

Graduate orthodontic residents' perspectives on education: A follow-up study

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Graduate orthodontic residents' perspectives on education: A follow-up study

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DECLARATION OF INTERESTS

None of the authors have any interest, financial or otherwise, in any of the parameters involved in this study.

ABSTRACT

Introduction/Objective: The purpose of this study was to conduct a follow-up survey at the Graduate Orthodontic Resident Program (GORP) in Ann Arbor, Michigan. It was based on two previous survey studies by Keith & Proffit in 1992 and Bruner et al in 2003. The survey identified current resident demographics, their perspectives about current training and future goals and compared the results with the 1992 and 2003 surveys to evaluate trends across a 26-year span.

Materials and Methods: An anonymous, electronic survey was distributed via SurveyMonkey at GORP in Ann Arbor, Michigan on August 2-3, 2018. It was a 39-42 question survey that used branching logic in three categories: Program Specific Questions, Future Goals and Demographics. The data was tested for statistically significant differences between groups using chi-square or analysis of variance.

Results: The total number of orthodontic residents attending GORP in 2018 was 489. The total respondent population was 369 (response rate 75.5%).

Conclusions: Orthodontic resident trends over 26 years show the number of female residents and educational debt has increased with less stipends given. The educational debt is associated with anxiety and influences residents' decisions on where to work.

INTRODUCTION

In 2016-2017 there were 1,043 orthodontic residents enrolled in 68 accredited orthodontic training programs in the United States (ADA, July 2017). Two previously published surveys examined orthodontic graduate education from the residents' perspective conducted in the United States (Bruner, Hilgers, Silveira, & Butters, 2005; Keith & Proffit, 1994). Previous to 2003, most survey studies (Keim & Sinclair, 2002; Lindauer, Peck, Tufekci, Coffey, & Best, 2003; Rudolph & Sinclair, 1997; Sinclair & Alexander, 1984; Sinclair & Rudolph, 1991) aimed at examining the status of graduate orthodontic education have been distributed to program chairs or directors. Since the Bruner et al. article published in 2005, which examined orthodontic residents in the United States, the United Kingdom, Canada, Nigeria, New Zealand, and Turkey have conducted their own surveys to gather information about their orthodontic residents (Noble, Hechter, Karaiskos, & Wiltshire, 2009; Noble, Karaiskos, & Wiltshire, 2009; Usumez, Noble, Yagci, Uysal, & Wiltshire, 2013; Yemitan, Bamgbose, & Fadeju, 2013), and one has compared 93 programs worldwide where the first language spoken is English (Anning, Thomson, & Quick, 2011). In addition, transition companies (e.g. Bentson Copple & Associates) have conducted surveys of orthodontic residents to understand the current orthodontic trends that will shape the orthodontic industry and market and sustain their services.

The first Graduate Orthodontic Research Program (GORP) survey was conducted in 1992 by Olga Keith and William Proffit (Keith & Proffit, 1994). At that time, there were 577 orthodontic residents enrolled in 51 orthodontic programs in the United States. The questionnaire was distributed to 207 orthodontic residents attending programs in the United States of varying years. Keith and associates asked questions in three categories: The Residents, The Programs and Expectations. Questions were oriented toward the characteristics of the residents; their

experiences in applying to and attending an orthodontic training program; and their expectations for their future careers. In the 1992 survey, 168 residents completed the questionnaire to give an 81% response rate among the residents attending GORP in 1992. The results from the study showed that of the 168 residents, there were more men than women (74% compared to 26%), with more men being married than women (64% compared to 42%) and more men having children than women (33% compared to 9%). Just under half of the residents had entered their orthodontic residency right out of dental school. Residency reputation was the most important reason for selecting an orthodontic program. Half of the residents received stipends of varying amounts, the majority of residents received additional income primarily from family contributions and nearly 1/3 did part-time work to support themselves while in residency. The majority (84%) intended to work in private practices upon graduation, half planned to return to their home state and very few intended to become American Board of Orthodontics (ABO) certified.

A second GORP survey was conducted in 2003 by Bruner et al. (Bruner et al., 2005). At that time, there were 722 residents enrolled in 58 orthodontic programs in the United States. A 26-item survey was given to residents from 56 programs. The survey was similar to but not identical to the 1992 survey. Bruner and associates also asked questions in three categories: Demographics, Program Specific Questions, and Future Goals (Appendix 1) about current resident characteristics, residents' perspectives on orthodontic training and their goals for the future. In the 2003 survey, 430 surveys were distributed and 330 were returned with a response rate of 77%. Several trends were identified since the 1992 survey. The percentage of women respondents increased in 2003 from 1992 (38% compared to 26%). More women had children in 2003 than 1992 (17% compared to 9%). The percentage of men that had children was roughly

the same as in 1992 (33% compared to 36% in 2003). The percentage of men and women that were married in 2003 remained roughly the same as in 1992 (60% men and 48% women). The mean age of orthodontic residents (29 years) remained unchanged since 1992. Over half of the residents (56%) entered orthodontic residency immediately following dental school. Most residents were satisfied with their orthodontic training which was also found in 1992. The most important reason for selecting an orthodontic program was clinical education compared to residency reputation in 1992. Half of the residents were still receiving a stipend of varying amounts. The percentage of residents getting family contributions while in residency decreased from 61% in 1992 to 42% in 2003 while the percentage receiving financial aid increased from 37% in 1992 to 53% in 2003. The percentage of residents working part-time decreased from 29% in 1992 to 17% in 2003. The median debt from orthodontic residency was reported as \$26,000-50,000 and the median overall educational debt was reported as \$101,000-150,000. The majority (82%) still intended to work in private practice. Women expected to earn significantly less annually than men and work significantly fewer hours per week. One of the largest differences between the 1992 and 2003 survey results was an increase in the percentage of residents planning to complete the American Board of Orthodontics (ABO) certification within 10 years after graduation from 3% in 1992 to 87% in 2003.

The purpose of this recent follow-up survey at GORP in August 2018 was to provide further information on the current demographics, perspectives about current training and future goals of orthodontic residents in the United States and Canada. This included foreign citizens who are attending a program in the United States or Canada. The goal was to compare the results with the 1992 and 2003 surveys and evaluate trends across a 26-year span.

MATERIALS AND METHODS

This research was conducted with the approval of the Institutional Review Board (IRB) of Oregon Health & Science University (OHSU) and permission from the University of Michigan GORP student committee. The survey (Appendix 2) was made available to orthodontic residents who attended the Graduate Orthodontic Residents Program (GORP) in Ann Arbor, Michigan on August 2nd and 3rd of 2018. The survey was accessed and data collected via a freely available online survey tool (SurveyMonkey, San Mateo, CA) with the help of the manager of this survey tool for the OHSU School of Dentistry. It was an anonymous survey that did not collect any subject identifiers and was not coded. By completing the survey, residents consented to participate.

Recruitment of potential participants took place adjacent to the GORP registration table as attendees checked-in for the conference. There was a total of 12 orthodontic residents from OHSU who recruited during shifts on Thursday, August 2nd from 12 pm-12 am and on Friday, August 3rd from 8 am-5 pm. Most of the residents attending GORP (about 2/3rds) arrived on Thursday. After residents checked-in with the Michigan GORP personnel, OHSU recruiters asked the attending residents to fill out a survey about their resident experience and future goals and most residents used one of the six portable computer tablets (iPads mini, Apple Inc., Cupertino, CA) provided to complete the survey. If all the tablets were in use, residents were asked to wait a few minutes until one was available or given the option to complete the survey on their personal cellular telephones. Recruiters explained the survey was a master's thesis research project. If residents refused to participate they were not asked again. There was a table set up with recruitment fliers (Appendix 3) to advertise the survey and donuts were provided to

participants that completed the survey. It was anticipated that the survey would take about 5-10 minutes to complete.

The survey had 39-items in three categories: Program, Future Goals and Demographic (Appendix 2). Program questions asked for information about program duration and type, and also included financial questions about tuition and debt. This category also asked questions about what was important to residents in choosing their program/orthodontics and their perspectives about their current training. Future Goals questions asked for information about types and location of future practice following residency, interest in teaching and expectations for future income and days worked. Demographic questions asked about gender, ethnicity, and age and also marital status and number of children.

The original 1992 survey was not available but according to Bruner et al., the 2003 (Bruner et al., 2005) survey was based on but not identical to this previous survey (Appendix 3). For the current survey, the three categories were kept the same as in the 2003 survey: Demographic, Program and Future Goals. However, the order was changed for this survey compared to the 2003 survey that put the demographic category last instead of first. The reason for this was to put the potentially more interesting questions first in case participants did not fill out the entire survey. All the questions from the 2003 survey were kept for the current survey, however, some were slightly reworded in an attempt to clarify some questions. The monetary scales and ranges were adjusted as it was anticipated that student debt and tuition had increased since 2003. Four questions were added in our survey to the first category: Program. The first question asked when choosing a career in orthodontics, what factor was the most important to the resident. A similar question was asked in the 1992 study, however the four answer choices used in our survey were based on the Bentson Copple & Associates 2017 Annual Orthodontic

Resident Survey results (Bentson Copple & Associates, 2017). The second question was a yes or no question about whether or not applicants think it would be better if all programs were in the Postdoctoral Dental Matching Program (Match). The third and fourth questions delved further into the topic of student debt. The third question asked if student debt is a source of anxiety in residents' life and if so to categorize the magnitude of the anxiety (major, moderate, mild); and the fourth question asked if student debt will influence their decision on where to work following residency. Four questions were added to the category: Future Goals. The first asked in which state the residents wished to practice in the future and provided a drop-down menu of states for the response. This question was based on the Bentson Copple & Associates 2017 Annual Orthodontic Resident Survey results (Bentson Copple & Associates, 2017). A follow-up question asked if the residents wanted to stay in the same area as their residency program. The third additional question asked what is the expectation of first year annual income and the fourth asked how important are four factors: location, cost of living, ability to pay off student debt and opportunity to buy a practice, when deciding where to accept a job after residency. Two questions were added to the category: Demographics. Ethnicity was added as it had not been asked in either of the two previous surveys. The last question added asked when the residents are planning on having children, during residency, after residency or not planning on having children.

After the 2018 GORP, the survey was closed and the manager of the survey tool account exported the data to an Excel spreadsheet using the Survey Monkey 'All Responses Data' function, which placed the survey responses line by line by respondent with the survey variables constituting the columns in the spreadsheet. The data were reviewed and cleaned and analyzed with statistical software (IBM SPSS Statistics v.24) with frequencies, cross tabulations, and

means calculated as appropriate. To test statistically significant differences between groups, chi-square or analysis of variance was used as indicated in the tables.

RESULTS

The total number of orthodontic residents attending GORP in 2018 was 489. Of these, 372 residents took the survey, however, three respondents did not complete all questions and were excluded from the study so the total respondent population was 369 (response rate 75.5%). There was only one question, “Would you be interested in full-time academics if the income for teaching were improved?”, that had 353 respondents instead of 369 respondents.

Demographics

The resident population consisted of 49% men and 51% women. The mean age \pm standard deviation (SD) of the orthodontic residents was 29 ± 3 years with 27.4% in the age range of 24-26 years, 46.9% in the age range of 27-29 years, and 25.7% in the age range of ≥ 30 years. As illustrated in Table 1, there was a statistically significant gender difference in age with female residents being younger (more females than males in the 24-26 year age range) and more male residents being older (more males in the ≥ 30 year age range) (Chi-square=13.84; df=2; $p < 0.001$). The majority of residents were white/Caucasian (60%), with Asians being the second most frequent group (26%) and Hispanic/Latino (5.4%), Black/African American (3.8%) and other (4.9%) in the minority (Table 2). There was no significant relationship between ethnicity and gender. The majority (85%) were United States citizens, 5% were Canadian citizens and 10% listed themselves as “Other.” There was no significant relationship between citizenship and gender. Sixty-two percent of the residents were single, 36.6% married and 0.8% divorced. There was no significant relationship between marital status and gender. The percentage of men and women that were married were about equal with 33% of the women and 40% of the men married. Eighty-six percent of the residents did not have children. Of the 14% that did have children, 22% of the men had children but only 5% of the women had children. The

chi-square test showed that this was statistically significant ($P < 0.000$) when comparing gender and children. When asked if they were planning on having children and when they were planning to have them, 13% said during residency, 77.5% said after residency and 9.5% said they were not planning on having children, but there was a statistically significant difference between male and female residents with female residents consistently planning children later. (Table 3, chi-square=17.9; df=2; $p < 0.000$). The distribution of residents surveyed was 193 first year (52%), 133 second year (36%), 41 third year (11%) and 1 4th + year (<1%). There was no significant difference between resident year and gender. More than half (66.7%) of the residents entered orthodontic training immediately following dental school, 16.8% began 1-2 years after, 11.1% began 3-5 years after and 5.4% began >5 years. Of the 124 residents who did not enter right after dental school, 34% worked in private practice, 13% worked as an employee in a corporate group, 17% were in academics, 13% were in the military and 24% were in the category of other.

Program Specific Questions

Most of the residents (42%) attended a residency program that was >31 months long, 39% attended programs that were 25-30 months long, and 19% attended 24 month long programs. About half (51%) of the residents were in a medium size class of 6-9 residents per class, 33% were in small class size of 2-5 residents per class and 16% were in a large class size of 10+ residents per class. The majority of the residents were working towards a combined Master of Science/Certificate program (80%), 14% were in a Certificate program only and 5% were in a combined MBA/Certificate program, <1% were in a Doctor of Philosophy/Certificate program and none were in a Post-Doctoral Fellowship. Forty-six percent of the residents reported having 3-4 full time faculty, 34% reported having 5-6 full time faculty, 12% reported having >7, 8% reported having 1-2 full time faculty and one person reported 0 full time faculty. The

number of part time faculty at each program was more varied with about 20% answering in each of the categories 3-5, 6-8, 9-11, and >14, 15% in 12-14 and 5% in 1-2. The majority (62%) stated that they planned to pursue publishing their research in a peer reviewed journal, 30% said that they did not plan to publish and 6% said it was not-applicable. The majority (78%) of the residents responded “yes” when asked if they thought it would be better for applicants if all programs were in the Match and 22% responded “no”.

Just over half (54%) of the residents were “very satisfied” with their orthodontic residency program, 43% were “satisfied” and 3% were “unsatisfied”. Residents rated the importance of 8 characteristics (reputation, location, cost, clinical education, length of training, where they went to dental school, research opportunities and class size) when choosing their orthodontic residency program. As indicated in Appendix 2 the rating scale ranged from 1 (not important at all) to 10 (very important). Clinical education was most frequently ranked as most important (8.39 ± 2.11 , Table 4) and research opportunities as least important (3.84 ± 2.64 , Table 4). Gender and the 8 characteristics were analyzed with an ANOVA and found statistically significant gender differences with location characteristic ($p < 0.004$) and clinical education ($p < 0.019$) (Table 5). A statistically significant gender difference was found in that more females ranked location and clinical education more important than males. However, the measures of association were small, where eta-squared was 0.022 for location and gender and 0.015 for clinical education and gender. An additional question to the 2018 survey asked when choosing a career in orthodontics, which factor (passion for orthodontics, workload flexibility and predictability, financial/earning potential, skill set or other) was most important to them. Forty-one percent reported that passion for orthodontics was the most important, 35% reported

workload flexibility and predictability, 11% reported financial/earning potential, 10% reported skill set and 3% reported other.

Tuition varied with the biggest percentage (18%) paying >\$80,000 per year and the lowest percentage (5%) paying \$21,000-30,000 per year. Nine percent of the residents paid no tuition. Only 39% of the residents reported receiving a stipend, the other 61% reported not receiving a stipend. Of the 146 residents (39%) that received a stipend, the highest percentage within each year (1st: 46%, 2nd: 47%, 3rd: 45%) received \$1,000-10,000, although the number of respondents decreased from 141 1st year, 131 2nd year and 96 for 3rd year respondents (Table 6). In addition, of the 39% of the residents that received a stipend, only 34% of those received a stipend that covered full tuition costs which is 13% of the total respondents. When asked what additional financial support they received while in their orthodontic residency, 58% had family support, 53% had financial aid, 13% took out bank loans, 20% used savings, 12% worked part-time jobs, 5% received military funding, 5% received assistance from other sources and <1% received a public health scholarship. Residents were asked to estimate their debt after graduation from residency and total educational debt. The average debt from orthodontic residency was \$137,706 ± \$127,380 and the average total educational debt was \$323,071 ± \$266,510. When summed up, the debt was \$50,813,500 for orthodontic debt and \$118,890,000 for total educational debt for 369 students. There was no association between orthodontic debt or total debt and gender or resident year. However, there was a statistically significant association (P<0.000) for both orthodontic residency debt and total debt and residents that received stipends, showing that having a stipend significantly affected debt load. Those that had stipends had significantly less debt. The measures of association (eta-squared values) showed that stipends had small effects on orthodontic residency debt (0.090) and total educational debt (0.040). Also,

in addition an ANOVA showed a statistically significant ($P < 0.000$) association between both orthodontic residency debt and total debt and residents that reported their stipend covered their full tuition costs. Even those that had their stipend cover full tuition costs had orthodontic residency debt but having the stipend cover full tuition costs significantly helped lower the debt compared to other residents that were receiving a stipend that covered only a portion of their tuition costs (Table 7). The measures of association showed small effects for full tuition stipend on orthodontic residency debt (eta-squared = 0.136) and total educational debt (eta-squared = 0.081). It was also found that there was a statistically significant correlation (Pearson Correlation of 0.704) between a high level of orthodontic residency debt and total educational debt (Figure 1). There were notable numbers of residents that had no orthodontic debt (22%) and no educational debt (17%) (Figure 2 and Figure 3). There were no significant associations between those that had no orthodontic debt or total educational debt and gender or age. However, a chi-square test showed there was a statistically significant ($P < 0.001$) association between no orthodontic debt and family financial support and also a statistically significant association ($P < 0.000$) between no total educational debt and family financial support (Table 8 and Table 9). A chi-square test also showed there was a statistically significant ($P < 0.000$) association between no orthodontic debt and no total educational debt and those receiving financial aid. Those that had orthodontic debt and total educational debt were more likely to have financial aid and those that did not have orthodontic debt or total educational debt were more likely to not be receiving financial aid (Table 10 and Table 11). It was also found with a chi-square test that there was an association between no orthodontic debt and bank loans ($P < 0.000$) and between total educational debt and bank loans ($P < 0.001$). The bank loans were taken out by residents that have orthodontic debt and total educational debt (Table 12 and Table 13). The relationship between

those that had no orthodontic debt or total educational debt and savings was not statistically significant (Table 14 and Table 15). Finally, a chi-square test found that it was statistically significant ($P < 0.000$) relationship between no orthodontic debt and military financial support and statistically significant ($P < 0.001$) relationship between no total educational debt and military financial support (Table 16 and Table 17). The average total educational debt for those that had no debt from orthodontic residency was \$41,975 and the average orthodontic debt excluding those that did not have orthodontic debt was \$177,051 and the average total educational debt for those that had orthodontic debt, excluding those that did not have orthodontic debt was \$402,404. When the 61 residents that had no educational debt were excluded, the average orthodontic debt was \$164,979 and the average total educational debt was \$387,264. Fifty-eight percent of the residents reported that their educational debt restricted them from pursuing full-time academics.

About one-quarter (28%) reported no anxiety. The remaining residents expressed varying levels (mild, moderate or major) of anxiety due to their student debt. An ANOVA showed a statistically significant ($P < 0.000$) association between amount of both orthodontic residency debt and total debt and anxiety; those with more debt had more anxiety (Figure 4). The measures of association showed that 17.1% and 26.6% of the variabilities in anxiety levels were accounted for by orthodontic residency and total educational debts, respectively. For the question if student debt will influence residents' decisions on where to work following residency, 62% reported yes that it would influence their work decision. However, the question did not permit respondents to specify in what ways it would influence location or practice modality. An ANOVA showed a statistically significant ($P < 0.000$) association between amount of both orthodontic residency debt and total educational debt and an influence on where to work following residency (Figure 5). The

measures of association showed small effects on the decision of where to work due to orthodontic residency and total educational debts (eta-squared = 0.113 and 0.166, respectively).

Future Goals

Most of the residents (46%) planned to work as an employee in an orthodontic private practice (Table 18). When asked about their interest in full-time academics, 49% said they would be interested in full-time academics if the income for teaching were improved. However, 85% said they would be interested in part-time academics combined with private practice. Residents were asked what state they wished to practice in the future and these responses were grouped by states within eight American Association of Orthodontics (AAO) constituencies regions (Table 19). The highest percentage (29%) wished to practice in the Pacific Coast region which includes California, Oregon, Washington, Arizona, Nevada, Alaska, Hawaii, that part of Idaho that includes Twin Falls and Ketchum and all areas west within the state, British Columbia, Alberta and Saskatchewan. The second highest percentage (22%) wished to practice in the Southern region which includes Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Kentucky, Mississippi, and that part of Louisiana east of the Mississippi River (Table 19). The majority (69%) did not want to stay in the same area that they went to residency.

The residents' expectations of first year annual income were \$200,000-249,999 for 39% of them and \$150,000-199,999 for 29% of them. Nineteen percent expected to make \geq \$250,000. A chi-square test looking at gender and expectation of first year annual income showed statistically significant results ($P < 0.002$) that males reported more frequently higher expectations for first year annual income than females. There were no significant findings for age group and expectation of first year annual income. Residents' 10-year goals showed the majority (63%)

planned to work 4 days a week, 41% plan to earn \$400,000-600,000 annually, and the majority (91%) plan to attain ABO certification within 10 years of graduation. A chi-square test looking at gender and the number of planned workdays per week 10 years after graduation showed statistically significant results ($P < 0.007$) that more males than females that planned to work 5 days a week and more women than males planned to work 3 days a week. About the same amount planned to work 4 days a week. There were no significant findings for age group and number of planned workdays 10 years after graduation. A chi-square test looking at gender and annual earnings planned 10 years after graduation showed statistically significant results ($P < 0.001$) that males expected to earn more than females. There were no significant findings for age group and annual earnings planned 10 years after graduation. Forty-seven percent of residents reported they would begin making financial contributions to their residency programs ≥ 5 years after graduation and the majority (62%) reported they would contribute 1-3% of their income annually to their residency program.

Residents rated the importance of four characteristics (location, cost of living, ability to pay off student debt, opportunity to buy a practice) with a scale of 1-10 when deciding where to accept their first job after residency. The majority of residents (61%) ranked location as very important (10 on the scale of 1-10). The majority of residents (61%) ranked cost of living in the middle of importance (5 on the scale of 1-10). The ability to pay off student debt was split as 42% ranked it as very important (10 on the scale of 1-10) and 45% ranked it in the middle of importance (5 on the scale of 1-10). The opportunity to buy a practice was split as well where 39% ranked it as very important (10 on the scale of 1-10) and 53% ranked it as middle of importance (5 on the scale of 1-10). An ANOVA test showed the relationship between gender and the characteristic opportunity to buy a practice was statistically significant ($P < 0.012$) and the

measures of association was 0.017. That is, it was significantly more important for men than women to have an opportunity to buy a practice when determining where to work after residency.

DISCUSSION

In the United States from 1992 to 2003 to 2018 there have been increases in the number of orthodontic residents by 25% and 44% and orthodontic residency programs by 14% and 17% (Figure 6). Thus, the number of residents per program has also increased. There has been an increase in women respondents from 26% in 1992, 38% in 2003 and 51% in 2018 (Figure 7) and men no longer outnumber women. This has been predicted and is becoming more of a discussion in the orthodontic community about how more women in orthodontics will affect the profession and the trends in orthodontic practice modalities (Davidson, Major, Flores-Mir, Amin, & Keenan, 2012). Several studies have found that female dentists are less likely to own their own practices, and are more likely to work fewer days and hours per week than men (Dolan, 1991; Morris, Harrison, Caswell, & Lunn, 2002; Waldman, 1998). The current study showed that there was no gender difference in the number of residents wanting to own their own practice and although 46% of all residents planned to work private practice, this percentage was lower than the 84% and 82% reported in 1992 and 2003, respectively. However, the current results do agree with the trend that more males than females plan to work 5 days a week and more women than males plan to work 3 days a week. This study showed that males expected to earn more annually 10 years after graduation than females. In addition, it was significantly more important for men than women to have an opportunity to buy a practice when determining where to work after residency. The average age (29 years) has been the same for all three surveys, 1992, 2003 and 2018. The positive chi-square test comparing age and gender showed that significantly less women than men are attending residency programs at higher ages (Table 1). This may be due to the fact that for the ≥ 30 year age group, it is more difficult for females than males during that time in their life. The proportion of married men and women are more equal in 2018 with 40% of

the men married and 33% of the women married compared to 1992 (64% of the men and 42% of the women) and 2003 (60% of the men and 48% of the women) when there were more married men than women. However, the trend shows that there are less married individuals compared to the previous years with 58% married in 1992, 56% in 2003 and 37% in 2018. The trend also shows that less residents have children. In 2018, 14% of the residents had children (22% of the males, 5% of the females) compared to previous years when in 1992, 27% of the residents (one-third of the men and 9% of the women) had children and in 2003 30% of the residents (36% of men and 17% of women) had children. In 2018 there was a higher proportion (67%) of residents entering residency immediately following dental school compared with just under half in 1992 and more than half (56%) in 2003.

Similar percentages of residents in 2003 and 2018 planned to pursue publishing their research (71% in 2003 and 62% in 2018) and similar satisfaction with their programs was reported with 51% “very satisfied”, 47% “satisfied” and 2% “unsatisfied” in 2003 compared to 54% “very satisfied”, 43% “satisfied” and 3% unsatisfied in 2018. Regarding the characteristics important to residents when selecting an orthodontic residency program, results were similar in 2003 and 2018 with clinical education most frequently ranked as most important and research opportunities as least important. However, in 1992 the most important reason was program reputation. Interestingly, it was found that more females ranked location and clinical education more important than males when selecting a residency program. The number of residents that attended a 24-month program decreased from 39% in 2003 to 19% in 2018. This finding is consistent with evidence that the number of 24-month programs has decreased since 1983 and 30 and 36 month programs has increased. (Keim & Sinclair, 2002). Most orthodontic residencies offer advanced degree programs, as indicated by the high percentage of residents enrolled in

such programs, 77% in 1992, 82% in 2003, and 80% in 2018. Of the residents pursuing advanced degrees, those pursuing PhD degrees has decreased from 5% in 1992 and 8% in 2003 to <1% in 2018.

The number of residents in programs that charges no tuition has dropped from when 25% in 2003 compared to 9% in 2018. Also, the number of residents receiving a stipend has decreased from 50% in 2003 and 1992 to 39% in 2018. The current research showed the importance of stipends in that those that had stipends had significantly less debt. Even those whose stipend covered full tuition costs had orthodontic residency debt, however, having the stipend cover full tuition compared to only a portion of tuition costs helped significantly to lower the debt (Table 7). The median orthodontic residency debt and total educational debt more than doubled since 2003 (Table 20). Interestingly, there were a notable number of residents that had no orthodontic debt (22%) and no educational debt (17%) (Figure 2 and Figure 3). There was an association between no orthodontic debt and no total educational debt and family financial support (Table 8 and Table 9) suggesting that those that are receiving family support are more likely to have less debt. In addition, there was an association between those with no orthodontic debt and no total educational debt and those receiving financial aid. Residents that had orthodontic debt and total educational debt were more likely to have financial aid and those that did not have orthodontic debt or total educational debt were more likely to not be receiving financial aid (Table 10 and Table 11). The relationship between those that had no orthodontic debt or total educational debt and who used savings to support their education was not statistically significant. Thus, it is possible that even those with orthodontic debt may be using their savings to help pay for orthodontic residency or their total educational expenses, or not all of those that had savings had no orthodontic debt or total educational debt (Table 14 and Table 15). The percentage of residents

receiving family support has changed from 61% in 1992, 42% in 2003 and 58% in 2018, however the percentage taking out financial aid has increased from 37% in 1992 to 53% in 2003 and 53% in 2018 (Table 21). Most residents in 2003 (63%) and in 2018 (58%) reported feeling that their educational debt restricts them from pursuing full-time academics. Therefore, large debt loads are likely to hinder residents from pursuing a career in teaching, further worsening the shortage of orthodontic academics. The association between amount of both orthodontic residency debt and total debt and anxiety showed that those with more debt had more anxiety (Figure 4).

The student debt is steadily increasing and salaries are not keeping pace. When the financial benefit (future wage) does not outweigh the cost (student debt) of going to school orthodontics may enter an educational bubble market. Orthodontic residents buy education from dental schools and residency programs. This education is formed into skills that are then sold to patients in the form of services. As long as it is believed that patients will keep paying more and more for orthodontic services, students should be willing to pay more and more for the education that enables them to sell those services. A perspective from *The New England Journal of Medicine* in 2013 discusses if the United States is in a medical educational bubble market. (Asch, Nicholson, & Vujcic, 2013) They use the ratio of the average total educational debt of a student to the average annual income in the profession on entry into the workforce as a simple measure of this market economy. Schools can sustain their high tuitions only if students can be convinced of higher returns in the form of payments from future patients. So, the amount that schools are able to charge students is linked to how much we pay orthodontists now and how much we plan to pay them in the future. There is no set debt to income ratio for what puts a profession in a bubble. According to this study the average total educational debt for orthodontic

residents is \$323,000 and according to the Bureau of Labor Statistics, the mean annual wage of orthodontists is \$229,000 for 2018 (Bureau of Labor Statistics, 2018). If we use these numbers to calculate the debt to income ratio for orthodontics, orthodontics debt to income ratio (141%) is higher than other medical specialties calculated in 2010 and is right behind veterinarians which the article said is nearing an educational bubble; the benefit does not outweigh the cost of going to school (Figure 8 and Figure 9). However, this is a simplified measure and does not factor in opportunity cost and total career earnings. At some amount of educational debt there is a breaking point where the cost does not outweigh the benefit and orthodontics enters an education bubble market.

It may be true that the debt burden today is the same as it was before, say in 1992 because even though student debt was lower 20-30 years ago, interest rates were higher and salary was lower. On the Bureau of Labor Statistics website you can calculate the average inflation from certain years say from 1992-2018, however it is not that simple and you have to compound the inflation and then look at other markers such as rising cost of living and interest rates. It would be an interesting question to answer and would require a knowledgeable specialist on the topic.

Orthodontic graduates' expectations of their earning potential may not be rational in the current economy. The Bureau of Labor Statistics reports mean annual wage for orthodontists in 2018 to be \$229,000 (Bureau of Labor Statistics, 2018) and from our survey 41% planned to earn \$400-600 annually in 10 years. A survey study of orthodontic residents and recent graduates in the JCO (Pruzansky, Ellis, & Park, 2016) reported similar numbers for anticipated income after graduation for orthodontic residents, however, they found that 75% of recent graduates reported incomes of \$100-300,000. In addition, the study found that 80% of 102 recent graduate respondents found it was difficult to find a job out of residency. Bentson and Copple's surveys

from 2010-2013 found 68% of graduates had difficulty finding a job (Overcash, 2014). Additionally, according to the 2015 JCO survey (Pruzansky, Ellis, & Park, 2016) the amount of educational debt had an obvious impact on the timing of other lifestyle and financial decisions of orthodontic graduates, with about 77% of all respondents indicating they were unable to purchase homes or save for retirement. About 71% percent said their debt load had left them incapable of purchasing practices, and 67% felt their debt had greatly influenced their decision to associate rather than own (Pruzansky, Ellis, & Park, 2016).

The rising costs of education and student debt is a complex problem. One school of thought is that the problem is an institutional problem and the schools could be doing more to control the debt burden to students. The thought is that it is irresponsible of the institution to have such steep educational costs. A second school of thought is that the individual student is at fault and a student should not go to an institution they cannot afford or help their debt by working a part-time job while in school. If the later is the case, the specialty may be unable to attract the best-qualified future residents and instead will attract those most able to pay tuition, or the highest bidder.

Limitations to this study include that the sample comprised about 35% of all current orthodontic residents and only included those that attended GORP which could represent selection bias. However, GORP pays for all residents' accommodations and food once they have arrived at the University of Michigan but does not fund travel to and from the conference, so that could have helped. During the survey distribution and analysis, it was noted that some areas of the survey could be improved upon. First of all, there was no option for "other" or "international" location for question 24 that asked "In which state do you wish to practice in the future?". For question #38 when asking about plans for children, there was no option to select

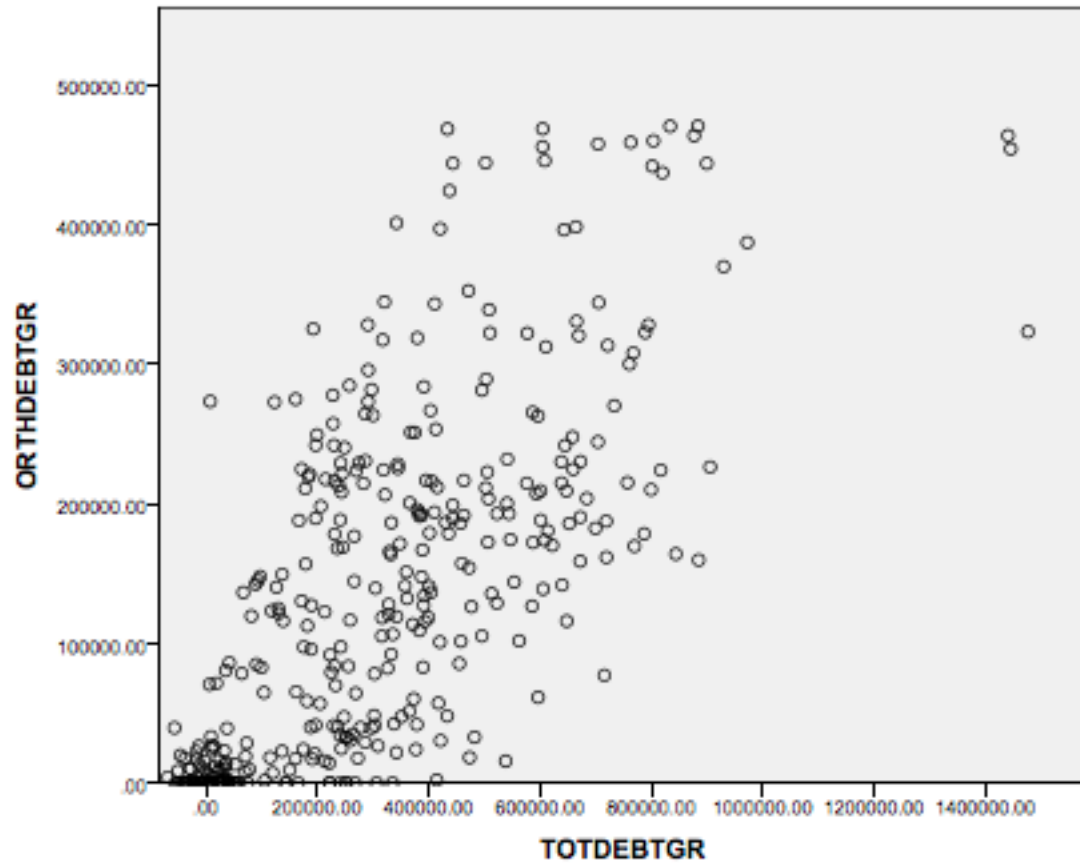
“already have children”. For question #16 there should have been an option for \$0 as not all residents that receive a stipend received it all 3 years. Many of the residents expressed that the survey was long. It was anticipated that the survey would take about 5-10 minutes to complete and respondents took about that much time but still expressed it was too long. Additional feedback included, that they did not know how much their tuition was and that they did not know how many part-time or full-time faculty they had. While filling out the survey, many residents expressed feeling stressed, usually after reaching the questions about their debt.

Future studies should address further details into the potential differences in practice patterns between male and female practitioners as the percentage of female orthodontists continue to increase. With the increased debt loads and significant association higher anxiety, a future study could look further at if student debt has an effect on student performance. Finally, future studies could look more closely at the reality facing recent graduates, comparing it to the expectations they had while a resident.

CONCLUSIONS

- Compared to the 1992 and 2003 surveys, the number of female residents has increased and educational debt has increased.
- The number of residents that go to a program that charges no tuition has dropped since 2003 when 25% of the residents paid no tuition. In 2018 only 9% attended a program that had no tuition.
- The number of residents receiving a stipend has decreased from 50% in 2003 and 1992 to 39% in 2018.
- Clinical education was most frequently ranked as most important and research opportunities as least important when residents rated the importance of 8 characteristics when choosing their orthodontic residency program. In 1992, program reputation was the most important reason when choosing their orthodontic residency program.
- Educational debt is associated with anxiety and influences residents' decisions on where to work.
- Most of the residents (46%) planned to work as an employee in an orthodontic private practice.
- The majority of orthodontic residents (63%) plan to work 4 days a week 10 years after graduation.
- 41% of orthodontic residents plan to earn \$400,000-600,000 annually 10 years after graduation.
- 91% of orthodontic residents plan to attain ABO certification 10 years after graduation.
- It was more important for men than women to have an opportunity to buy a practice when determining where to work after residency.
- Less women than men are going to residency at higher ages.
- The proportion of married men and women are more equal in 2018 compared to 1992 and 2003 when there were more married men than women. However, the trend shows that there are less married individuals compared to the previous years.
- The trend also shows that less residents are having children. With women always having a smaller percent of having children than men.
- More residents are entering residency immediately following dental school.
- The average length of orthodontic residency training is increasing.

FIGURE 1: Correlation between orthodontic residency debt and total educational debt



Correlations

		ORTHDEBTGR	TOTDEBTGR
ORTHDEBTGR	Pearson Correlation	1	.704**
	Sig. (2-tailed)		.000
	N	369	368
TOTDEBTGR	Pearson Correlation	.704**	1
	Sig. (2-tailed)	.000	
	N	368	368

** . Correlation is significant at the 0.01 level (2-tailed).

FIGURE 2: Orthodontic residency debt

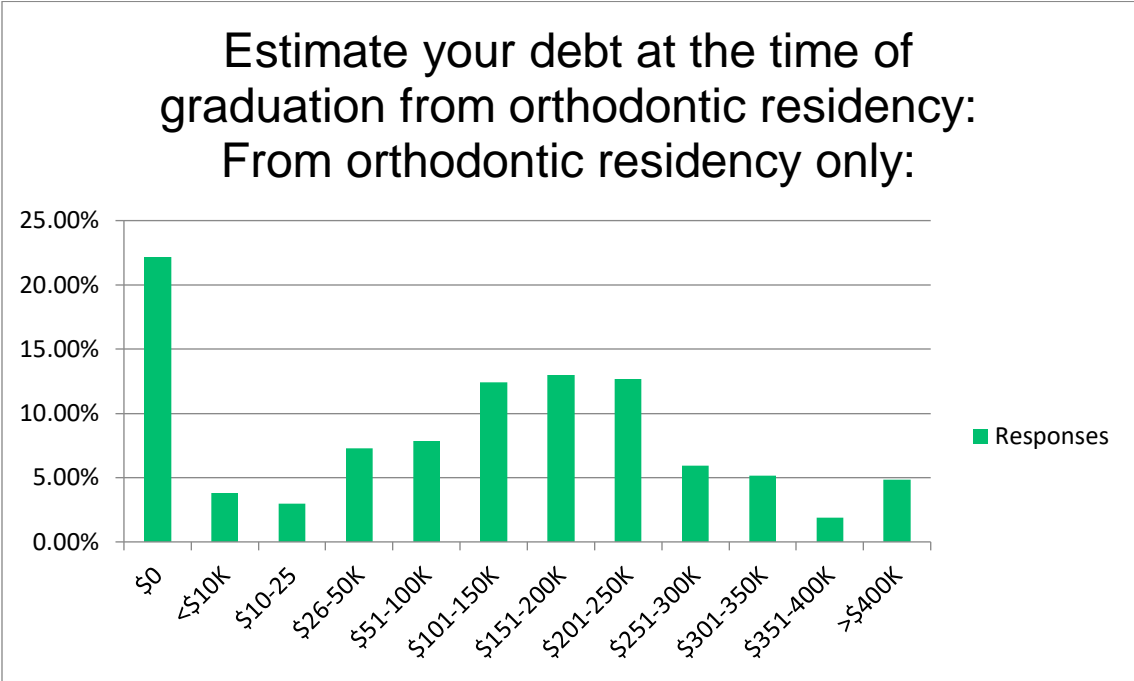


FIGURE 3: Total educational debt

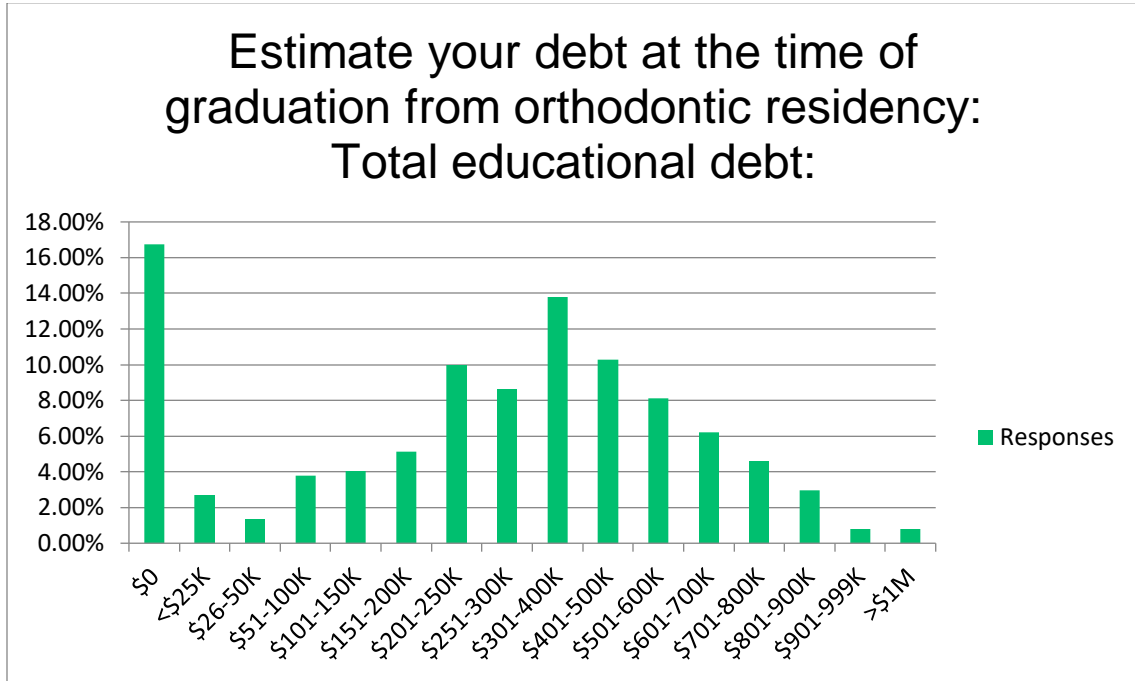


FIGURE 4: Debt and anxiety

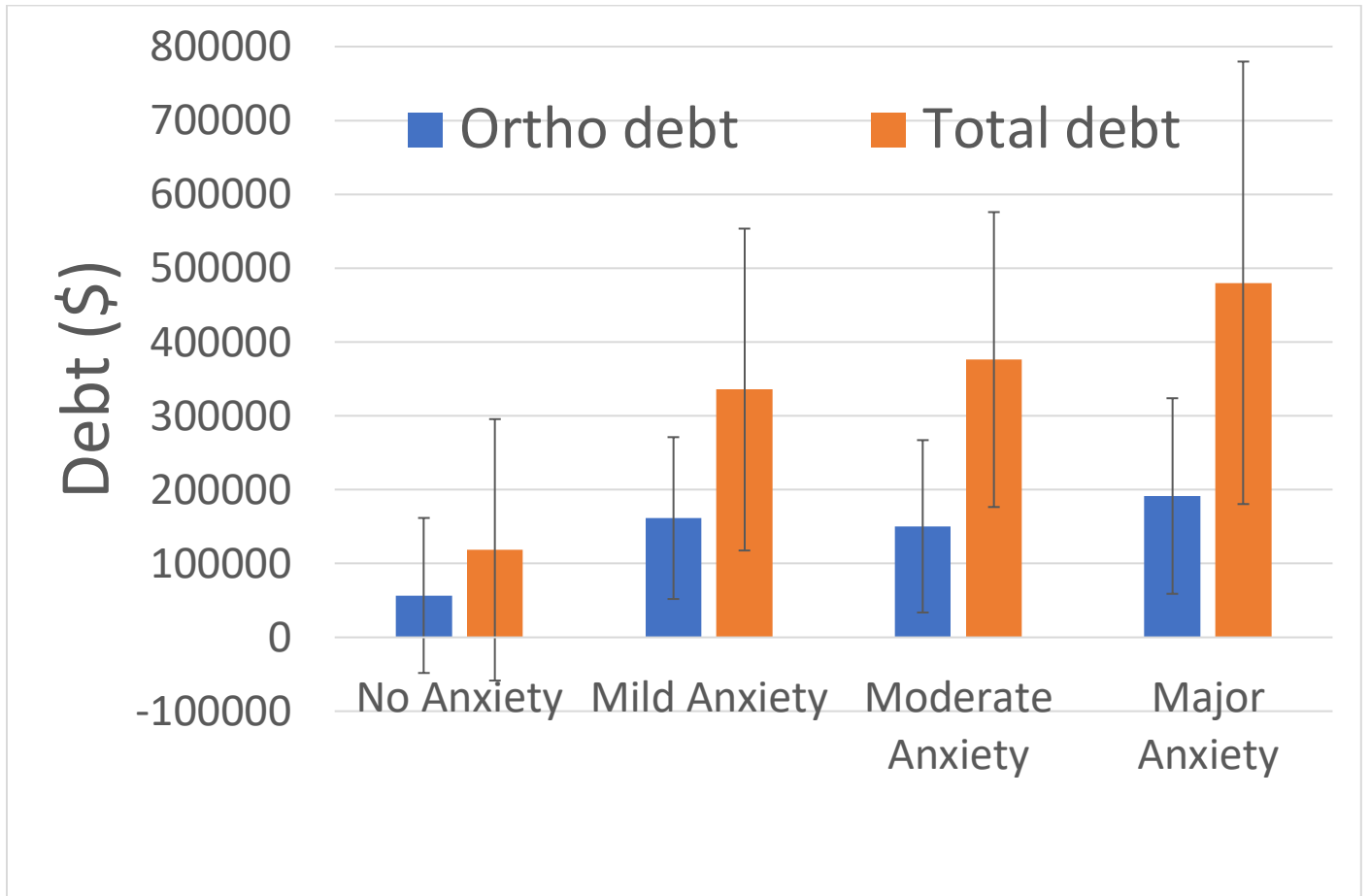


FIGURE 5: Debt and decision on where to work

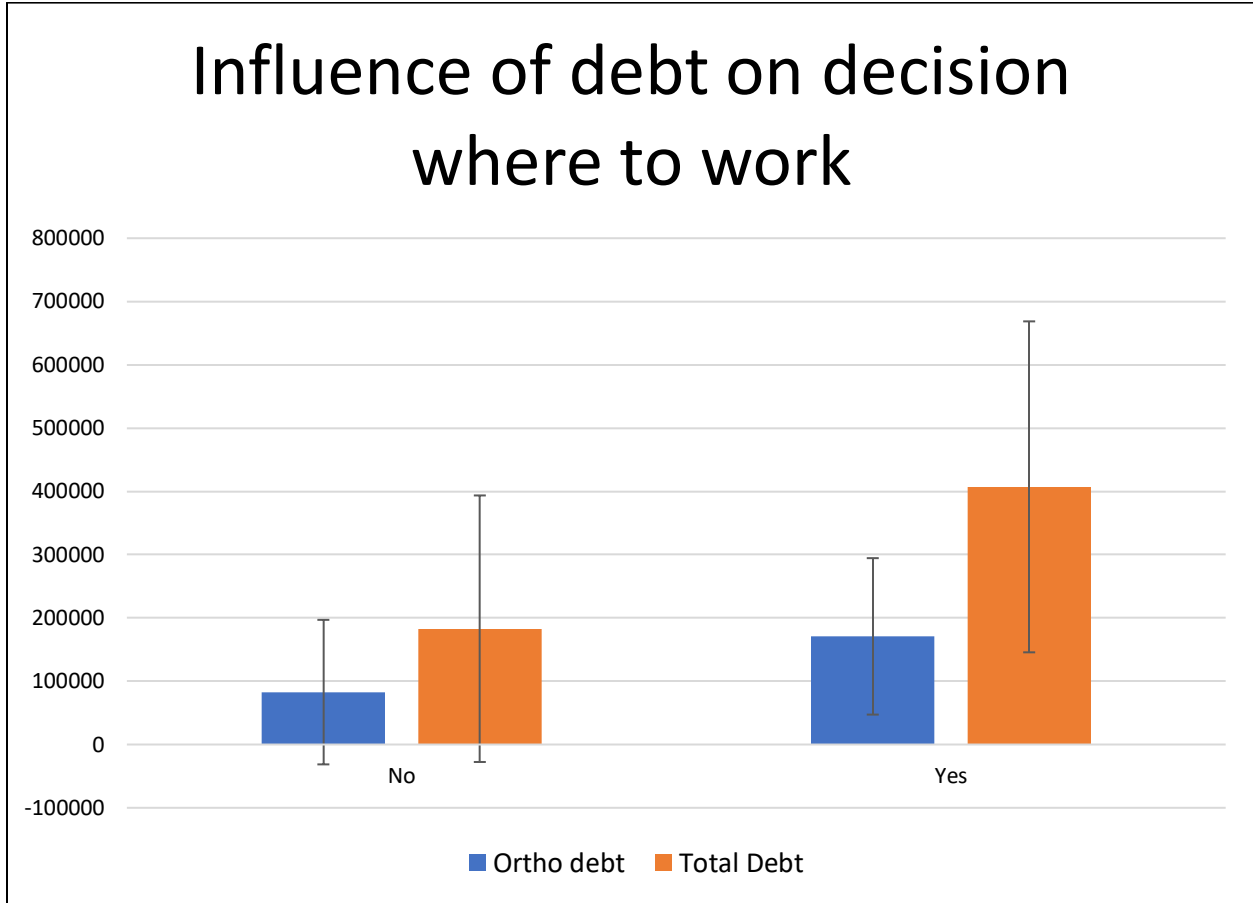


FIGURE 6: Comparison of 1992, 2003 and 2018 surveys

Survey	1992	2003	2018
# of US Programs	51	58	68
# of Residents	577	722	1043
# of GORP attendees	207	430	489
# of Respondents	168	330	372
Response rate	81%	77%	76%

FIGURE 7: Female resident trend 1992-2018

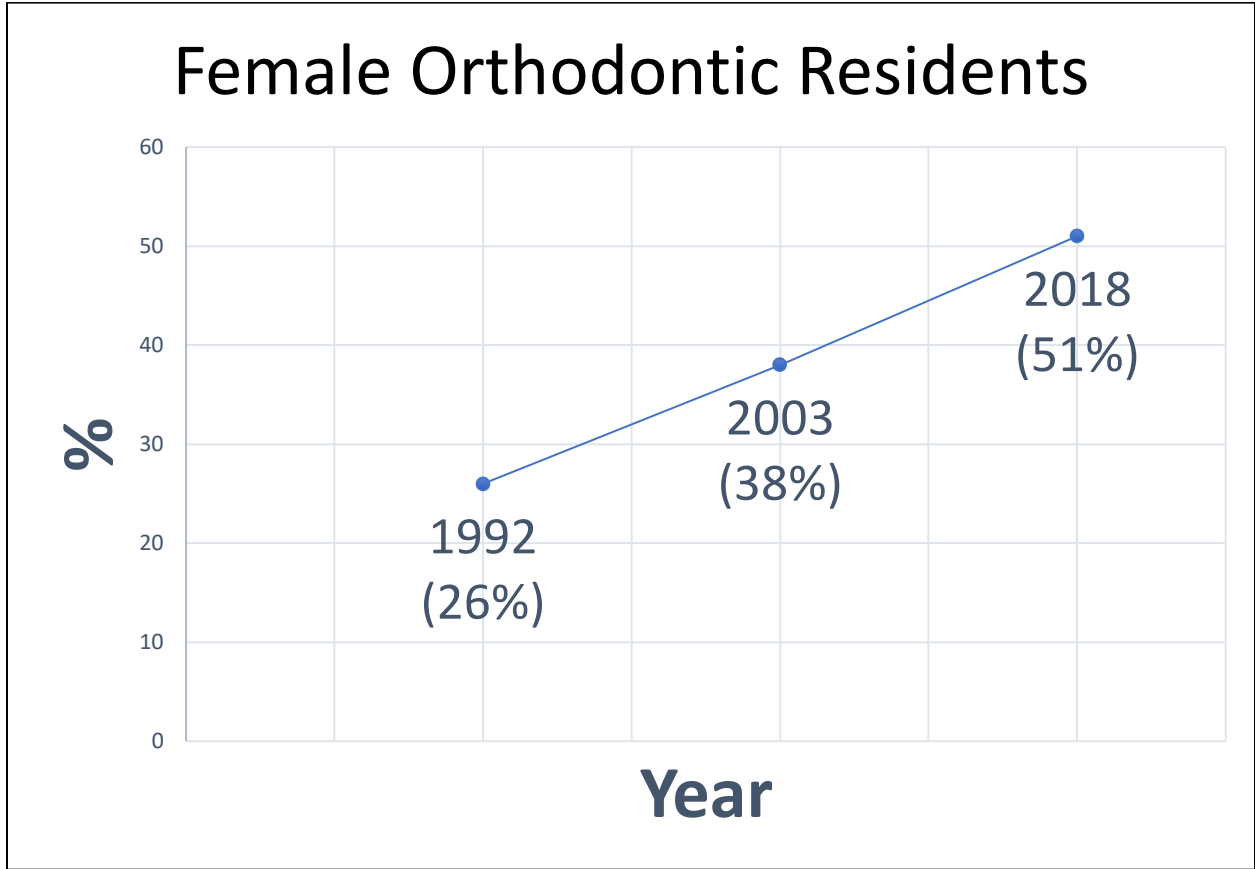


FIGURE 8: Ratio of Debt to Income, According to Medical Specialty

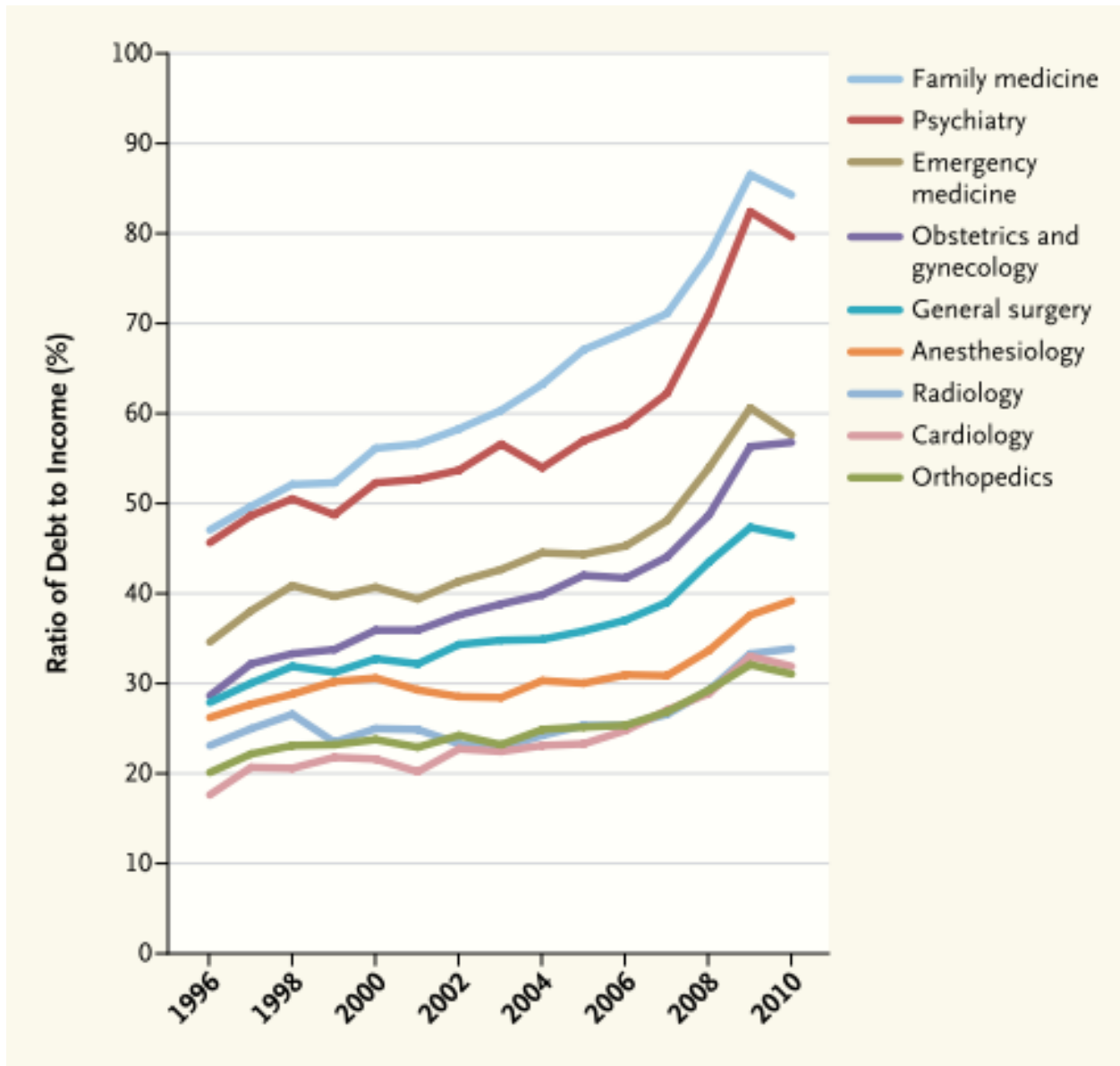


FIGURE 9: Ratio of Debt to Income, According to Occupation

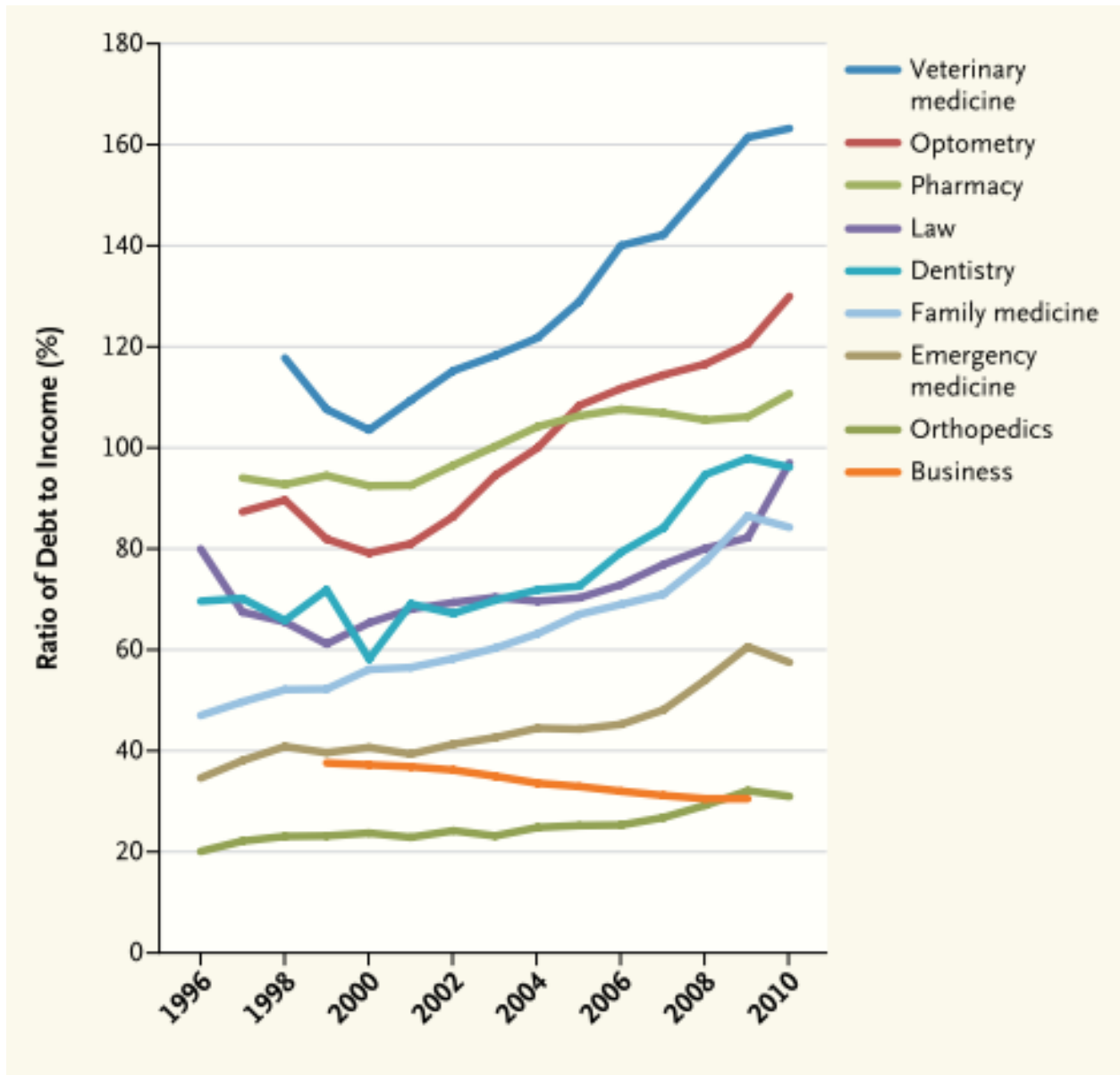


TABLE 1: Age group and gender cross tabulation

Crosstab

		Gender		Total	
		Female	Male		
Agegroup	24-26	Count	65	36	101
		% within Gender	34.8%	19.8%	27.4%
	27-29	Count	86	87	173
		% within Gender	46.0%	47.8%	46.9%
	30+	Count	36	59	95
		% within Gender	19.3%	32.4%	25.7%
Total		Count	187	182	369
		% within Gender	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.836 ^a	2	.001
Likelihood Ratio	14.007	2	.001
N of Valid Cases	369		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 46.86.

TABLE 2: Ethnicity

Ethnicity	%
White/Caucasian	60%
Asians	26%
Hispanic/Latino	5.4%
Black/African American	3.8%
Other	4.9%

TABLE 3: Child plan and gender cross tabulation

Crosstab

Count

		Gender		Total
		Female	Male	
Childplan	After residency	161	125	286
	During residency	12	36	48
	Not planning on having children	14	21	35
Total		187	182	369

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.867 ^a	2	.000
Likelihood Ratio	18.443	2	.000
N of Valid Cases	369		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.26.

TABLE 4: Importance of 8 characteristics when selecting an orthodontic program

		Statistics					
		REPGR	LOCGR	COSTGR	CLINEDGR	LENGTHGR	DENTSCHGR
N	Valid	369	367	367	366	365	368
	Missing	0	2	2	3	4	1
Mean		6.7588	7.3651	6.8501	8.3907	6.8274	4.2772
Std. Deviation		2.53108	2.55490	2.67694	2.11007	2.52576	2.87037

		Statistics	
		RESGR	CLASSGR
N	Valid	365	367
	Missing	4	2
Mean		3.8438	5.1226
Std. Deviation		2.63644	2.43466

TABLE 5: Gender and importance of 8 characteristics when selecting an orthodontic program

		Report				
Gender		REPGR	LOCGR	COSTGR	CLINEDGR	LENGTHGR
Female	Mean	6.7594	7.7419	7.0000	8.6452	6.7540
	N	187	186	186	186	187
	Std. Deviation	2.49103	2.42243	2.66712	1.95432	2.43483
Male	Mean	6.7582	6.9779	6.6961	8.1278	6.9045
	N	182	181	181	180	178
	Std. Deviation	2.57845	2.63514	2.68565	2.23489	2.62256
Total	Mean	6.7588	7.3651	6.8501	8.3907	6.8274
	N	369	367	367	366	365
	Std. Deviation	2.53108	2.55490	2.67694	2.11007	2.52576

		Report		
Gender		DENTSCHGR	RESGR	CLASSGR
Female	Mean	4.1230	3.8757	4.9355
	N	187	185	186
	Std. Deviation	2.86823	2.49580	2.36326
Male	Mean	4.4365	3.8111	5.3149
	N	181	180	181
	Std. Deviation	2.87182	2.78020	2.49783
Total	Mean	4.2772	3.8438	5.1226
	N	368	365	367
	Std. Deviation	2.87037	2.63644	2.43466

			F	Sig.
REPGR * Gender	Between Groups	(Combined)	.000	.997
	Within Groups			
	Total			
LOCGR * Gender	Between Groups	(Combined)	8.369	.004
	Within Groups			
	Total			
COSTGR * Gender	Between Groups	(Combined)	1.183	.278
	Within Groups			
	Total			
CLINEDGR * Gender	Between Groups	(Combined)	5.568	.019
	Within Groups			
	Total			
LENGTHGR * Gender	Between Groups	(Combined)	.323	.570
	Within Groups			
	Total			
DENTSCHGR * Gender	Between Groups	(Combined)	1.097	.296
	Within Groups			
	Total			
RESGR * Gender	Between Groups	(Combined)	.055	.815
	Within Groups			
	Total			
CLASSGR * Gender	Between Groups	(Combined)	2.236	.136
	Within Groups			
	Total			

TABLE 6: Stipend for 1st, 2nd and 3rd year residents

	How much is your stipend?										Total	Weighted Average		
	<\$1K	\$1-10K	\$10-20K	\$20-30K	\$30-\$50K	>\$50K	Skipped	Answered	Skipped	226				
1st year	6.38%	9	46.10%	65	24.11%	34	14.18%	20	0.71%	1	8.51%	12	141	2.82
2nd year	4.58%	6	47.33%	62	23.66%	31	15.27%	20	0.76%	1	8.40%	11	131	2.85
3rd year	8.33%	8	44.79%	43	29.17%	28	10.42%	10	0.00%	0	7.29%	7	96	2.71
													Answered	146
													Skipped	226

TABLE 7: Association between stipends that cover full tuition and amount of orthodontic residency debt and total educational debt

Stipcover		ORTHDEBTGR	TOTDEBTGR
	Mean	168622.7679	364906.2500
	N	224	224
	Std. Deviation	123334.8440	270978.6286
No	Mean	121094.7368	321941.4894
	N	95	94
	Std. Deviation	128395.2983	266338.9672
Yes	Mean	30760.0000	137770.0000
	N	50	50
	Std. Deviation	66552.13086	141868.2275
Total	Mean	137705.9621	323070.6522
	N	369	368
	Std. Deviation	127379.6304	266509.5694

ANOVA Table

			Sum of Squares	df	Mean Square
ORTHDEBTGR * Stipcover	Between Groups	(Combined)	8.122E+11	2	4.061E+11
	Within Groups		5.159E+12	366	1.410E+10
	Total		5.971E+12	368	
TOTDEBTGR * Stipcover	Between Groups	(Combined)	2.109E+12	2	1.054E+12
	Within Groups		2.396E+13	365	6.564E+10
	Total		2.607E+13	367	

ANOVA Table

			F	Sig.
ORTHDEBTGR * Stipcover	Between Groups	(Combined)	28.811	.000
	Within Groups			
	Total			
TOTDEBTGR * Stipcover	Between Groups	(Combined)	16.065	.000
	Within Groups			
	Total			

TABLE 8: Association between no orthodontic residency debt and family financial support

Crosstab

		Support		Total	
			1		
No debt ortho	.00	Count	23	59	82
		% within Support	14.2%	28.5%	22.2%
	1.00	Count	139	148	287
		% within Support	85.8%	71.5%	77.8%
Total		Count	162	207	369
		% within Support	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	10.759 ^a	1	.001		
Continuity Correction ^b	9.948	1	.002		
Likelihood Ratio	11.137	1	.001		
Fisher's Exact Test				.001	.001
N of Valid Cases	369				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 36.00.

b. Computed only for a 2x2 table

TABLE 9: Association between no total educational debt and family financial support

Crosstab

		Support		Total	
			1		
No total debt	.00	Count	14	47	61
		% within Support	8.6%	22.7%	16.5%
	1.00	Count	148	160	308
		% within Support	91.4%	77.3%	83.5%
Total		Count	162	207	369
		% within Support	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	13.026 ^a	1	.000		
Continuity Correction ^b	12.027	1	.001		
Likelihood Ratio	13.811	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	369				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 26.78.

b. Computed only for a 2x2 table

TABLE 10: Association between no orthodontic debt and financial aid

Crosstab

		FinAid		Total	
			1		
No debt ortho	.00	Count	80	2	82
		% within FinAid	44.4%	1.1%	22.2%
	1.00	Count	100	187	287
		% within FinAid	55.6%	98.9%	77.8%
Total	Count	180	189	369	
	% within FinAid	100.0%	100.0%	100.0%	

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	100.408 ^a	1	.000		
Continuity Correction ^b	97.914	1	.000		
Likelihood Ratio	121.444	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	369				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 40.00.

b. Computed only for a 2x2 table

TABLE 11: Association between no total educational debt and financial aid

Crosstab

		FinAid		Total	
			1		
No total debt	.00	Count	60	1	61
		% within FinAid	33.3%	0.5%	16.5%
	1.00	Count	120	188	308
		% within FinAid	66.7%	99.5%	83.5%
Total		Count	180	189	369
		% within FinAid	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	71.902 ^a	1	.000		
Continuity Correction ^b	69.544	1	.000		
Likelihood Ratio	89.277	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	369				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 29.76.

b. Computed only for a 2x2 table

TABLE 12: Association between no orthodontic debt and bank loans

Crosstab

		BankLoans		Total	
			1		
No debt ortho	.00	Count	82	0	82
		% within BankLoans	25.5%	0.0%	22.2%
	1.00	Count	240	47	287
		% within BankLoans	74.5%	100.0%	77.8%
Total		Count	322	47	369
		% within BankLoans	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	15.389 ^a	1	.000		
Continuity Correction ^b	13.951	1	.000		
Likelihood Ratio	25.521	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	369				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.44.

b. Computed only for a 2x2 table

TABLE 13: Association between no total educational debt and bank loans

Crosstab

			BankLoans		Total
				1	
No total debt	.00	Count	61	0	61
		% within BankLoans	18.9%	0.0%	16.5%
1.00		Count	261	47	308
		% within BankLoans	81.1%	100.0%	83.5%
Total		Count	322	47	369
		% within BankLoans	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	10.667 ^a	1	.001		
Continuity Correction ^b	9.338	1	.002		
Likelihood Ratio	18.295	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	369				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.77.

b. Computed only for a 2x2 table

TABLE 14: Association between no orthodontic debt and savings

Crosstab

		Savings			
			1	Total	
No debt ortho	.00	Count	72	10	82
		% within Savings	24.2%	13.9%	22.2%
	1.00	Count	225	62	287
		% within Savings	75.8%	86.1%	77.8%
Total	Count	297	72	369	
	% within Savings	100.0%	100.0%	100.0%	

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	3.594 ^a	1	.058		
Continuity Correction ^b	3.020	1	.082		
Likelihood Ratio	3.908	1	.048		
Fisher's Exact Test				.060	.037
N of Valid Cases	369				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.00.

b. Computed only for a 2x2 table

TABLE 15: Association between no total educational debt and savings

Crosstab

		Savings			
			1	Total	
No total debt	.00	Count	56	5	61
		% within Savings	18.9%	6.9%	16.5%
	1.00	Count	241	67	308
		% within Savings	81.1%	93.1%	83.5%
Total	Count	297	72	369	
	% within Savings	100.0%	100.0%	100.0%	

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	5.958 ^a	1	.015		
Continuity Correction ^b	5.126	1	.024		
Likelihood Ratio	7.018	1	.008		
Fisher's Exact Test				.013	.008
N of Valid Cases	369				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.90.

b. Computed only for a 2x2 table

TABLE 16: Association between no orthodontic debt and military

Crosstab

		Military		Total	
			1		
No debt ortho	.00	Count	71	11	82
		% within Military	20.2%	64.7%	22.2%
	1.00	Count	281	6	287
		% within Military	79.8%	35.3%	77.8%
Total		Count	352	17	369
		% within Military	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	18.609 ^a	1	.000		
Continuity Correction ^b	16.122	1	.000		
Likelihood Ratio	14.908	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	369				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.78.

b. Computed only for a 2x2 table

TABLE 17: Association between no total educational debt and military

Crosstab

		Military		Total	
			1		
No total debt	.00	Count	53	8	61
		% within Military	15.1%	47.1%	16.5%
	1.00	Count	299	9	308
		% within Military	84.9%	52.9%	83.5%
Total		Count	352	17	369
		% within Military	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	12.036 ^a	1	.001		
Continuity Correction ^b	9.829	1	.002		
Likelihood Ratio	9.112	1	.003		
Fisher's Exact Test				.003	.003
N of Valid Cases	369				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.81.

b. Computed only for a 2x2 table

TABLE 18: Residents' work plans following graduation

	Percent (n=370)
Academics	4.59%
Military	2.97%
Purchase of an existing practice	11.35%
Start your own practice	8.65%
Work as an employee in a corporate group	8.38%
Work as an employee in an orthodontic private practice	46.49%
Equity minded associateship	5.41%
Work in a pediatric or general dental private practice	1.62%
Undecided	10.54%

TABLE 19: Residents' plans to work by region

		STATEGROUP			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Great Lakes	35	9.5	9.5	9.5
	Mid-Atlantic	17	4.6	4.6	14.1
	Midwestern	33	8.9	8.9	23.0
	Northeastern	39	10.6	10.6	33.6
	Pacific Coast	107	29.0	29.0	62.6
	Rocky Mountain	17	4.6	4.6	67.2
	Southern	80	21.7	21.7	88.9
	Southwestern	41	11.1	11.1	100.0
	Total	369	100.0	100.0	

TABLE 20: Comparison of median educational debt

Year	Orthodontic	Total
2003	\$26,000-50,000	\$101,000-150,000
2018	\$101,000-150,000	\$251,000-300,000

TABLE 21: Sources of additional financial support during residency

	1992	2003	2018
Family Support	61.3%	42.4%	58%
Financial Aid	36.9%	52.6%	53%
Savings	36.3%	29.4%	20%
Part-time work	28.6%	25.1%	12%
Bank loan	17.9%	17.0%	13%
Other source	5.4%	10.8%	10%

APPENDIX 1: Bruner et al 2003 survey

A. Please answer the following DEMOGRAPHIC questions:

1. Gender Male Female
2. Age: _____
3. Marital Status: Single Married Divorced
4. # of Children _____
5. Citizenship: US Canada Other _____
6. How many years after dental school graduation did you begin your orthodontic residency?
 0 years 1-2 years 3-5 years >5 years
 What did you do during that time? N/A Private practice Other residency (GPR, etc.)
 Other education (MS, PhD, etc.) Military

B. Please answer the following PROGRAM SPECIFIC questions:

7. Length of program in months: 20 months 24 months 30 months 36 months
8. In what year of residency class are you? 1st year 2nd year 3rd year
9. Number of residents/class:
 1 2 3 4 5 6 7 Other _____
10. How important were each of the following when selecting your orthodontic program?

	Not Important			Most Important	
Reputation	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Location	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Cost	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Clinical education	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Length of training	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Where I went to dental school	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Research opportunities	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
11. How satisfied are you with your orthodontic residency training program?
 Unsatisfied Satisfied Very satisfied
12. Does your program offer an advanced degree: Yes No
 If yes, are you pursuing a: Masters PhD Other
13. Do you plan to pursue publishing your research in a refereed journal: Yes No
14. Estimate number of full-time faculty: 0 1-2 3-4 5-6 >7
15. Estimate number of part-time faculty: 0 1-2 3-5 6-8 9-11 12-14 >14
16. Estimate the tuition for your program each year:
 \$0 <\$5K \$5-10K \$10-15K \$15-20K >\$20K
17. If you receive a stipend, how much is it?
 1st yr: \$0 <\$5K \$5-10K \$10-15K \$15-20K >\$20K
 2nd yr: \$0 <\$5K \$5-10K \$10-15K \$15-20K >\$20K
 3rd yr: \$0 <\$5K \$5-10K \$10-15K \$15-20K >\$20K
18. What additional financial support have you received while in your orthodontic residency? (Check all that apply)
 Family Financial Aid Bank Loans Savings P/T Work Other
19. Estimate your debt at the time of graduation from orthodontic residency training:
 From ortho residency only:
 \$0 <\$10K \$10-25K \$26-50K \$51-75K \$76-100K >\$100K
 Total educational debt:
 \$0 <\$25K \$26-50K \$51-75K \$76-100K \$101-150K \$151-200K >\$200K
20. Do you feel that your educational debt restricts you from pursuing full-time academics after graduation?
 yes no

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

21. What are your plans following graduation?
 Associate Partner Solo Practice HMO Military Academics Undecided
22. Would you be interested in full-time academics if the income for teaching were improved? yes no
23. Are you interested in part-time academics combined with private practice? yes no
24. Realistically, ten years after graduation I plan to:
 Work weekly: 1 day 2 days 3 days 4 days 5 days
 Earn annually: \$100-200K \$200-400K \$400-600K \$600-800K >\$800K
 Receive ABO certification: yes no
25. How many years after graduation will you begin making financial contributions to the residency in which you trained?
 0 years 1-2 years 3-4 years 5+ years Never
26. After reaching financial stability, what percentage of income do you think is reasonable to contribute annually?
 0% 1-3% 4-6% 7-10% >10%

Comments:

APPENDIX 2: Current 2018 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: 24 months 25-30 months ≥31 months
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
9a. If you did not go straight from dental school to residency, what was your main employment activity? Academics Military Work as an employee in a corporate group Work as an employee in a private practice Other _____
10. Using a scale of 1=Not at all important and 10=Very important, please rate how important each of the following were when selecting your orthodontic program.

Not at all
Important

Very
Important

	1	2	3	4	5	6	7	8	9	10
Reputation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clinical education	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Length of training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Where I went to dental school	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Class size	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. Do you think it would be better for applicants if all programs were in the Match? Yes No
12. If you conduct research in your program, do you plan to pursue publishing your research in a peer reviewed journal: Yes No N/A
13. How much is the tuition for your program each year: \$0 <\$10K \$10-20K \$21-30K \$31-40K 41-50K 51-60K 61-70K 71-80K >80K
14. Do you receive a stipend? Yes No
- 14a. How much is your stipend?
- | | | | | | | |
|---------------------|--------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---------------------------------|
| 1 st yr: | <input type="checkbox"/> <\$1K | <input type="checkbox"/> \$1-10K | <input type="checkbox"/> \$10-20K | <input type="checkbox"/> \$20-30K | <input type="checkbox"/> \$30-50K | <input type="checkbox"/> >\$50K |
| 2 nd yr: | <input type="checkbox"/> <\$1K | <input type="checkbox"/> \$1-10K | <input type="checkbox"/> \$10-20K | <input type="checkbox"/> \$20-30K | <input type="checkbox"/> \$30-50K | <input type="checkbox"/> >\$50K |
| 3 rd yr: | <input type="checkbox"/> <\$1K | <input type="checkbox"/> \$1-10K | <input type="checkbox"/> \$10-20K | <input type="checkbox"/> \$20-30K | <input type="checkbox"/> \$30-50K | <input type="checkbox"/> >\$50K |
- 14b. Does your stipend cover full tuition costs? Yes No
15. 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 _____
16. Estimate your debt at the time of graduation from orthodontic residency.
From orthodontic residency only:
- \$0 <\$10K \$10-25K \$26-50K \$51-100K \$101-150K \$151-200K \$201-250K \$251-300K \$301-350K \$351-400K >\$400K
17. 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
18. Do you feel that your educational debt restricts you from pursuing a full-time academic faculty position after graduation?
 Yes No
19. Is your student debt a source of anxiety in your life? Yes, major anxiety Yes, moderate anxiety Yes, mild anxiety No
20. Will your student debt influence your decision on where to work following residency? Yes No

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

21. What are your plans following graduation?
- 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
22. Would you be interested in full-time academics if the income for teaching were improved? Yes No *only displayed if answered anything but academics from question #19
23. Are you interested in part-time academics combined with private practice? Yes No
24. In which state do you wish to practice in the future? _____ (Drop down menu with all 50 states listed)
25. Do you want to stay in the same area as you went to residency? Yes No
26. 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 or more
27. Ten years after graduation I plan to work weekly:
- 1 day 2 days 3 days 4 days 5 days 6 days
28. Ten years after graduation I plan to earn annually:

- \$100-200K \$200-400K \$400-600K \$600-800K >800K
29. Ten years after graduation I plan to attain ABO certification? Yes No
30. How many years after graduation will you begin making financial contributions to the residency in which you trained?
 <1 year 1-2 years 3-4 years 5+ years Never
31. After reaching financial stability, what percentage of income do you think is reasonable to contribute annually to your residency program?
 0% 1-3% 4-6% 7-10% > 10%
32. Using a scale of 1=Not at all important and 10=Very 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

Very
Important

	1	2	3	4	5	6	7	8	9	10
Location	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cost of Living	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ability to pay off student debt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Opportunity to buy a practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>


C. Please answer the following DEMOGRAPHIC questions:

33. Gender Male Female Other
34. Age: _____ (Drop down menu with options 20-50)
35. Ethnicity White/Caucasian Black/African American Asian Hispanic/Latino Native American Indian/Alaska Native Native Hawaiian/Other Pacific Islander Two or More Races Other: _____
36. Marital Status: Single Married Divorced
37. # of Children 0 1 2 3 4 5+
38. If you are planning on having children, when are you planning to have them?
 During residency After residency Not planning on having children
39. Citizenship: US Canada Other _____



HELP US UNDERSTAND THE
RESIDENCY EXPERIENCE

TAKE THIS SURVEY



School of
DENTISTRY

OHSU Research IRB #18607
Principal Investigator: Dr Eli Schwarz
Contact Amelia Stoker (stoker@ohsu.edu) for further information

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