this 6-year period was an increase in caseloads. The average caseload grew from 58 to 72 patients per resident between 1983 and 1989. The authors also noted an increase in the number of publications based on orthodontic residents' research, increasing from 0.94 publications per school in 1983 to 2.4 per school in 1989.

In August of 1992 Keith and Proffit distributed a survey at the Graduate Orthodontic Residency Program (GORP) at the University of Michigan.[7] This was the first survey distributed

directly to residents to gain their perspectives of their programs. Residents appeared eager to share their opinions as 168 of the 207 residents returned the surveys for a response rate of 81%. Of the residents who completed the survey, one-quarter (26%) were female, and one-fifth (21%) were from countries other than the United States. When asked the reason for selecting a particular program as their first choice, residents listed program reputation, location, clinical content, cost, head of department, research, and teaching opportunities as some of the major factors. When totaling application and interview costs, on average, residents spent $1300 during their application process. Overall, the majority of orthodontic residents reported they were satisfied with their program, with a small number (11%) reporting dissatisfaction or mixed feelings. This survey revealed that, for most residents who were less satisfied with their "problems and difficulties related to orthodontic training fell into two major categories: financial stress and family pressures."

In 1994, shortly after the work of Keith and Proffit, a third survey in the series was distributed by Rudolph and Sinclair.[3] This survey was formatted very similarly to the ones given in 1983 and 1989, with the main difference being a new section dedicated solely to program costs. Forty-nine out of sixty-one department chairs returned the survey for a response rate of 80%. Similar to the survey in 1989, this survey found a continued increase in the number of 3-year curriculums, with a notable decrease in 2-year curriculums. This 1994 survey revealed that less than 3% of graduates were planning to enter careers in teaching and research. The authors noted the concern that without first-rate educators and leaders the profession may begin to suffer. In fact, according to the 1994 survey, programs reported that it was becoming increasingly difficult to fill full-time faculty positions, although the average number of faculty positions per program over the 11-year span had remained the same. Another concerning factor was the sharp

increase in tuition. The study showed that over a ten-year period, both in-state and out-of-state tuition had nearly doubled. The small fraction of programs that did provide stipends provided amounts far less than the cost of tuition. Rudolph and Sinclair also discussed the increase in the number of schools publishing papers based on their residents' research since 1989. In 1994, 45% of residents' research results were published compared to 25% and 9% in 1989 and 1983 respectively.

In 2000, Keim and Sinclair distributed a fourth survey in the series and evaluated trends and new developments in orthodontic education since 1984. [2] This survey was distributed to program directors in the US and Canada. Fifty-eight surveys were sent and forty-four were returned for an overall response rate of approximately 76%. Of note, was the increase in female residents since 1984. In 2000, about half of all orthodontic residents were female, compared to their 15% representation in 1983. Once more, the authors noted a striking increase in tuition prices. In 1983 the average cost of tuition was around $5,000, whereas in 2000, the average cost of tuition had more than tripled to nearly $16,000, with the highest cost of tuition per year reaching $38,000. The authors also emphasized the programs' struggle to find faculty members. Not only did the average number of full-time and part-time faculty members decrease, but there was also a decrease in the number of full-time faculty with at least 20 years of experience. Overall, the proportion of more experienced to younger, less experienced faculty was noted to be decreasing during this time frame. The 2000 survey indicated a clear trend toward a larger caseload per student. On average each resident's caseload increased from 57.9 patients in 1983 to 85.2 patients in 2000. Lastly, one of the most significant findings from this survey was the decrease in student research. In 1994, 84% of schools had at least one publication based on residents' research whereas in 2000, only 42% of the schools reported this. In total, only 15% of

residents' research results were published in 2000, which was down significantly from 45% in 1994.

Shortly after the survey by Sinclair and Keim in 2000, Bruner et al. distributed a 26-item survey to orthodontic residents attending the GORP held at Harvard University in 2003.[6] Their survey contained 3 sections: resident demographics, residency training, and resident goals after graduation. Of the 380 questionnaires distributed, 295 were completed and returned at the meeting for a 77% response rate. The demographic portion of the survey revealed that 62% of the residents attending GORP were males, while only 38% were females. In addition, male residents were more likely to have children than their female classmates. When choosing a residency program, most residents listed clinical education as the most important deciding factor and research opportunities as the least important factor. This 2003 survey reported average debts attributed to orthodontic residency ranged from $26,000 to $50,000, while average overall educational debt ranged from $101,000 to $150,000. Notably, 63% of respondents reported that their educational debt held them back from pursuing a full-time career in academics. Lastly, this survey noted that female orthodontic residents had significantly lower income expectations than male orthodontic residents, but they planned to work nearly the same number of hours per week.

In 2008, Nobel et al., surveyed orthodontic residents to investigate factors influencing career choice and identify their future life plans.[8] The survey was sent to 335 orthodontic residents in the United States and 136 residents completed the survey for a response rate of 40.6%. Of the residents who responded, 65% were male and 35% were female. When asked to select the single most important factor for choosing a career in orthodontics, passion for orthodontics, intellectual stimulation, and workload flexibility and predictability were the most common answers selected. The average debt of orthodontic residents at graduation from

residency was $165,226 with a range from $0 to $500,000. In terms of future plans, most respondents (32%) reported that they planned to practice orthodontics as an associate after graduation, and 89% reported plans to work in a private practice setting. The results from this survey also showed that most residents (93%) intended to work more than 3 days per week.

In 2018, Stoker and co-authors worked to distribute another survey to residents at the GORP held at the University of Michigan. [1] The survey was based on Bruner et al.'s survey in 2003 and had 3 overarching sections: program selection, future goals, and resident demographics. Of the 489 conference attendees, 76% completed the survey. Of the residents who completed the survey, 51% were females and 49% were males. In 2018, the average length of orthodontic residency programs was 30.9 months. Ninety-seven percent of residents reported they were either satisfied or very satisfied with their orthodontic program, while only 3% reported to be unsatisfied with their program. When asked to rank factors that influenced their choice in residency programs, clinical education was most frequently ranked as the most important, and research opportunities were ranked as least important. Similar to those in the past, this survey found that only a very small proportion of orthodontic residents planned to enter academics after graduation; however, 49% of the respondents said they would be interested in a full-time academic career if the career was more lucrative. When excluding those with no student debt, this survey revealed the average debt for orthodontic residency in 2018 was $164,979 ± $122,211 while the average total educational debt was $387,264 ± $245,449. Fifty-eight percent of respondents reported their educational debts played a major role in their decision not to pursue a full-time academic career, and 72% of residents reported varying levels of anxiety due to their debt. Once more, it was found that males had higher salary expectations than their female

colleagues. However, significantly more males than females planned to work 5 days a week whereas significantly more females than males planned to work 3 days a week.

Since 2018 there have been several societal and economic shifts to indicate that conducting a new follow-up survey was of paramount interest to re-evaluate trends in orthodontic residents' opinions. For example, results from Stoker et al. suggested orthodontics could be approaching a "bubble market," where the costs of education outweighed the financial benefits from orthodontic practice. [1] As the price of higher education has continued to increase, it is essential to re-assess how this may affect future orthodontic professionals' decisions to practice. Also, the benefits of diversity and inclusivity in education are becoming more widely recognized in recent years. In 2020, the American Dental Education Association (ADEA) released a guide to help dental programs understand the benefits of diversity and demonstrate methods that these programs can utilize to improve diversity. [9] With the efforts since 2018, to highlight the benefits of diversity, equity, and inclusion (DEI) in dental education, it was important to assess if current orthodontic residents considered DEI in their decision-making process when selecting a residency training program. In addition, the COVID-19 pandemic had disruptive effects on society, education, and the economy. According to a 2021 study, 11.5% of dental and dental hygiene students reported their plans for future dental practice have changed since the COVID-19 outbreak. [10] It would be beneficial to assess the way that the COVID-19 pandemic may have similarly affected orthodontic residents and compare this to the information gathered from the 2018 survey. Thus, the goal of this current project was to distribute a new survey to orthodontic residents in 2024 to collect information on their demographics, future plans, and preferences when selecting their residency program in order to shed light on the priorities and challenges faced by orthodontic residents in 2024. This allowed consideration of

trends or changes that may have emerged since 2018. By understanding these factors, program directors can make informed decisions to enhance the quality and effectiveness of residency programs. This study also allows orthodontists and stakeholders in orthodontic care to take a deeper look into the future of the field and evaluate ways in which it can be improved.

Specific Aims

1. To conduct a follow-up survey of the demographics, educational experiences, and future plans of current orthodontic residents.
2. To evaluate trends over time by comparing results with previous similar surveys conducted in 1992, 2003, and 2018.

Materials and Methods

After approval from the Institutional Review Board (IRB) of Oregon Health & Science University (OHSU) (Appendix A), this study was conducted via an anonymous survey using a cloud-based platform (Qualtrics, 2020, Provo, UT) and was designed for viewing on personal mobile devices with small screen sizes. The survey was 41 questions (Appendix B) based on the survey distributed by Stoker in 2018 but modified slightly to address recognized limitations of the previous study[6] and to incorporate questions about the importance of diversity and inclusion to decisions about residency programs, future work environments, and the effects the COVID-19 pandemic had on orthodontic residents. Categorical choices that were previously recognized as problematic in the 2018 survey were replaced by fillable fields so that text could be added directly by respondents or expanded to include more pertinent choices for current conditions. The survey included three central categories: program specific questions, future goals, and demographics.

Program specific questions included topics such as program length, number of residents, number of part-time and full-time faculty members, and factors that may have influenced their choice in residency programs. This section also asked questions regarding program cost, potential stipends given from each program, financial support, amount of student debt, and feelings related to the amount of student debt incurred. The future goals section asked residents to share their career plans after residency, their predicted future salaries, and their intentions to obtain certification from the American Board of Orthodontics (ABO). Lastly, the demographic section of the survey asked residents about their gender, age, race/ethnicity, marital status, number of children, and citizenship status. Note that for "gender" the choices given were female, male, or other and henceforth will be reported as "sex" to align with the categories offered rather than a spectrum of gender identities. [11]

Subjects

The study targeted the population of orthodontic residents enrolled in accredited programs across the United States and Canada during the 2024 academic year.

Recruitment and Survey Distribution

The survey was distributed via e-mail (Appendix C) to all orthodontic residents who registered for the 2024 Graduate Orthodontic Residents Program (GORP) and allowed their e-mail to be shared with vendors. To increase the response rate, residents from OHSU provided quick response (QR) codes to residents attending the 2024 GORP so that they could be informed about the project and complete the survey on their personal cell phones while attending the conference. Reimbursements were offered to those who opted to complete the survey, and any

resident who completed the survey received an online gift card worth $10. Residents were informed that their participation in the survey was voluntary, and by completing the survey they consented to participate.

In addition to the distribution to residents attending the 2024 GORP, an explanation of the project and a link to the survey was also sent to all graduate orthodontic program directors in the US and Canada. The e-mail asked program directors to share the opportunity to complete the survey with their residents (Appendix D).

An initial reminder e-mail was sent to the 2024 GORP attendees two weeks after the primary survey distribution, and one more reminder was sent at the three-week mark. After one month following the distribution of the survey to resident e-mails, the survey was closed.

Data and Statistical Analyses

The data collected from the survey were exported to a spreadsheet (Excel version 16.86, Microsoft Office, Redmond, WA). The data were reviewed, cleaned, and analyzed with statistical software (R Core Team (2025). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria.) to determine means and standard deviations. Collected data were further analyzed via Wilcoxon and Fisher's exact tests to compare females versus males and ≤ versus >$300k total educational debt, where significance was defined as $p < 0.05$. Once collected and analyzed, the survey data from 2024 were compared to the survey data from 1992, 2003, and 2018 to identify changes and trends that have emerged.

Results

Response Rate

According to the American Dental Education Association, there were 1,146 residents enrolled in US orthodontic residency programs in 2024, and an additional 72 residents were enrolled in Canadian programs. [12,13] Of the 1,218 total residents, there were 297 respondents to the survey, which represented approximately 24% of this total. Of the 449 residents who attended the 2024 GORP, 288 allowed their email address to be shared and were sent the survey by email. From this, 206 responded, for a response rate from eligible GORP attendees of approximately 72% and an overall GORP response rate of 46%.

Demographics

Of the 297 residents who enrolled in the survey, 69% (n = 206) reported they attended the 2024 GORP, while 31% (n = 91) did not attend the conference. There was a higher proportion of 1st year residents who attended GORP (91%) versus 2nd and 3rd year residents (72% and 24% respectively). Of the 270 respondents who provided their sex, 61% were female and 39% were male (Table 1, Figure 1). Overall, there was no significant difference in the distribution by sex of those who attended versus those who did not attend the 2024 GORP, where distributions for females were 68% (n = 113) versus 32% (n = 52), respectively, and for males were 72% (n = 76) versus 28% (n = 29), respectively. Most of the 297 respondents (45%) were in their first year of residency while 32% were in their second year, 22% were in their third year, and one respondent was in ≥ fourth year. The overall mean age ± standard deviation of respondents was 29 ± 3 years old. Notably, there was a statistically significant difference in age between female respondents and male respondents by one year, where the mean age of female residents was 28 ± 3 years, and the mean age of male residents were 29 ± 3 years ($p = 0.005$, Table 1). The majority of

responding residents were White/Caucasian at 53%, followed by Asian at 30%, Hispanic/Latino and ≥2 races each at 6%, "other" (described as Métis, Middle Eastern, North African) at 3%, and Black/African American at 2%. The majority of respondents (n = 179/270, 66%) were single, but there was a significant difference ($p < 0.001$) in the distribution of single versus married status between the sexes, where for females this was 75% versus 25%, respectively, and for males this was 52% versus 48%, respectively (Figure 2, Table 1). Eighty-nine percent of respondents were United States citizens, 5% were Canadian, and 5% had citizenship outside of the US or Canada.

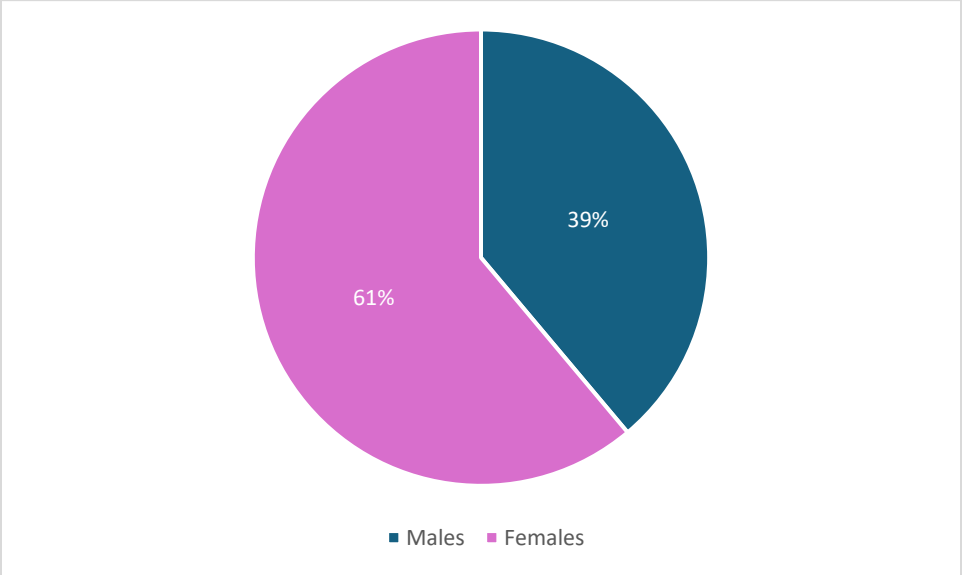

Figure 1. Sex distribution of responding orthodontic residents

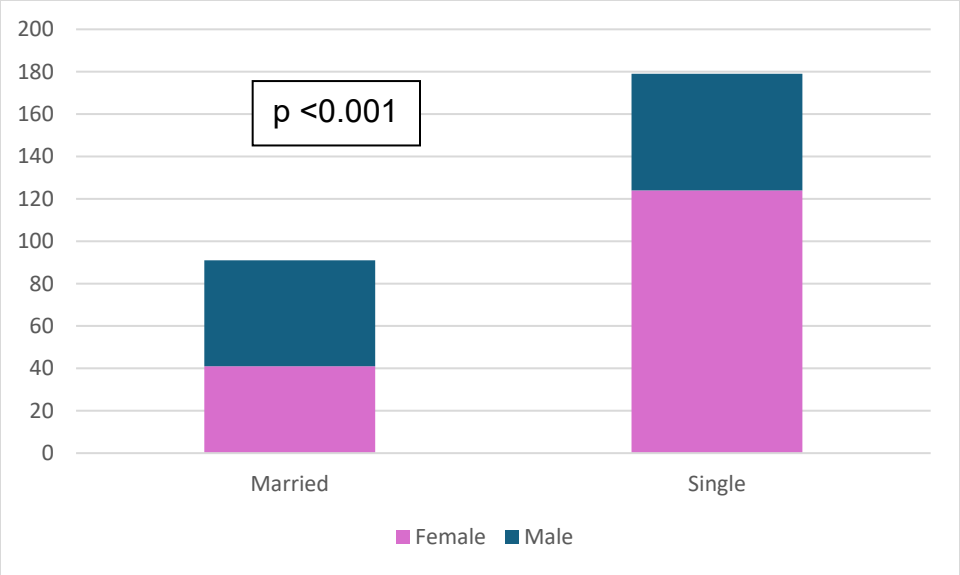

Figure 2. Numbers of respondents versus marital status organized by sex where the distribution of single versus married status between the sexes was significantly different ($p < 0.001$).

Table 1. Sex, age, marital status, children, considerations about orthodontic program, and future plans overall (n = 270) and for female and male respondents in terms of % or mean ± standard deviation. Where significant differences were found, p-values are provided

Feature	Overall	Females	Males	P-value
Sex		61%	39%	
Age (years)	29 ± 3	28 ± 3	29 ± 3	**0.005**
Single	66%	75%	52%	**<0.001**
Married	34%	25%	48%	
Children	12%	0.1 ± 0.3	0.5 ± 0.9	**<0.001**
Importance of: Program cost?				**<0.01**
Very Moderate Slight	62% 25% 14%	54% 28% 18%	74% 19% 7%	
Importance of: Diverse/Inclusive environment?				**<0.001**
Very Moderate Slight	41% 26% 33%	50% 24% 27%	28% 29% 44%	
Future work plans: Purchase existing practice?				**<0.001**
No Yes	75% 25%	86% 14%	52% 48%	
Future work plans: Start own practice?				**<0.001**
No Yes	81% 19%	87% 13%	68% 32%	

Most residents (n = 237/270) reported they did not currently have any children. However, overall, male respondents had on average 0.5 ± 0.9 children per person, and this was significantly more than female respondents who had on average 0.1 ± 0.3 children per person ($p < 0.001$, Table 1). It was also noted that residents who estimated ≤$300,000 total educational debt had on average 0.3 ± 0.7 children per person, while residents who estimated >$300,000 of debt had on average 0.2 ± 0.6 children per person, and this was not statistically significant ($p = 0.11$).

Seventy percent of respondents plan to have children after residency, 4% already have children with no plans to have more, 10% plan to have children during residency, and 16% report no plans to have children. There was a significant difference ($p = 0.003$) between female and male respondents about if and when they plan to have children or more children, where larger percentages of females compared to males planned to have children after residency (73% compared 67%) and had no plans to have children (19% compared to 10%), whereas smaller percentages of females compared to males planned to have children during residency (6% compared to 16%) and already had children with no plans to have more (2% compared to 7%).

Approximately three-quarters (73%) of respondents started their residency program directly after graduating from dental school. This was compared to 13% who started 1-2 years after dental school, 9% who started 3-5 years after, and 4% who started more than five years after graduating from dental school. Of those who did not start residency directly after dental school, 50% reported working in a private practice or corporate setting and 14% reported serving in the military. Of the 76 respondents who did not begin residency right after graduation from dental school; 43 worked in a community health clinic, corporate, or private practice, eleven were in a general practice residency or advanced education in general dentistry program eleven were in the military, six were in a fellowship/internship, three were dental school faculty, one was a hospital dentist, and one completed a pediatric dentistry residency. The proportion of respondents with ≤ versus >$300,000 total educational debt was significantly different ($p = 0.002$) for the time between starting residency and graduation from dental school, where this was 61% versus 82% for 0 years, whereas this was 16% versus 10% for 1-2 years, 15% versus 5% for 3-5 years, and 7% versus 2% for >5 years (Figure 3).

When asked if the COVID-19 pandemic affected their academic/career path, 93% (n = 251) of respondents answered "no," while 7% (n=20) answered "yes." Those who shared how they were affected reported virtual interviews for residency, less clinical experience in dental school, less time to shadow, and online learning during their dental education.

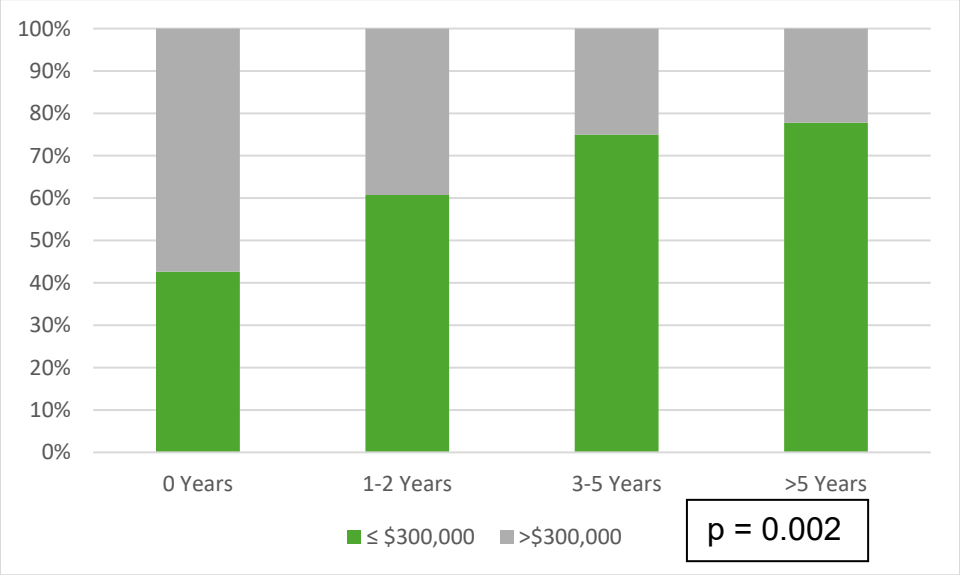

Figure 3. Percentage of respondents versus number of years between dental school and orthodontic residency where significant differences (p = 0.002) were found between those with less than or equal to $300,000 total educational debt shown in green and those with more than $300,000 total educational debt shown in gray.

Estimates of Debt

More than one quarter of respondents (n = 70/262, 27%) estimated $0 of debt from their orthodontic residency. Of those with debt from orthodontic residency, 11% estimated ≤$50,000, 24% estimated $51,000 to $150,000, 24% estimated $151,000 to $250,000, 13% estimated $251,000 to $350,000, and 1% (n = 3) estimated $351,000-$400,000 (Figure 4). Sixteen percent of respondents (n = 45/273) estimated $0 total educational debt. Of those with debt from their education, 7% estimated ≤$100,000, 9% estimated $101,000 to $200,000, 12% estimated

$201,000 to $300,000, 15% estimated $301,000 to $400,000, 14% estimated $401,000 to $500,000, 11% estimated $501,000 to $600,000, 8% estimated $601,000 to $700,000, 3% estimated $701,000 to $800,000 as well as $801,000 to $900,000, 1% estimated $901,000 to $1,000,000, and <1% estimated ≥$1,000,000 (n = 1) (Figure 5).

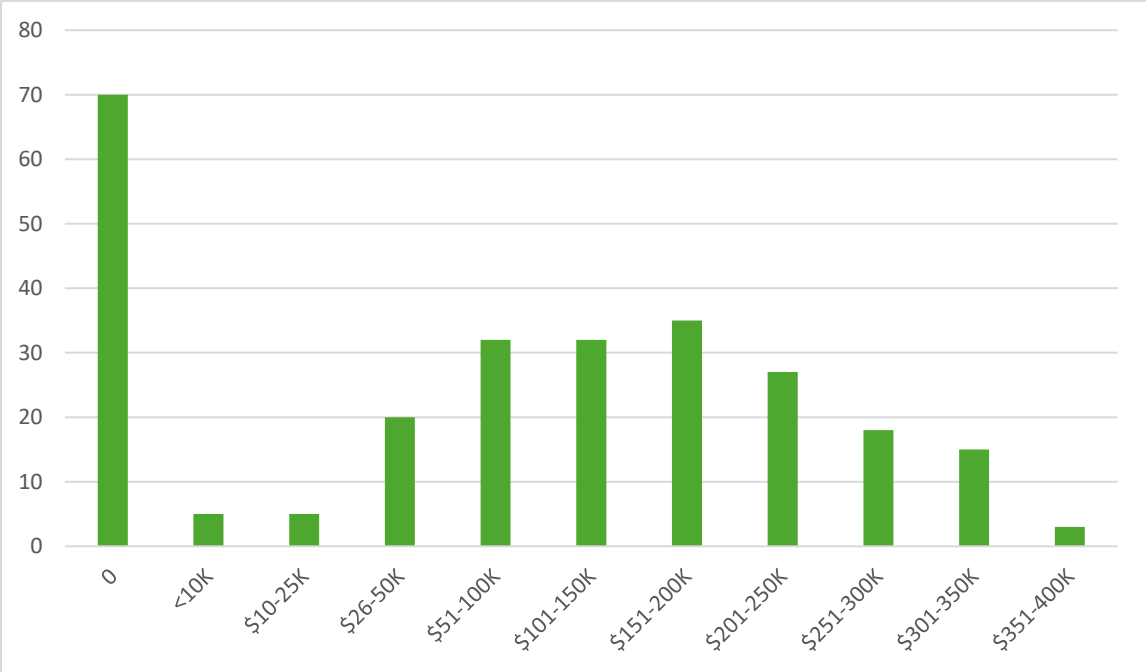

Figure 4. Respondents' estimated debt from orthodontic residency where y axis is number of respondents and x axis is estimated debt in thousands (K) of dollars.

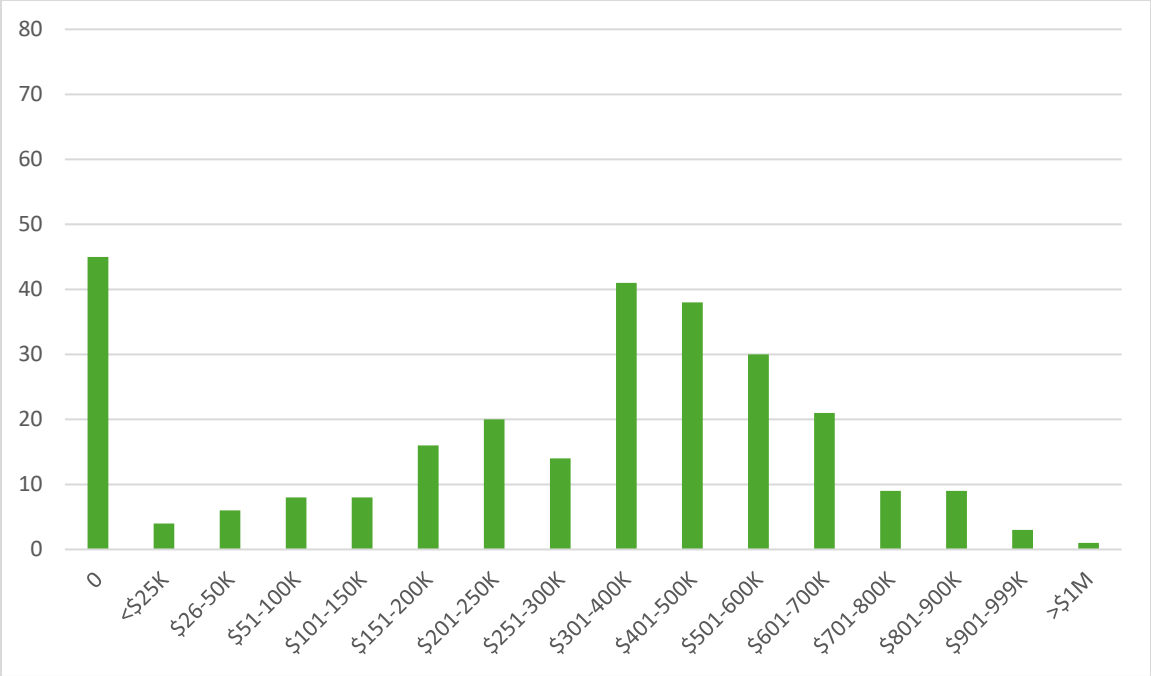

Figure 5. Respondents' estimated total educational debt where y axis is number of respondents and x axis is estimated debt in thousands (K) or millions (M) of dollars.

Program Specific Questions

The mean length of orthodontic residency programs reported by 283 respondents was 31 ± 4 months with a median of 33 months and a range of 24 to 48 months. Most respondents (87%) were working towards a Master of Science and Advanced Education in Orthodontics Certificate while 13% were working towards a Certificate only.

The average number of residents per class was 6 ± 3 with a range from one resident to 15 residents. Notably, respondents with >$300,000 total educational debt had significantly more residents at their program compared to those who had ≤$300,000 total educational debt but the mean difference was less than one resident (7 ± 3 residents versus 6 ± 3 respectively; $p = 0.03$).

Nearly half (47%) of respondents reported to have 3 to 4 full-time faculty members at their program. This is compared to 23% who had 5 to 6 full-time faculty members, and 20% who

had 1 to 2. A smaller portion (10%) had seven or more, and less than 1% had no full-time faculty members. The number of part-time faculty was more evenly distributed for most programs, where 18%, 20%, 23%, 13%, and 20% of respondents had 3 to 5, 6 to 8, 9 to 11, 12 to 14, and more than 14 respectively, whereas less than 5% had 0 to 2.

The vast majority of residents (94%) reported to be satisfied or very satisfied with their orthodontic residency program, whereas 17 of the respondents (6%) reported they were unsatisfied with their orthodontic residency program. There was a noted trend where more residents who reported they were unsatisfied with their program had ≤$300,000 versus >$300,000 total educational debt (10% versus 3%) however, this difference was not statistically significant ($p = 0.08$).

Residents ($n = 273$) reported a wide range in the cost of tuition per year for their orthodontic residency programs, anywhere from zero dollars to more than $100,000 per year. Tuition costs per year for 5% were $0, for 7% were ≤$10,000, for 14% were $11,000 to $20,000, for 7% were $21,000 to $30,000, for 8% were $31,000 to $40,000, for 13% were $41,000 to $50,000, for 6% were $51,000 to $60,000, for 13% were $61,000 to $70,000, for 2% were $71,000 to $80,000, for 5% were $81,000 to $90,000, for 9% were $91,000 to $100,000, and for 10% were more than $100,000 (Figure 6). Notably, there was a significant sex difference ($p = 0.04$) in reported tuition costs per year. That is, higher percentages of males versus females were in more of the lower annual tuition brackets of $0 (9% versus 4%), ≤$10,000 (10% versus 4%), $11,000 to $20,000 (17% versus 13%), $41,000 to $50,000 (16% versus 11%), and $51,000 to 60,000 (8% versus 5%), whereas higher percentages of females versus males were in more of the higher annual tuition brackets of $61,000 to $70,000 (15% versus 10%), $81,000 to $90,000 (6% versus 3%), $91,000 to $100,000 (10% versus 9%), and >$100,000 (12% versus 7%) (Figure 7).

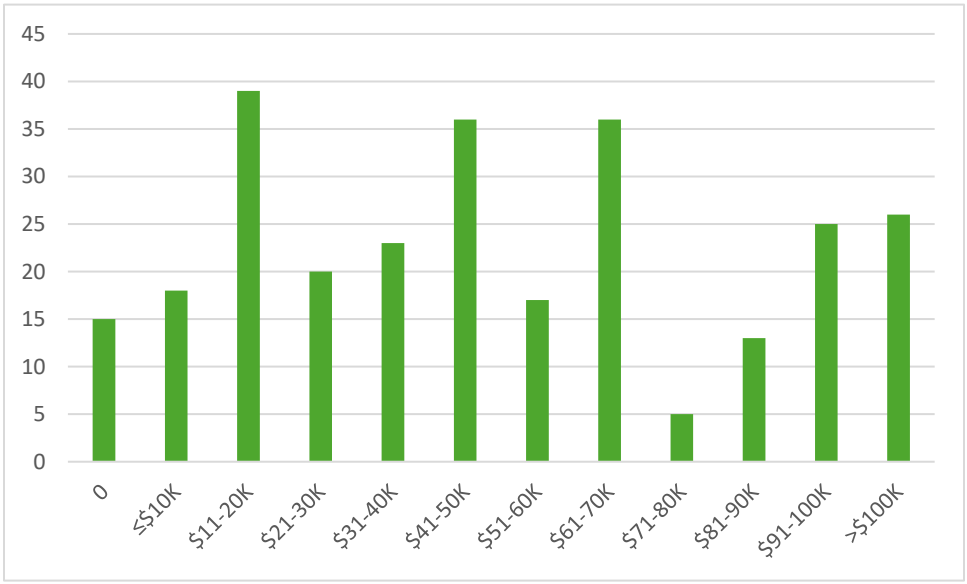

Figure 6. Number of respondents versus annual tuition cost of orthodontic residency in thousands (K) of dollars.

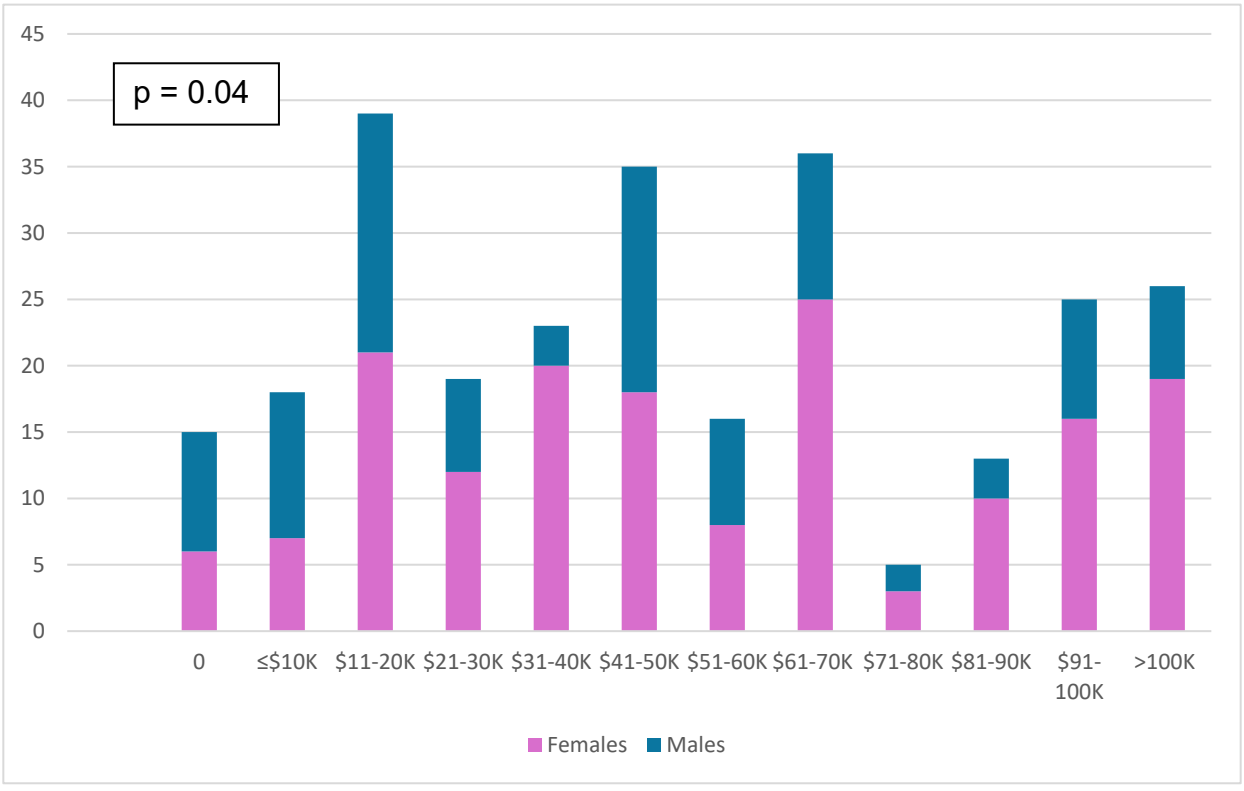

Figure 7. Number of respondents versus annual tuition cost of orthodontic residency in thousands (K) of dollars segregated by females (pink) and males (blue) and where the distribution of tuition costs between the sexes was significantly different (p = 0.04).

More than half of respondents (57%) did not receive a stipend to help offset the cost of tuition, while 43% did receive a stipend. Of the respondents who received stipends, 21% were less than $15,000, 32% received between $15,000 and $30,000, 23% received between $30,000 and $75,000, and 24% received more than $75,000. For a quarter of respondents (n = 34/135), their stipend covered the full cost of tuition, while for 75%, their stipends only covered a portion of their tuition. There was a significant sex difference (p=0.002) in these responses, where the percentages of females (n = 165) versus males (n = 105) whose stipends covered tuition were 8% versus 19%, whereas those whose stipends did not cover the full cost of tuition were 44% versus 27%.

Resident Priorities in Program and Career Selection

When residents were asked which factor was most important when selecting a career in orthodontics, most respondents (n = 175/283, 62%) reported “workload flexibility and predictability” compared to “financial/earning potential” (19%), “skill set” (14%), and “other” (5%). Sex differences for this question were almost significant (p = 0.07), where more females versus males selected “workload flexibility/predictability” (65% versus 55%), “skillset” (15% versus 13%) and “other” (6% versus 4%), whereas more males versus females selected “financial/earning potential” (28% versus 14%).

When asked how important program reputation was when selecting their orthodontic program, nearly half of respondents felt it was either “extremely important” or “very important” (n = 131/283, 48%), compared to 35% who felt it was “moderately important”, and 17% who felt it was “slightly important” or “not at all important”. Sixty-two percent of respondents reported program location was either “extremely important” or “very important” compared to 25% who reported it was “moderately important”, and 12% who reported it was “slightly important” or

"not at all important". Over half of residents (62%) reported that program cost was either "extremely important" or "very important" factor compared to 25% who reported it was "moderately important" and 14% who reported it was "slightly important" or "not at all important". There was a highly significant sex difference ($p < 0.01$, Table 1) for this factor, where more males versus females regarded program cost as either "extremely important" or "very important" (74% versus 54%), whereas more females versus males regarded this as "moderately important" (29% versus 19%), and "slightly important" or "not at all important" (18% versus 7%) (Figure 7). Also, respondents who had >$300,000 versus those who had ≤$300,000 total educational debt showed significant differences ($p = 0.02$, Figure 8, Table 2) in opinions about the importance of program costs, where distributions for either "extremely important" or "very important" were 64% versus 60%, for "moderately important" were 28% vs 21%, whereas for "slightly important" or "not at all important" were 9% versus 20%. Nearly all respondents reported that clinical education was either "extremely important" or "very important" when selecting a resident program (92%), while 7% reported it was "moderately important", and 1% reported it was "slightly important" or "not at all important". Nearly half of the respondents reported that length of training was either "extremely important" or "very important" when selecting a residency program (43%), compared to 27% who said this was "moderately important", and 20% who said program length was "slightly important" or "not at all important". Notably, distributions of opinions about this factor were significantly different between males versus females where for "extremely important" or "very important" these were 51% versus 38%, for "moderately important" these were 37% versus 36%, while for "slightly important" or "not at all important" these were 12% versus 26%. More than half of respondents (58%) reported that where they attended dental school was only a "slightly important" factor when choosing an

orthodontic residency program. This is compared to 24% and 18% of respondents who report this factor was “moderately important” and “very important”, respectively. Most respondents (80%) reported that research opportunities were “slightly important” when selecting a residency program, whereas 13% reported this factor was “moderately important”, and 7% reported this factor was “very important”. Nearly half of respondents (43%) stated that class size was only “slightly important”, however 34% regarded this factor as “moderately important”, and 23% felt it was “very important”. Forty-one percent of residents reported that a diverse and inclusive environment was “very important” when selecting a residency program. This is compared to 26% and 33% of residents who reported this factor was “moderately important” and “slightly important”, respectively. There was a highly significant sex difference ($p < 0.001$, Table 1) where more females than males regarded this factor as “very important” (50% versus 28%) and more males than females regarded this factor as “slightly important” (44% versus 27%).

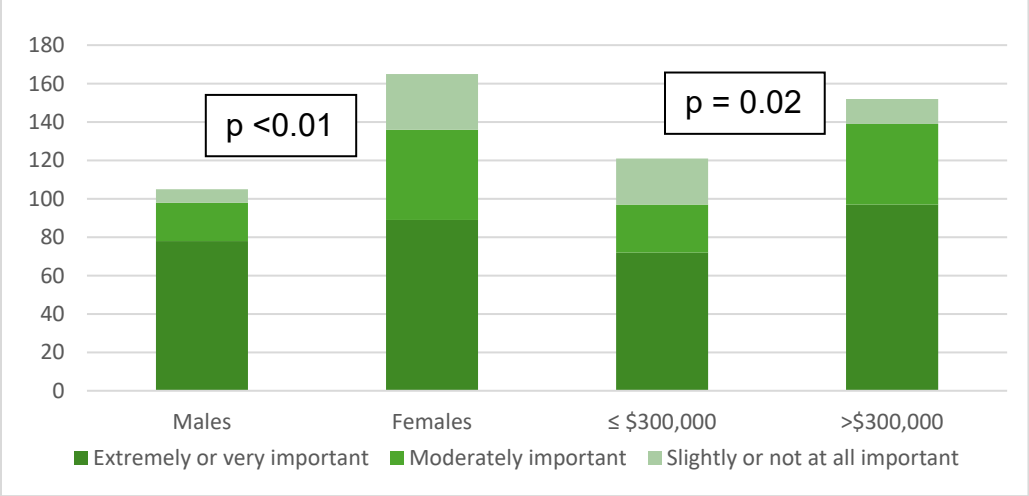

Figure 8. Perceived importance of program cost for numbers of survey respondents, where the distribution of responses were significantly different between sexes ($p < 0.01$) and amount of total educational debt (≤ $300,000 versus > $300,000, $p = 0.02$). Dark green represents those who considered program cost as “extremely” or “very important”, medium green indicates those who rated program cost as “moderately important”, and light green shows those who found it “slightly” or “not at all important”.

The majority of respondents answered "yes" to the question: Do you think it would be better for all applicants if all orthodontic residency programs were in the Match (n = 218/273, 80%), whereas 20% answered "no."

Sixty percent of respondents answered "yes" to the question: If you conduct research in your program, do you plan to pursue publishing your research in a peer reviewed journal (n = 155/260), whereas 40% answered "no."

Table 2. Financial support during residency, perceptions of program cost, and the impact of debt on anxiety and career decisions by total educational debt (≤ $300,000 vs. > $300,000) among respondents (n = 273), presented in percentages. Where significant differences in distribution of responses between groups were identified, corresponding p-values are provided.

Feature	≤$300,000	>$300,000	P-value
Importance of: Program cost?			0.02
Very	60%	64%	
Moderate	21%	28%	
Slight	20%	9%	
In residency: Financial support from family?			0.007
No	36%	52%	
Yes	64%	48%	
In residency: Support from financial aid?			<0.001
No	61%	19%	
Yes	39%	81%	
Debt = source of anxiety?			<0.001
No	43%	9%	
Yes, mild	28%	22%	
Yes, moderate	18%	44%	
Yes, major	11%	26%	
Debt: Influence decision on where to work?			<0.001
No	60%	20%	
Yes	40%	80%	

Financial Support

When asked about financial support while in orthodontic residency, approximately half reported they had received financial support from family (51%) versus 49% who reported no support from their family. There was a significant difference ($p = 0.007$, Figure 9, Table 2) in respondents who answered yes versus no to the question about financial support from family between those with total educational debt <$300,000 (64% versus 36%) compared to those with ≥$300,000 total educational debt (48% versus 52%). There was a significant difference ($p = 0.01$) for the question about financial support from family, where females had a higher percentage of yes versus no responses (62% versus 38%) compared to males (46% versus 54%). Over half (58%) of respondents reported they received financial support from financial aid. There was a significant difference ($p < 0.001$, Figure 8, Table 2) in respondents who answered yes versus no to the question about financial support from financial aid between those with more than $300,000 total educational debt were more likely to answer "yes" (61% versus 39%) than those with less than or equal to $300,000 of total educational debt (19% versus 81%). Only 9% of respondents answered yes to receiving bank loans as financial support whereas 91% answered no. One quarter of residents answered "yes" when asked if they used savings as a form of financial support compared to 75% who answered "no". Males were more likely to answer "yes" versus "no" when asked if they used savings as a form of financial support (33% versus 67%) compared to females (23% versus 77%), however this difference was not statistically significant ($p = 0.07$). Thirteen percent of residents stated they have worked part time as a means of financial support whereas 87% of residents have not. Four percent of residents answered "yes" when asked if they received financial support from the military ($n = 12$), and no residents report receiving financial support from a public health scholarship. There was a significant difference ($p = 0.04$) in respondents who answered yes versus no to the question about financial support

from the military between those with total educational debt ≤$300,000 (7% versus 93%) compared to those with more than $300,000 total educational debt (2% versus 98%).

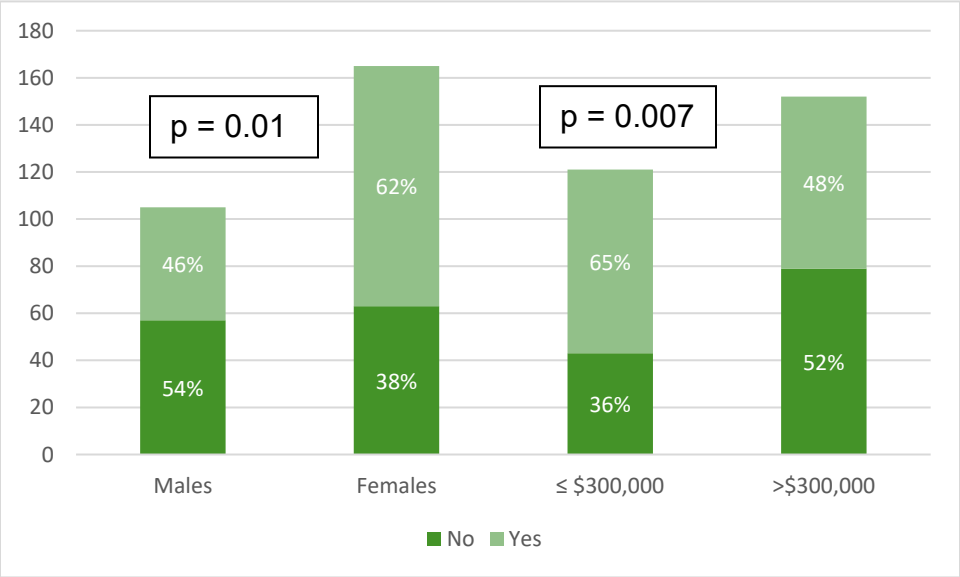

Figure 9. Number of respondents who reported to have (light green) and not have (dark green) financial support from family during orthodontic residency. Significant differences in distribution of responses were found for females versus males (p=0.01) and for amount of total educational debt (≤ $300,000 versus > $300,000, p = 0.007).

Future Plans

Of 297 respondents, reported work plans were 69% (n=204) as an employee in an orthodontic private practice, 33% (n=99) as an employee in a corporate group, 25% (n=75) to purchase an existing practice, 19% (n=56) to start their own practice, 18% (55) to work in an equity-minded associateship, and 12% (35) undecided. Eight percent (n=25) planned to work in a pediatric/general dental private office, 8% planned to work in academics, and 1% (n=2) planned to work in the military. There were significant sex differences in "yes" versus "no" responses to questions about future plans, where for plans to purchase an existing practice (p<0.001, Table 1) females answered 14% versus 86% whereas males answered 48% versus 52%; for plans to start

their own practice ($p<0.001$, Table 1) females answered 13% versus 87% whereas males answered 32% versus 68%; to work in an equity-minded associateship ($p = 0.02$) females answered 16% versus 84% whereas males answered 28% versus 72%; and to work in a pediatric/general dental private practice office ($p<0.02$) females answered 13% versus 87% whereas males answered 4% versus 96%. Sixty-two percent (n = 170) versus 38% (n = 103) of respondents answered "yes" versus "no," respectively, to the question of will educational debt influence their decision on where to work following residency. However, "yes" versus "no" responses to this question were significantly different ($p<0.001$, Table 2), for those with >$300,000 total educational debt (80% versus 20%) compared to those with ≤$300,000 total educational debt (40% versus 60%).

Factors important to respondents for their first job after residency, were, in order of importance: location, ability to pay off educational debt, opportunity to buy a practice, cost of living, and diverse and inclusive environment, where 89%, 66%, 53%, 49%, and 43%, respectively, chose "extremely" or "very" important. A significant sex difference ($p = 0.002$) was found for the factor: opportunity to buy a practice, where more males versus females regarded this as extremely (29% versus 17%) and very important (37% versus 27%), while more females than males regarded this as moderately (36% versus 27%), slightly (10% versus 7%), and not at all important (10% versus 1%). A significant sex difference ($p = 0.03$) was also found for the factor: diverse and inclusive environment, where more females versus males regarded this as extremely (18% versus 16%), and very important (30% versus 17%), while the same percentages of females and males regarded this as moderately important (28% for both), but more males than females regarded this as, slightly (21% versus 13%) and not at all important (18% versus 10%). Another significant difference noted ($p<0.001$) between those with ≤$300,000 versus >$300,000

total educational debt was for the question of how important the first job after residency was for the ability to pay off educational debt, where responses were “extremely important” or “very important” for 45% versus 81%; “moderately important” for 13% versus 16%, and “slightly important” or “not at all important” for 41% versus 3%.

Only 8% of respondents reported that they plan to work in academics after graduating compared to 92% who do not. When asked if residents were interested in a part-time academic career combined with private practice, 80% said they were interested while 20% said they were not. When asked if they would be interested in a full-time academic faculty position if not for their educational debt, 29% said yes, while 71% said no. However, 47% (n = 127) of respondents indicated they would be interested in a full-time career in academics if the income were improved compared to 52% (n = 140) who said they would not be interested, and 1% (n = 4) who said they were already considering an academic career. There was a significant sex difference ($p = 0.02$) in the proportions of females versus males who were interested (41% versus 55%), not interested (56% versus 45%), and already considering an academic career (2% versus 0%).

For the question “Do you want to stay in the same area as you went to residency,” “yes” versus “no” responses were 29% versus 71% overall, and significantly different ($p = 0.03$) for females (34% versus 66%) compared to males (21% versus 79%), and almost significantly different ($p = 0.06$) for respondents with ≤$300,000 of total educational debt (35% versus 64%) compared to those with >$300,000 of total educational debt (24% versus 76%). Eighty percent of survey respondents reported that in their first year of work, they would expect to make somewhere between $200,000 and $349,999 annual salary where 23% had expectations of $200,000-$249,999, 30% had expectations of $250,000-$299,999, and 26% had expectations of

$300,000-$349,999. Eight percent of respondents had expectations of $150,000-$199,999 and of $350,000-$399,999, whereas 3% had expectations of ≤$149,999 and 2% had expectations of ≥$400,000. Ten years after graduation, 63% of respondents expected to work four days per week, 23% expected to work three days per week, 12% expected to work 5 days per week, and ≤1% expected to work each of 1 day, 2 days, 6 days and 7 days per week. There was a significant sex difference ($p = 0.002$, figure 10) in the number of days per week that respondents plan to work ten years after graduation, where for 1, 2, 3, 4, 5, 6, and 7 days per week, the percentages of female respondents were 1%, 1%, 30%, 56%, 12%, 0%, and 0%, respectively, and of male respondents were 0%, 1%, 10%, 74%, 12%, 1% and 1%, respectively.

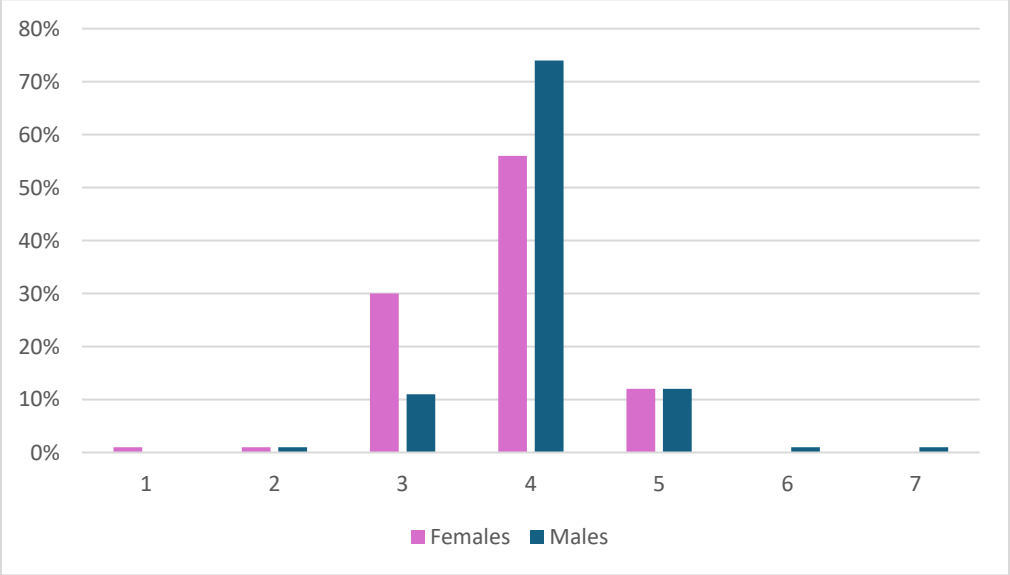

Figure 10. Percentages of females versus males planning to work 1 – 7 days per week 10 years after graduation showing significantly different distribution between sexes ($p = 0.002$).

For the question "Is educational debt a source of anxiety in your life," nearly one-quarter (24%) of respondents answered "no," whereas 76% ($n = 208$) answered "yes," with levels of anxiety rated as major, moderate, and mild for 19%, 33%, and 25%, respectively. The distribution of responses to this question of "no" and "yes" at major, moderate, and mild levels,

was significantly different ($p<0.001$, Table 2) for those with ≤ $300,000 total educational debt (43% and 11%, 18%, and 28%, respectively) compared to those with >$300,000 total educational debt (9% and 26%, 44%, and 22%, respectively).

Nearly half of respondents (49%) reported they planned to make financial contributions to the residency at which they trained. Twenty-one percent said they would not consider donating to their program and 30% said they were undecided.

Ninety-five percent of respondents stated that they planned to attain ABO certification compared to 5% who did not plan to become board certified.

Discussion

The current survey collected some information common to previous surveys and allowed comparison between results from 1992, 2003, 2018, and 2024 (Table 3). [1,6,7] The 2024 response rate represents a significant decrease compared to previous surveys conducted at the GORP conferences. In past years, the surveys were distributed directly to residents during check-in, which allowed for more direct engagement and a higher response rate. However, in 2024, the distribution method changed, as it was not permitted to distribute the surveys in person at check-in. Instead, the survey was administered online to those residents who had agreed to share their email addresses with vendors, which was approximately 65% of the total GORP attendees. Additionally, the survey was sent to program directors to forward to their residents, which theoretically allowed for the distribution to all 1,218 residents. However, there is uncertainty about whether all program directors successfully forwarded the survey to their residents. In contrast, previous surveys were only administered to GORP attendees, resulting in a smaller and more targeted sample pool. This shift in distribution methods likely contributed to the lower response rate in 2024.

Table 3. Comparison of survey results from 1992, 2003, 2018, and 2024 where: GORP = graduate orthodontic resident program, k=1,000, USA = United States of America, NA = not asked
* = Response rate from GORP attendees
Table modified from Stoker et al., 2020 to include results from 2024 survey [1]

Survey year:	1992	2003	2018	2024
Number of USA programs	51	58	68	69
Number of USA residents	577	722	1043	1,218
Number of GORP attendees	207	430	489	449
Number of respondents	168	330	372	297
Survey response rate	81%	77%	76%	46%*
Male/Female/Other respondents	74%/26%/NA	62%/38%/NA	49%/51%/0%	39%/61%/0%
Married respondents	58%	56%	37%	34%
Married male respondents	64%	60%	40%	48%
Married female respondents	42%	48%	33%	25%
Respondents with children	27%	30%	14%	12%
Male respondents with children	30%	36%	22%	22%
Female respondents with children	9%	17%	5%	0.1%
Median orthodontic educational debt	Not asked	$26k-50k	$101k-150k	$51-100k
Median total educational debt	Not asked	$101k-150k	$251k-300k	$301-400k
Financial support from: Family	61%	42%	58%	51%
Financial support from: Financial aid	37%	53%	53%	58%
Financial support from: Savings	36%	29%	20%	25%
Financial support from: Part-time work	29%	25%	12%	13%
Financial support from: Bank loan	18%	17%	13%	9%
Financial support from: Other source	5%	11%	10%	0.03%

Demographics

Over time, the sex distribution among orthodontic residents has shifted considerably (Table 3). In earlier studies males consistently outnumbered females, who comprised only 15% of those enrolled in orthodontic residency programs in 1983. [4] In 1992 the percentage of female residents had risen to 30% and by the 2018 GORP survey, the distribution had nearly equalized, with 51% identifying as female and 49% as male. [1,7] In the present study, female residents comprised 61% of the respondents. "Other" was an option for the question about "gender" but this was not selected by any of the participants. This continuing upward trend aligns with broader shifts documented in dental education where a recent report from the American Dental Education Association found female enrollment in pre-doctoral dental programs rose from 46% in 2013 to 51% by 2018. [14]

Unlike the findings for sex distribution, the average age of orthodontic residents has remained relatively stable over the past several decades. In Burk and Orellana's 2010 study, the mean age was 29.6 years, and in the 2018 GORP survey, 47% of residents were between 27 and 29 years old, with a mean age of 29 years. [1,15] In the present study, the average age was 29 ± 3 years, in line with historical norms. However, the current study noted a statistically significant difference in age between sexes where female residents were younger on average (28 ± 3 years) than male residents (29 ± 3 years). This finding may reflect differences in the timing of educational and career pathways between male and female residents, including variations in gap years, military service, or work experience prior to residency. While the age gap is modest, its consistency across respondents and statistical significance could have potential implications for family planning, practice timing, and career trajectory decisions.

Race and ethnic representation among orthodontic residents have evolved gradually, with modest gains in diversity over the past two decades. A 2010 study reported that 73% of

orthodontic residents were non-Hispanic white, 14% were Asian/Asian-American, 5% Hispanic, and 1% African American. [15] The 2018 GORP survey found that 60% of residents identified as white, 26% as Asian, 5% as Hispanic/Latino, 4% as Black/African American, and 5% as other. [1] In the current study, 53% of respondents identified as White/Caucasian, 30% as Asian, 6% as Hispanic/Latino, 6% as two or more races, 2% as Black/African American, and 3% as "other." These findings indicate a decline in the proportion of Caucasian residents and an increase in Asian residents since 2010, with minimal changes to and continued underrepresentation of Black and Hispanic individuals compared to national population demographics.

Marital status among orthodontic residents has decreased over time (Table 3), potentially reflecting evolving societal norms and career priorities. In the 2003 survey by Bruner et al., 55% of residents were married, with marriage more common among males (60%) than females (48%).[6] However, the 2018 GORP study showed an 18% decrease, where only 37% of residents were married, while 63% were single, indicating a potential delay in marriage during postgraduate education. [1] In the present study, there was a further decrease to only 33% of residents reported being married, while 66% were single. A significant sex disparity also remains where 48% of male residents were married compared to only 25% of female residents. Overall, these findings suggest that orthodontic residents, especially females, are increasingly delaying marriage during their training years. This marriage delay or choice to not marry seen in orthodontic residents mirrors broader U.S. demographic patterns where national analyses show rising ages of first marriages and predicted declines in the probability of ever marrying. [16] Financial considerations also appear to play a role at the population level where studies link higher education costs and student loan debt to postponed marriage, particularly among women. [17]

Historically, family planning among orthodontic residents has shown sex-related disparities, with male residents more likely to be married and have children during training (Table 3). In the 2003 GORP study, Bruner et al. found that 30% of residents had children and male residents were significantly more likely than their female peers to have children. [6] The 2018 study showed even less, 14%, of respondents had children and reaffirmed that of these, males were significantly more likely to have children than females. [6] In the current study, these trends continued where 12% reported having children and the average number of children was significantly larger for male compared to female respondents. These findings indicate persistent sex differences in the timing of family planning among residents and are not unique to orthodontics. In a 2020 multicenter survey, 61% of female medical residents reported delaying childbearing during residency. [18] At the population level, U.S. childbirth has shifted to later ages, mirroring the reduction in orthodontic residents reporting children from 2003-2004. [19]

Program Specifics

The average orthodontic residency class size has increased slightly over the past several decades. In 1983 the average class size was 4.9 students with the largest class size at 15 students, while the 2018 GORP study found that 51% of residents reported class sizes from 6-9 residents per class. [1,4] In the current study, the average class size reported was 6 ± 3 residents, with a range from 1 to 15. This suggests that the typical residency cohort size has remained largely consistent with prior surveys. However, a statistically significant difference was noted based on educational debt where respondents with >$300,000 in total educational debt were enrolled in programs with slightly larger class sizes (mean = 7 residents) compared to those with ≤$300,000 in debt (mean = 6 residents). Although the numerical difference was small, the trend may reflect an association

between higher debt loads and attendance at programs with larger class sizes and possibly higher tuition.

It is important to acknowledge that the field has recently witnessed the emergence of a large-capacity residency program, reportedly enrolling up to 45 residents per year, [20] and which likely accounts for the increase in number of orthodontic residents in the US since 2018 (Table 3). This program, associated with a for-profit or corporate educational model, represents a significant departure from the historical norms. However, none of the respondents to this survey reported class sizes in this range, suggesting that this program was not represented in the sample. Their absence limits the generalizability of the present findings to all types of orthodontic programs and warrants further investigation into the implications of these larger training models.

The duration of orthodontic residency programs in the United States has slightly increased over the past few decades but typically range between 24 and 36 months. Rudolph et al. noted that from 1983 to 1994 many programs increased their duration from 24 months to 30 months or greater. [3] In 2003 the average length of orthodontic residency training was reported as 29 months. [6] By 2018, Stoker et al. reported that most respondents (42%) attended programs greater than 31 months in duration, whereas 39% attended 25-30 month programs, and 19% attended 24 month programs. [1] In the present study, the mean reported length of orthodontic residency programs was 31 ± 4 months, with a median of 33 months and a range from 24 to 48 months. These findings are consistent with previous literature, affirming the increase in program durations since 1983.

Resident satisfaction serves as an important metric for evaluating the effectiveness and overall experience of orthodontic residency programs. Surveys have shown high levels of satisfaction of residents with their programs, where for the 1992 GORP survey this was 89%,[7]

for the 2018 GORP survey this was 97%,[1] and for the current survey, this was 94%. Notably, a trend was observed in relation to educational debt where a higher percentage of residents with ≤$300,000 in total educational debt reported dissatisfaction (10%) than those with >$300,000 in debt (3%), although differences between the two groups did not reach statistical significance. The emerging pattern suggesting a potential link between lower debt and higher dissatisfaction may warrant further investigation. It is possible that residents in lower-cost programs may have different expectations, workloads, or institutional structures that influence overall satisfaction differently than their peers in higher-cost programs.

The timing of entry into orthodontic residency following dental school has varied historically, though trends over the past several decades suggest that most residents enter directly after graduation. In 1992, just under half of respondents reported starting residency immediately following dental school. [7] By 2003 this rose to 56%, and by 2018, 67% of respondents reported starting residency immediately following dental school. [1,6] In 2024, 73% of respondents entered orthodontic residency directly after completing dental school. A significant association was found between educational debt and timing of entry, where a larger percentage of respondents with >$300,000 total educational debt began residency immediately after dental school (82%) compared to those with ≤$300,000 debt (61%). It could be that graduates who delayed residency may have used that interim period to earn income and reduce borrowing, thereby entering specialty training with a lower debt burden. Further studies could aim to explore the underlying factors contributing to this disparity, such as financial planning or career urgency.

In 1992, program reputation was reported as the most important factor residents consider when choosing a residency program. [7] By 2018, clinical education was considered to be the most important factor. [1] In 2024, clinical education quality continued to stand as the most universally

valued factor, with 92% of respondents rating it “extremely” or “very” important. Other highly rated factors included location (62%), program cost (62%), and program reputation (48%). Conversely, class size, research opportunities, and whether the program was in the Match were viewed as less critical by most respondents. In 2018, significantly greater numbers of females rated location and clinical education as more important than their male colleagues. [1] By 2024, several other significant sex-based differences emerged. For example, more males than females considered program cost “extremely” or “very” important (74% versus 54%) and ranked the importance of program length highly (51% versus 38%), while more females valued a diverse and inclusive environment (50% versus 28%). There were also significant differences in responses to questions about the importance of program costs between those with >$300,000 and those with ≤$300,000 of total educational debt, where “very” or “moderately” important responses were higher in the group with higher debt (64% and 28%) compared to the group with lower debt (60% and 21%), whereas “slightly” important responses were lower in the group with higher (9%) compared to lower debt (20%). These results reflect both continuity and evolution in residency decision-making with important differences apparent between the sexes and amounts of total educational debt.

Engagement in research remains a central component of orthodontic residency training; however, the proportion of residents intending to publish in refereed journals has declined over time. In the 2003 GORP study, 71% of residents reported plans to publish their research. [6] This number decreased to 62% in the 2018 GORP survey, and has declined further to 60% in the current study. [1] While the drop from 2003 to the present is modest, continued monitoring is warranted to assess whether this trend stabilizes or further declines and what implications it may hold for the future of orthodontic education and evidence-based practice development.

Orthodontic residents have historically reported high levels of satisfaction with their residency programs, as noted above. However, questions about stress levels have not been included in most previous surveys of orthodontic residents, whereas this has been investigated for other dental specialties. For example, Inglehart et al. reported that prosthodontics residents experienced the highest levels of personal life-related, faculty-related, confidence-related, and academic stress among pediatric dentistry, prosthodontics, and Oral Maxillofacial Surgery (OMS) residents, with OMS residents also reporting elevated stress in several domains. [21] These heightened stress levels were associated with lower career satisfaction scores, particularly among prosthodontics residents, who had the lowest overall job satisfaction in the study. [21] To investigate the relationship between program or career satisfaction and levels of stress, future surveys should include residents in a broader range of dental specialties, including orthodontics.

Annual tuition costs for orthodontic residency have increased markedly over the past several decades. In 1989 the average tuition fees for state schools were approximately $6,500 per year for in-state tuition and $9,000 per year for out-of-state tuition. [5] By 2003, the median annual cost of tuition had rose to between $10,000 to $15,000 for each year of residency. [6] By 2018, Stoker et al., noted that tuition costs varied, but 18% of residents paid over $80,000 per year in tuition. [1] In the present study, tuition costs reported by residents ranged widely, from $0 to over $100,000 per year, reflecting the broad diversity of program costs.

Stipends can represent a critical form of financial relief for orthodontic residents, particularly in programs with high tuition costs. In this study, 43% of respondents reported receiving a stipend, while 57% did not. This is similar to the findings in 2018, where 39% of residents reported receiving a stipend, however, is a noted decrease from the 50% of residents who reported receiving a stipend in 2003. [1,6] Notably, in the 2024 survey, only 25% of stipend

recipients indicated that their stipend fully covered their tuition, leaving the majority with residual costs. A significant sex difference was identified in stipend coverage where male residents were more likely to receive stipends that fully covered their tuition (19%) compared to female residents (8%), while a larger proportion of females (44%) received partial stipends relative to males (27%). This disparity in stipend adequacy may contribute to broader financial strain, particularly for female residents, and may again help to explain their lower rates of planned practice ownership. Efforts to ensure equitable access to stipends may help reduce the financial barriers to training for all orthodontic residents.

In addition to the sex differences found regarding stipends, the current survey also reveals a number of other factors of financial importance that are significantly different between female and male respondents. For example, with respect to annual tuition costs for orthodontic residency, higher proportions of male respondents were in lower tuition brackets, while higher proportions of female respondents were in higher tuition tiers. This difference is particularly consequential given the finding of those who receive stipends, more female than male respondents indicated that their stipends did not fully cover tuition. Furthermore, more male (74%) than female (54%) respondents regarded program cost as “extremely” or “very important,” suggesting that male residents may weigh affordability more heavily in their program selection. Conversely, females may be impacted by higher tuition costs during the application process, potentially due to other concurrent values such as the importance of diverse and inclusive environments. The downstream impact of these differences may be important. For example, male respondents were much more likely than female respondents to report plans to purchase or start a practice, a trend that may partially reflect earlier financial recovery due to lower tuition and debt. Higher educational costs may delay or deter practice ownership,

particularly among female orthodontists, exacerbating long-term income and wealth gaps in the field. Recent AAO member data documenting a persistent pay gap between the sexes lends weight to this concern where, in a 2019 salary analysis, male orthodontists reported average annual earnings just under $400,000 whereas female orthodontists reported earnings of roughly $300,000. [22] Likewise, a recent AAO Economics of Orthodontics survey showed significant sex-based income discrepancies even after adjusting for age and ownership, with female respondents disproportionately concentrated in lower salary categories and more likely to enter employee or Dental Support Organization (DSO)/ Orthodontic Support Organization (OSO) positions. [23] Consistent with these disparities, in 2022, Campbell Worthington et al. found that female orthodontists earned an average of $119,000 less per year than male colleagues despite working the same number of days per week. [24] The study also showed that women charged approximately 9% less than the national average and less than men for both extraction and non-extraction cases, and started 27% fewer new cases annually. [24] In addition, female orthodontists were more likely to be the primary caregivers for their children, a factor the authors suggested may limit practice growth and contribute to income differences. [24] Ultimately, these findings support ongoing concerns about tuition inflation in orthodontic education and its disproportionate impact across demographic groups.

The sources of financial support for orthodontic residents have shifted over the past several decades (Table 3). In 1992, 61% of residents received financial assistance from family and 37% relied on financial aid. [7] By 2003, family support had declined to 42%, while financial aid usage had increased to 53%.[6] The 2018 study showed a rebound in family contributions, with 58% of residents receiving support from family and 53% utilizing financial aid. [1] In the current study, 51% of residents reported receiving family support, and 58% reported receiving financial

aid. Additionally, the present study found financial support varied significantly by total educational debt. Notably, residents with greater than $300,000 in educational debt were significantly more likely to report receiving financial aid, while those with lower debt were more likely to receive family support. Sex-based differences were also apparent. Female residents were significantly more likely than males to report receiving financial support from family (62% versus 46%, $p = 0.01$). However, male residents were more likely to report using personal savings as a source of support (33% versus 23%). These results highlight the divergent financial strategies employed by residents depending on sex and debt level, which may influence not only the affordability of orthodontic education, but also post-graduation financial flexibility.

Educational debt remains one of the most significant challenges facing orthodontic residents. Comparing prior and current survey results, the trajectory of increasing debt is clear (Table 3). In the 2003 GORP survey, the median debt attributed to orthodontic residency was between $26,000 and $50,000, and the median total educational debt ranged from $101,000 to $150,000.[6] In 2005, the average debt of orthodontic residents at graduation from residency was $165,226 with a range of $0 to $500,000.[8] By 2018, estimated orthodontic and total educational debts had increased dramatically, averaging $137,706 ± $127,380 and $323,071 ± $266,510, respectively.[1] Notably, 22% of residents in 2018 reported no orthodontic debt, and 17% reported no total educational debt.[1] This 2024 survey found the median debt from orthodontic residency alone to be between $51,000-$100,000 and the median total educational debt to be between $301,000-$400,000. The increase in educational debt among orthodontic residents parallels broader economic trends in dental education. An empirical analysis of nine U.S. dental schools from 2003 to 2011 showed that the cost of attending public dental schools grew by 150%, while private school costs rose by 66.8%, and the total cost of a dental degree increased at an average

annual rate of 4.45% outpacing the 3.8% annual growth in dentists' real income, leading to a declining return on investment. With the increase in educational debt, it is not surprising that in 2018, 72% of orthodontic residents reported some level of anxiety regarding their educational debt, and by 2024, that percentage rose to 76%.[1] The 2024 survey also found that residents with greater than $300,000 in total educational debt were significantly more likely to report anxiety about their debt ($p < 0.001$) and were more likely to state that their debt influenced their future career plans ($p = 0.01$). Additionally, residents with higher debt were less likely to express interest in full-time faculty roles ($p = 0.04$). Collectively, these findings highlight how rising educational debt not only affects residents' current well-being but also constrains their long-term career trajectories. With tuition rising and stipends not keeping pace, the financial barriers to academia and practice ownership may continue to widen unless systemic reforms are introduced. The field may also experience a decline in the proportion of graduates who enter orthodontic residency immediately after dental school, as more candidates could elect to mitigate educational costs by first serving in the military or practicing general dentistry. Because these cost-mitigation pathways extend the time between dental school and specialty training, they could potentially further postpone marriage and family planning for some residents.

The increase in educational debt and its downstream consequences observed in orthodontics has also been noted across other dental specialties including oral and maxillofacial surgery, pediatric dentistry, endodontics, periodontics, and prosthodontics. For example, a 2019 study from the Resident Organization of the American Association of Oral and Maxillofacial Surgeons (ROAAOMS) Debt Task Force highlights that, like orthodontics, oral and maxillofacial surgery (OMS) has experienced a substantial rise in educational debt among trainees. [25] The survey revealed that 51% of OMS residents graduating in 2017-2018 carried

more than $350,000 in student loan debt, compared with only 19% of graduates from 2010-2012. ROAAOMS surveys also found that this growing debt burden has increasingly influenced graduates' career choices, practice models, and personal decisions such as home ownership and family planning. [25] Similarly, a 2020 survey by Alexander et al. showed that similar patterns have emerged in pediatric dentistry where 36.8 % of residents indicated that their educational debt was a hindrance to future practice ownership. [26] Debt has also been shown to shape prosthodontic training choices. Wojnarwsky et al. found that tuition and stipend considerations ranked highest among applicants with debt between $150,000-$250,000, and that women and men differed significantly in how strongly they weighted program cost, mirroring the sex differences seen in our 2024 study. [27] In endodontics, a 1999 study by McNally et al. reported that 51% of residents ruled out an academic career specifically because of their educational debt, underscoring how loan magnitude can deter entry into faculty roles across dental specialties. [28] Periodontics shows the same trajectory where, in 2012, Mawardi et al. found that 24% of residents expected to graduate owing more than $300,000, and debt magnitude was a major concern in post-residency planning. [29] More recently, in 2018, Silva et al. found that anticipated tuition and debt were key deterrents for US dental school graduates applying to periodontics specialty programs. [30]

Collectively, these findings underscore that escalating educational debt is a shared challenge across dental specialties, potentially shaping workforce patterns, influencing residency selection, delaying practice ownership, and dissuading graduates from academic careers.

Future Plans

The vast majority of residents in the current study reported plans to enter private practice upon graduation, with 69% planning to work as an employee in an orthodontic private practice. This aligns with prior findings from Stoker et al., which similarly identified private practice as the predominant predicated career path. [1] However, a notable 33% of respondents indicated plans to work in a corporate group setting, which reflects a continued increase from earlier data. For instance, the 2018 survey showed a lower percentage of residents pursuing corporate employment (8%), and earlier surveys from 2003 and 2010 did not distinguish corporate models in the same way, reflecting the more recent rise of corporate dentistry in the orthodontic market. [1] Campbell Worthington et al. (2022) provide further context where they found that 71% of final-year residents in their sample said they were open to working for corporate entities, compared with only 46% of practicing orthodontists. Only 29% of residents said they would rule out corporate employment entirely compared to 54% of practicing orthodontists. [24] Taken together, these results suggest a generational shift in which today's residents are more willing than earlier cohorts to consider corporate positions as an initial practice model.

In 2018, 11% of residents reported plans to purchase an existing practice, while 9% aimed to start their own practice. [1] In 2024, these percentages had increased to 25% and 19% respectively, and notably, significantly smaller percentages of female versus male respondents indicated that they planned to purchase (14% versus 48%) or start a practice (13% versus 32%). However, when comparing the results from the 2018 survey to the 2024 survey, it is important to note that in 2018, respondents were only able to select one of the choices for future career plans, while in 2024, respondents could select multiple options. This methodological difference likely contributed to higher response rates across multiple categories and should be considered when comparing findings across timepoints.

Interest in academic careers among orthodontic residents has remained modest over time, and financial considerations continue to play a critical role in shaping this trajectory. In the 2003 GORP survey, only 3% of residents reported plans to pursue a full-time academic career, while 63% indicated that their educational debt restricted them from doing so. However, 40% of respondents said they would consider full-time academics if compensation were improved. [6] By 2018, interest in full-time academic roles rose slightly to 5%, with nearly half of all respondents (49%) indicating they would be interested in such a path if income levels were higher. Notably, a substantial 85% of respondents in 2018 expressed interest in a part-time academic role in combination with private practice. [1] In the current 2024 study, 8% of residents planned to pursue an academic career, and a large proportion of residents continue to view financial barriers as a limiting factor where 47% indicated they would consider full-time academics if income were improved, closely mirroring the findings from 2018. Additionally, 80% of current respondents expressed interest in part-time academic appointments combined with private practice. These findings reflect a persistent interest in academic involvement among residents, tempered by financial constraints and income expectations. As the profession continues to address faculty shortages and the need for diverse educational leaders, greater financial incentives and flexible career structures may be key to expanding participation of orthodontic specialists as educators and researchers.

Expectations surrounding future income among orthodontic residents have evolved over time, reflecting both shifts in the profession and broader economic trends. In the 2003 GORP survey, the expected median income for residents entering private practice ranged from $400,000 to $600,000, while those planning careers in academia or military service anticipated lower earnings in the $200,000 to $400,000 range. [6] In 2007, Noble et al. found that 5 years after

graduation the average expected income was $306,336 with a range of $75,000 to $1,000,000.[8] By 2018, 41% of residents projected an annual income between $400,000 and $600,000 ten years after graduation.[1] However, in the current 2024 study, expectations were notably more modest for the initial post-graduation period, with 56% of respondents anticipating an income between $250,000 and $350,000 in their first year of practice. However, these expectations for first year salaries in 2024 align closely with national income data and hence, seem realistic. According to the U.S. Bureau of Labor Statistics (May 2023), the average annual income for orthodontists was $246,950.[31] Additionally, the 2023 AAO Economics of Orthodontics report found that 22% of orthodontists earned between $201,000 and $300,000, and 18% reported incomes between $301,000 and $400,000, which is similar to the expected earnings reported in the 2024 survey.[32]

Orthodontic residents' plans regarding weekly workdays have remained relatively stable over the past two decades, though sex differences persist. In the 2003 GORP study, male residents planned to work an average of 4.0 days per week ten years after graduation, compared to 3.8 days per week for female residents.[6] The 2018 survey revealed further divergence in planned work schedules, with significantly more male residents planning to work five days per week, while a greater proportion of female residents intended to work three days per week ten years into their careers.[1] In the 2024 study, the majority of residents (63%) indicated plans to work four days per week immediately following graduation. It is also apparent that sex-based differences remain. Thirty percent of female respondents reported plans to work three days per week ten years after graduation, compared to just 11% of male respondents. Conversely, 74% of male respondents anticipated working four days per week, while only 56% of female respondents planned to do the same.

Interest in achieving ABO certification has grown steadily among orthodontic residents over the past three decades. In 1992, ABO certification was notably rare, with 0% of female residents and only 3% of male residents indicating they planned to obtain certification within ten years of graduation. [7] By 2003, interest had increased substantially, with 87% of both male and female respondents reporting plans to pursue certification. [6] This upward trend continued in 2018, with 91% of residents planning to become ABO certified. [1] In the current 2024 study, this percentage rose further, with 95% of respondents indicating their intent to earn ABO certification. The steady rise in resident intent likely reflects, at least in part, a series of deliberate changes by the American Board of Orthodontics aimed at reducing participation barriers. [33]

When evaluating factors that influence the selection of a first job following residency, orthodontic residents have consistently prioritized both financial and lifestyle considerations. In the 2018 survey, residents rated the importance of four job selection factors on a scale from 1 (not important) to 10 (very important). Sixty-one percent of respondents rated location as very important (10), while cost of living was most frequently rated at midlevel importance (5). The ability to pay off student debt was considered very important by 42% of respondents and of moderate importance by an additional 45%. The opportunity to purchase a practice was rated as very important by 39% of respondents and of moderate importance by 53%. Notably, the opportunity to buy a practice was significantly more important to male residents than to their female counterparts. [1] In the 2024 location remained the most important factor, with 89% of respondents rating it as either “very” or “extremely important.” This was followed by the ability to pay off educational debt (66%), the opportunity to purchase a practice (53%), cost of living (49%), and the presence of a diverse and inclusive work environment (43%). Sex-based differences remained evident in the 2024 results as well. For instance, a significantly greater

proportion of male residents rated the opportunity to buy a practice as “very” or “extremely important” compared to female residents. These findings suggest that, while the profession continues to place high value on practical and financial considerations, individual priorities may vary meaningfully by sex.

Study Limitations

While this study provides valuable insights into the demographics, experiences, and future goals of orthodontic residents in 2024, several limitations should be acknowledged. First, although the survey was distributed to a large number of residents at the 2024 Graduate Orthodontic Residents Program (GORP) and followed up with an e-mail sent to all program directors in the US and Canada, participation was voluntary, which introduces the possibility of response bias. Residents who chose to respond may differ in meaningful ways from those who did not.

Second, the lack of representation from residents enrolled in programs with exceptionally large class sizes limits the generalizability of findings. While there is growing awareness of such programs within the field, no respondents from these institutions completed the survey. As such, the perspectives of residents in these large-scale training environments are not captured and may differ substantially from those in smaller or more traditional programs.

Finally, although efforts were made to align the survey with previous versions used in studies from 1992, 2003, and 2018, modifications to survey content and response formats were made to address known limitations and incorporate emerging topics. These changes, while necessary, may limit direct comparability with past data. In addition, the changes from previous surveys resulted in the 2024 survey being longer than previous versions. This could possibly

have contributed to less participation and/or a number of residents enrolling but not completing the survey in full.

Despite these limitations, the current study offers a valuable contemporary perspective and builds on prior research efforts to track evolving trends in orthodontic residency education.

Future Research

The present study highlights several areas where further investigation could advance understanding of orthodontic residency training and post-residency planning. First, given the observed sex-based differences in debt burden, career planning, family planning, and long-term work expectations, future studies should further explore the intersection of gender and career development in orthodontics. In addition, terms could be improved in future studies to improve precision and inclusivity. For instance, distinguishing sex assigned at birth from current gender identity, allowing respondents to self-describe when options do not fit. Similarly, race could be collected separately from ethnicity/cultural affiliation with the ability to select multiple categories for each.

Second, as the profession continues to shift with the emergence of corporate dentistry and expanded residency programs, longitudinal studies tracking residents beyond graduation could help assess how early career intentions align with actual outcomes. Such work would be valuable in evaluating the stability of plans for private practice, academic careers, and practice ownership over time.

Lastly, considering the continuing rise in educational costs and student debt, future research should prioritize a deeper economic analysis of the financial viability of orthodontic education. Average tuition, residency-related expenses, and total educational debt have increased

significantly over the past two decades, with the present study revealing even higher levels than previous surveys. In 2018, Stoker et al. raised concerns that orthodontics may be approaching a "bubble market," where the long-term financial benefits of the profession may no longer justify the upfront costs of education and training. [1] However, even with the rising cost of education, applicant demand has not decreased. Orthodontic match participation grew from 487 candidates in 2018 to 657 in 2024. [34,35] Still, given the increasing variability in program tuition and stipends—as well as the influence of debt on resident decision-making and career planning—future investigations should examine whether this financial model remains sustainable for new orthodontists. Studies that evaluate return-on-investment (ROI) across different residency pathways, assess debt-to-income ratios over time, and explore the role of financial counseling in residency programs may help inform policy changes and support structures that ensure continued access to the profession.

Collectively, these directions can guide future scholarship and policymaking to ensure that orthodontic education remains equitable, responsive to resident needs, and reflective of the changing dynamics of the profession.

Conclusions

This study captured an updated profile of orthodontic residents' demographics, educational experiences, and future plans. Some significant differences were found between male and female respondents as well as between those with ≤ $300,000 versus >$300,000 total educational debt. Comparison with previous survey results since 1992 revealed trends, in particular, a sustained rise in female representation and a progressive increase in educational debt.

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Appendix A: IRB Approval Letter

OREGON HEALTH & SCIENCE UNIVERSITY

IRB MEMO

Research Integrity Office
3181 SW Sam Jackson Park Road - L106RI
Portland, OR 97239-3098
(503)494-7887 irb@ohsu.edu

APPROVAL OF SUBMISSION

June 15, 2023

Dear Investigator:

On 6/15/2023, the IRB reviewed the following submission:

IRB ID:	STUDY00025895
Type of Review:	Initial Study
Title of Study:	Opinions, plans and demographics of orthodontic residents: A follow-up study
Principal Investigator:	Howard Freedman
Funding:	Name: American Association of Orthodontists Foundation, PPQ #: 1023374
IND, IDE, or HDE:	None
Documents Reviewed:	• Orthodontic Residency Survey HF updates_LI_071322_HF_clean.docx • Consent-Information Sheet • Letter to Program Directors_HF-LI_060623_clean.pdf • Protocol

The IRB granted final approval on 6/15/2023. The study requires you to submit a check-in before 6/13/2026.

Review Category: Exempt Category #4

Copies of all approved documents are available in the study's **Final** Documents (far right column under the documents tab) list in the eIRB. Any additional documents that require an IRB

signature (e.g. IIAs and IAAs) will be posted when signed. If this applies to your study, you will receive a notification when these additional signed documents are available.

Ongoing IRB submission requirements:

- Six to ten weeks before the eIRB system expiration date, submit a check-in..
- Any changes to the project must be submitted for IRB approval prior to implementation.
- Reportable New Information must be submitted per OHSU policy.
- Submit a check-in to close the study when your research is completed.

Guidelines for Study Conduct

In conducting this study, you are required to follow the guidelines in the document entitled, "Roles and Responsibilities in the Conduct of Research and Administration of Sponsored Projects," as well as all other applicable OHSU IRB Policies and Procedures.

Requirements under HIPAA

If your study involves the collection, use, or disclosure of Protected Health Information (PHI), you must comply with all applicable requirements under HIPAA. See the HIPAA and Research website and the Information Privacy and Security website for more information.

IRB Compliance

The OHSU IRB (FWA00000161; IRB00000471) complies with 45 CFR Part 46, 21 CFR Parts 50 and 56, and other federal and Oregon laws and regulations, as applicable, as well as ICH-GCP codes 3.1-3.4, which outline Responsibilities, Composition, Functions, and Operations, Procedures, and Records of the IRB.

Sincerely,

The OHSU IRB Office

Appendix B: Survey

Please participate in a research study investigating current orthodontic residents' demographics, their perspectives about their orthodontic training and their future goals. All responses are anonymous and no personal identifiers will be collected. Your participation in this research is voluntary. The survey should take 5-10 minutes to complete. By completing the survey, you consent to participate in the study. Thank you for your participation.

A. **Please answer the following specific questions about your PROGRAM**

1. In what year of residency are you? □ 1st □ 2nd □ 3rd □ 4th +
2. Number of residents/class: □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 □ 10 □ 11 □ 12 □ 13 □ 14 □ 15 □ ≥16
3. Length of program in months: _____ (fillable field)
4. Number of full-time faculty at your program: □ 0 □ 1-2 □ 3-4 □ 5-6 □ >7
5. Number of part-time faculty at your program: □ 0 □ 1-2 □ 3-5 □ 6-8 □ 9-11 □ 12-14 □ >14
6. What type of program is yours? □ Certificate □ Master of Science/Certificate □ Doctor of Philosophy/Certificate □ MBA/Certificate □ Post-Doctoral Fellowship
7. How satisfied are you with your orthodontic residency training program? □ Unsatisfied □ Satisfied □ Very satisfied
8. When choosing a career in orthodontics, which of the following factors is most important to you? □ Passion for orthodontics □ Workload Flexibility and Predictability □ Financial/Earning Potential □ Skill Set □ Other _____
9. How many years after dental school graduation did you begin your orthodontic residency? □ 0 years □ 1-2 years □ 3-5 years □ >5 years
10. If you did not go straight from dental school to residency, what was your main employment activity? □ Dental School Faculty □ Military □ Work in a community health clinic □ Work in a corporate group □ Work in a private practice □ Other_____ (fillable field)
11. Using a scale of 1=Not at all important and 5=extremely important, please rate how important each of the following were when selecting your orthodontic program.

	Not at all important	**Slightly important**	**Moderately important**	**Very important**	**Extremely important**
	1	2	3	4	5
Reputation	□	□	□	□	□
Location	□	□	□	□	□
Cost	□	□	□	□	□
Clinical education	□	□	□	□	□
Length of training	□	□	□	□	□
Where I went to dental school	□	□	□	□	□

Research opportunities	□	□	□	□	□
Class size	□	□	□	□	□
Diverse and inclusive environment	□	□	□	□	□

12. Do you think it would be better for applicants if all programs were in the Match? □ Yes □ No
13. If you conduct research in your program, do you plan to pursue publishing your research in a peer reviewed journal: □ Yes □ No □ N/A
14. How much is the tuition for your program each year: □ $0 □ ≤$10K □ $11-20K □ $21-30K □ $31-40K □ 41-50K □ 51-60K □ 61-70K □ 71-80K □ 81-90K □ 91-100K □ >100K
15. Do you receive a stipend? □ Yes □ No
16. How much is your stipend?

1st yr:	□<$1K	□ $1-10K	□ $11-20K	□ $21-30K	□ $31-50K	□ >$50K
2nd yr:	□<$1K	□ $1-10K	□ $11-20K	□ $21-30K	□ $31-50K	□ >$50K
3rd yr:	□<$1K	□ $1-10K	□ $11-20K	□ $21-30K	□ $31-50K	□ >$50K

17. Does your stipend cover full tuition costs? □ Yes □ No
18. What additional financial support have you received while in your orthodontic residency? (Check all that apply)
    □ Family □ Financial Aid □ Bank Loans □ Savings □ Part Time Work □ Military □ Public Health Scholarship □ Other_____
19. Estimate your debt at the time of graduation from orthodontic residency.
    From orthodontic residency only:
    □ $0 □ <$10K □ $10-25 □ $26-50K □ $51-100K □$101-150K □ $151-200K □ $201-250K □ $251-300K □ $301-350K □ $351-400K □ >$400K
20. Estimate your debt at the time of graduation from orthodontic residency.
    Total educational debt:
    □ $0 □ <$25K □ $26-50K □ $51-100K □ $101-150K □ $151-200K □ $201-250K □ $251-300K □ $301-400K □ $401-500K □ $501-600K □ $601-700K □ $701-800K □ $801-900K □ $901-999K □ >$1M
21. If not for educational debt, would you consider pursuing a full-time academic faculty position after graduation?
    □ Yes □ No
22. Is your educational debt a source of anxiety in your life? □ Yes, major anxiety □ Yes, moderate anxiety □ Yes, mild anxiety □ No
23. Will your educational debt influence your decision on where to work following residency? □ Yes □ No

B. Please answer the following questions about your FUTURE GOALS:

24. What are your plans following graduation? (Select all that apply)
    □ Academics □ Military □ Purchase of an existing practice □ Start your own practice □ Work as an employee in a corporate group □ Work as an employee in an orthodontic

private practice □ Equity minded associateship □ Work in pediatric or general dental private office □ Undecided

25. Would you be interested in full-time academics if the income for teaching were improved? □ Yes □ No □ I am already considering a full-time academic career
26. Are you interested in part-time academics combined with private practice? □ Yes □ No
27. In which US state, Canadian province, or country outside of the US/Canada do you wish to practice in the future?
28. Do you want to stay in the same area as you went to residency? □ Yes □ No
29. What is your expectation of first year annual income?
    □ Less than $100,000 □ $100,000-149,999 □ $150,000-199,999 □ $200,000-249,999 □ $250,000-299,999 □ $300,000-349,999 □ $350,000-399,999 □ ≥$400,000
30. Ten years after graduation I plan to work weekly:
    □ 1 day □ 2 days □ 3 days □ 4 days □ 5 days □ 6 days □ 7 days
31. I plan to attain ABO certification? □ Yes □ No
32. After graduation will you consider making financial contributions to the residency in which you trained?
    □ Yes □ No □ Undecided
33. Using a scale of 1=Not at all important and and 5=Extremely important, please rate how important each of the following factors are when deciding where to accept your first job after residency.

	Not at all important	**Slightly important**	**Moderately important**	**Very important**	**Extremely important**
	1	2	3	4	5
Location	□	□	□	□	□
Cost of Living	□	□	□	□	□
Ability to pay off educational debt	□	□	□	□	□
Opportunity to buy a practice	□	□	□	□	□
Diverse and inclusive environment	□	□	□	□	□

34. Did the COVID-19 pandemic affect your academic/career path?
    □ No □ Yes (Please share how you were affected): _____

C. Please answer the following DEMOGRAPHIC questions:

35. Gender □ Male □ Female □ Other
36. Age: _____
37. Ethnicity □ White/Caucasian □ Black/African American □ Asian □ Hispanic/Latino □ Native American Indian/Alaska Native □ Native Hawaiian/Other Pacific Islander □Two or More Races □ Other:_____
38. Marital Status: □ Single □ Married □ Divorced

39. # of Children □ 0 □ 1 □ 2 □ 3 □ 4 □ 5+
40. Are planning on to have children/more children:
    □ During residency □ After residency □ No plans to have children □ Already have children
41. Citizenship: □ US □ Canada □ Other_____

Appendix C: Informed E-mail Script

GORP Attendees/Orthodontic Residents:

You are being asked to participate in a research study. This study is being conducted by me, Lori Gossett, 2nd Year student in the MS Orthodontics program at Oregon Health & Science University (OHSU).

The purpose of this research study is to learn about current orthodontic residents' demographics, perspectives about their training, and future goals.

I am asking for volunteers to complete a survey of ~40 questions.

This survey will take approximately 10-20 minutes to complete. All responses will be completely unidentifiable. The surveys will not have any identifiers to link your responses back to you or any other participants. There are no foreseeable risks to you in completing the survey. We are only interested in evaluating the data for the entire group. Although there is no direct benefit to you, your participation may help orthodontic residents and others interested in the orthodontic profession plan for the future.

Your participation in this research study is completely voluntary. The alternative to participating is to not participate. You will receive a $10 gift card for completing the survey.

If you have any questions regarding this research study, please contact me at gossettl@ohsu.edu. If you have any questions regarding your rights as a research subject, please contact the OHSU Institutional Review Board at (503) 494-7887 or irb@ohsu.edu.

Please know that your time and contribution to research is valued and appreciated.

All the best,
Lori Gosset
2nd Year Graduate Student
OHSU Orthodontics

Appendix D: Letter Sent to Program Directors

Hello from OHSU – Please consider forwarding the attached IRB-approved survey to your residents. Lori Gossett explains more below. Thank you for considering! – Laura
Laura Iwasaki, DDS, MSc, PhD, CDABO
Chair, Department of Oral & Craniofacial Sciences
Oregon Health & Science University, School of Dentistry

Dear Doctor:
My name is Lori Gossett. I am a graduate student in the MS program in Orthodontics at Oregon Health & Science University (OHSU). My thesis project is "Opinions, plans and demographics of orthodontic residents". It is a follow-up study looking to update information and evaluate changes since the last such survey, completed in 2018. To get a better understanding of such factors, I would appreciate if you would share this survey with your current orthodontic graduate students/residents. This survey was given to attendees at the recent GORP meeting, but I am hoping to collect information from residents who did not attend that meeting as well as those who did. Residents who have already completed the survey will be asked to opt out so their information is not duplicated.
All responses will be unidentifiable. The surveys will not have any identifiers to link responses back to you or any participants. There are no foreseeable risks in completing the survey. We are only interested in evaluating the data for the entire group. Although there is no direct benefit to you, your residents' participation will contribute to a better understanding of concerns facing current residents and may help orthodontic residents, orthodontic programs, and others plan for the future. A $10 gift card will be offered as reimbursement for those who complete the survey. The alternative to participation is to not participate. The decision to participate or not participate will not have any negative influence on you or them. Participation in this research study is voluntary. If your residents do not wish to complete the survey, they may exit without completing the survey.
This survey will take approximately 5-10 minutes to complete.
Please forward the survey as soon as possible. I hope to complete this survey by 8/30/2024.
If you have any questions regarding this research study, please contact me at gossettl@ohsu.edu.
If you have any questions regarding your rights as a research subject, please contact the OHSU Institutional Review Board at (503) 494-7887 or irb@ohsu.edu.
Thank you in advance for your time and your assistance with my project.
Best,
Lori Gossett
Graduate Student
OHSU Orthodontics