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Orthodontic Care in a Community of Underserved Patients: A Public Dental School Analysis

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Abstract

Orthodontic treatment in the United States has become commonplace, with the prevalence approaching one fifth of adolescents and teenagers. Ethnic minorities are significantly less likely to have orthodontic treatment, however these trends are starting to improve in recent years. Although much is known about adolescent oral and dental health during orthodontic treatment, much less is known about adult oral and dental health among the growing population of young minority adults seeking orthodontic treatment. Therefore, this study sought to analyze the demographic composition of the patient population within a recently opened public dental school-based Orthodontic program to determine if minority and low-income residents are being served and to evaluate some general parameters of oral health. Using Medicaid, Census and aggregate patient data, these analyses revealed that UNLV-SDM currently serves a large percentage of Medicaid and CHIP patients (>62%), much higher than in the local community (~37%). Moreover, minority patients in the Main (~59%), Orthodontic (~65%) and Pediatric (~82%) clinics are also much higher than the local population (~48%). These analyses strongly suggest that UNLV-SDM is currently meeting the mandate to provide services to low-income, Medicaid and Minority patients. Finally, the analysis of oral health parameters revealed that Minority patients were more likely to have significantly elevated markers for oral disease than non-Minority patients. These data may be among the first to elucidate the oral health problems facing this patient population and may provide more in depth prevention and treatment options for patients that face barriers to health information and social access.

1. Background

Orthodontic treatment and care in the United States has become commonplace, with the prevalence approaching one fifth of adolescents and teenagers (1). In addition, nearly 1% of young adults (18 to 30 years old) surveyed were in orthodontic treatment in a recent cross-sectional analysis (2). Although males and females are nearly equally represented among those receiving orthodontic care and treatment, racial and ethnic minorities (Black and Hispanic children, in particular) were found to have significantly lower odds of having made any type of orthodontic visit (3).

These data reflect another recent study that have found large shortages of minority graduate dental residents, which revealed nearly three quarters of all Orthodontic residents were White, non-Hispanic (4). Furthermore, additional research regarding

professional attitudes and behaviors of orthodontic residents found overall positive attitudes about treating poor patients, as well as ethnic and racial minorities compared with currently practicing orthodontists – although these attitudes did not indicate an increased willingness to treat pro bono patients or provide reduced fees or financial assistance if requested (5). These data may suggest that although many White adolescents and teenagers seek orthodontic treatment at the behest of their parents, many minorities are significantly less likely to have access or knowledge of orthodontic care until adulthood, which may account for the large and growing population of young adults undergoing orthodontic treatment (2, 6).

Although much is known about adolescent oral and dental health during orthodontic treatment, much less is known about adult oral and dental health among the growing population of young minority adults seeking orthodontic treatment and care (6, 7). Some promising research has been undertaken in recent years to more thoroughly investigate the oral microbial burden among adult, minority orthodontic patients, which revealed elevated levels of pathogenic bacteria among this patient population (8). Although some research has suggested new caries testing and risk models for adolescent orthodontic patients, less may be known about adult patients, minorities in particular, and their oral health assessment needs (9, 10).

Many Southwestern US states have disproportionately large percentages of both low-income and minority families, which include Nevada (11, 12). To address the needs of low-income and minority residents of Southern Nevada, The University of Nevada – Las Vegas established a public dental school to serve and improve the oral and dental health of the underserved. Although an Advanced Education Program in Orthodontics was established in 2008, to date there have been no comprehensive evaluations of the patient population to determine if care is being provided to the needy and underserved within this community. In addition, although one study evaluated oral microbial burden in a small subset of patients– no thorough investigation of oral health status has yet been undertaken (8).

Based upon this information, the primary objectives of this study were: 1) to evaluate and analyze the demographic composition of the patient population within this orthodontic clinic to determine if the mission to serve minority and low-income residents is being met, and 2) to evaluate the general information collected about the oral health of these patients for comparison with young adult patients without orthodontic appliances.

2. Methods

2.1. Aggregate Patient Data

Selected demographic information, which included sex or gender, race or ethnicity, and insurance status (Medicaid/Children’s Health Insurance Program or CHIP or

Self-insured/private pay) was provided to the study authors by the Office of Information Technology. These data were provided as summary data only with no references or identifiers to any specific patient record or information. Overall number of UNLV-SDM patients: Main clinic N=71,051; Pediatric clinic N=3,042; Orthodontic clinic N=1,220.1

2.2. Medicaid / CHIP and Census Data

Aggregate data for both Medicaid and the Children’s Health Insurance Program (CHIP) in Nevada were accessed from the Medicaid / CHIP State of Nevada website and the Center for Children and Families (CCF), Georgetown University Health Policy Institute State Resource Center (15, 16, 11, 12). Information from this website includes total number and percentage of insured, Medicaid, CHIP, and uninsured, which were originally compiled by the Nevada Division of Health Care Financing and Policy’s Medicaid and Nevada Check Up Fact Book, January 2013 (17). Aggregate data regarding sex and ethnicity were obtained from the U.S. Census Bureau State and County Quick Facts website (18).

2.3. Human Subjects

The protocol for this study titled “The prevalence of oral microbes in saliva from the UNLV School of Dental medicine pediatric and adult clinical population” was filed, amended and approved by the University of Nevada, Las Vegas (UNLV) Office of Research Integrity and Protection of Research (Human) Subjects (OPRS#1502-506M) on February 6, 2015. This current study is a retrospective examination of previously collected saliva samples (n=183), originally obtained under a separate protocol approved on April 9, 2010 (OPRS#1002-3361). Orthodontic samples, n=54; Pediatric samples, n=76; Adult samples, n=53.

2.4. Convenience Sample Patient Health Data

In brief, in the previous study consented dental patients were given a sterile saliva 50 mL collection container for one sample (8; 13; 14). Each of these samples was given a unique, randomly generated number to prevent research bias and any identifying information from being disclosed. The patient demographic and corresponding oral and general health information was also collected and given the matching randomly generated number for analytical purposes, but no patient-specific identifying information was available to any research team member. This information included height, weight and body mass index (BMI), overt oral lesions, decayed missing and filled teeth (DMFT) score, depth of periodontal pockets, and number of sealants (pediatric patients only).

2.5. Statistical Analysis

Demographic and insurance information from Nevada were compared with the overall demographic profile of the

UNLV-SDM patient clinics using a chi-square (χ^2) test, to determine if any characteristic (gender, race, age, Medicaid/CHIP status) was different than expected. Although data were available for gender, age and insurance status for all patients, only a subset had complete demographic information for all demographic variables, including race. A probability level of alpha (α) \leq 0.05 was used to determine statistical significance. The differences between sample groups (patient health data) were measured using a t distribution, $\alpha = 0.05$. All samples were analyzed using two-tailed t-tests as departure from normality can make more of a difference in a one-tailed than in a two-tailed t-test. As long as the sample size is at least moderate (>20) for each group, quite severe departures from normality make little practical difference in the conclusions reached from these analyses.

For the clinic sample analysis, two-tailed t-tests were performed between Orthodontic and Pediatric samples, Orthodontic and Main clinic samples, as well as Pediatric and main clinic samples. Because these analyses involved multiple two sample t-tests, these results may have a higher probability of Type I error (incorrectly rejecting the null hypothesis, H_0). ANOVA was performed to more accurately assess these results and confirm significance. Significance

level for these analyses was $\alpha=0.05$. To minimize reporting of multiple non-significant findings and results, only the lowest p -value results were reported.

3. Results

At the time of this analysis, a cross-sectional analysis of summarized patient demographic information was used to determine if the dental school clinic was providing care for the low-income and underserved population, as evidenced by current enrollment in Medicaid and other public assistance programs including CHIP (Figure 1). The most current Medicaid/CHIP information from Nevada demonstrated a participation rate of 73.7%, which is lower than the national participation rate of 88.3% - but represents an increase of nearly two-thirds since 2013 (Fig. 1A). The analysis of Medicaid or CHIP patients within the UNLV-SDM clinic ($N=71,051$) revealed almost two-thirds of all patients were enrolled in Medicaid/CHIP or other public assistance programs, which was significantly higher than their percentage statewide of only slightly more than one-third of residents or 36.8% (Fig 1B, $p<0.0001$).

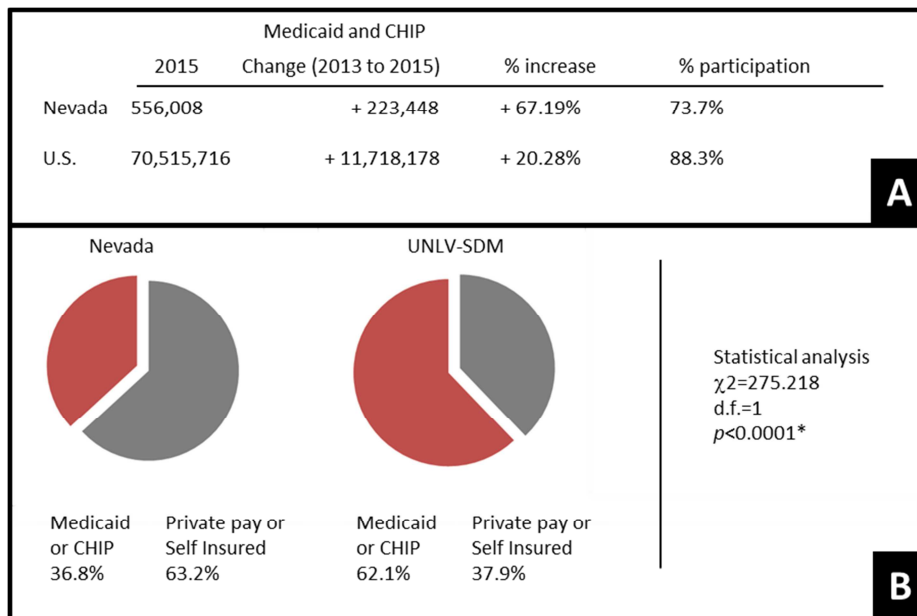


Figure 1. Comparison of Medicaid/CHIP/Public Assistance Programs in Nevada and UNLV-SDM. A) Participation rates (and rate increases) for Medicaid/CHIP and other public assistance programs demonstrate a large increase in recent enrollments within Nevada, although participation rates remain lower than the national average. B) Summary data from the UNLV-SDM clinic ($N=71,051$) demonstrate that patient participation rates (62.1%) are significantly higher than statewide averages (36.8%), $p<0.0001$. [* denotes statistical significance]

To more accurately assess whether dental care was being provided to traditionally underserved minority populations, national, state, and clinic demographic information were also analyzed (Figure 2). The preliminary analysis of these data revealed that minorities (non-White) within Nevada (47.8%) comprise a significantly higher percentage of the population than nationwide (37.4%)(Fig 2A, $p<0.0001$). A more detailed analysis of clinic data revealed that minorities within the overall clinic (59.2%), as well as pediatric (81.6%) and orthodontic clinics (64.9%) comprise significantly higher

percentages than expected – given their distribution within the overall population (Fig. 2B, $p<0.0001$). Furthermore, the data also strongly suggest that orthodontic treatment, while traditionally accessed at much lower rates among minorities populations (Okunseri et al., 2007; Okunseri et al., 2013), are represent nearly two-thirds of all patients at this clinic. Overall number of UNLV-SDM patients from each clinic were as follows: Main clinic $N=71,051$; Pediatric clinic $N=3,042$; Orthodontic clinic $N=1,220$.

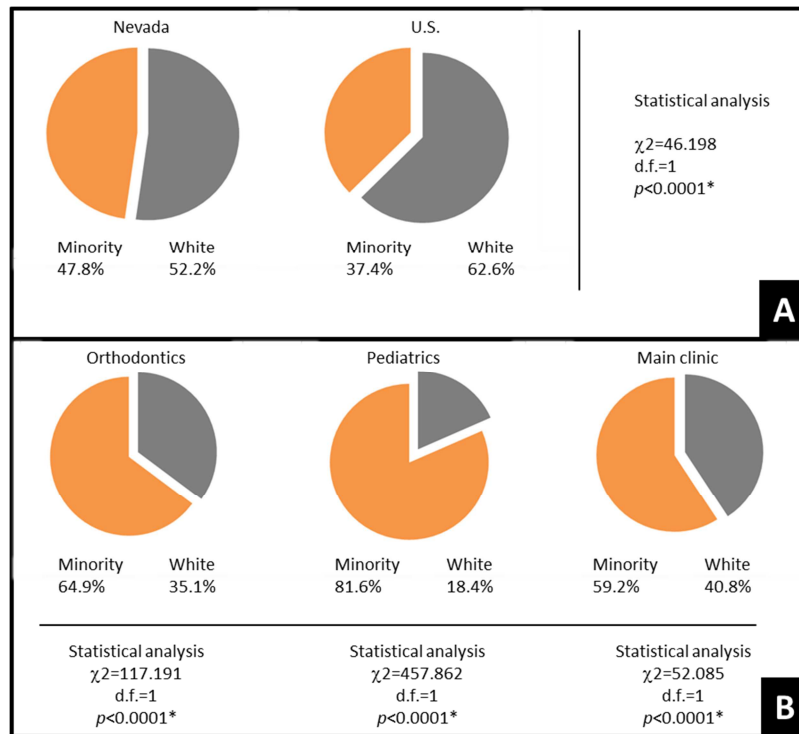


Figure 2. Racial and ethnic analysis of National, State, and Clinic populations. A) State and national demographic data suggest the Nevada population may be comprised of significantly higher percentages of minority (non-White) residents ($p<0.0001$). B) Analysis of UNLV-SDM clinic summary data reveal that minority patients represent much higher percentages within the main (59.2%), orthodontic (64.9%) and pediatric (81.6%) populations than their overall percentage within the state population (47.8%), which was statistically significant $p<0.0001$. [* denotes statistical significance] Main clinic N=71,051; Pediatric clinic N=3,042; Orthodontic clinic N=1,220.

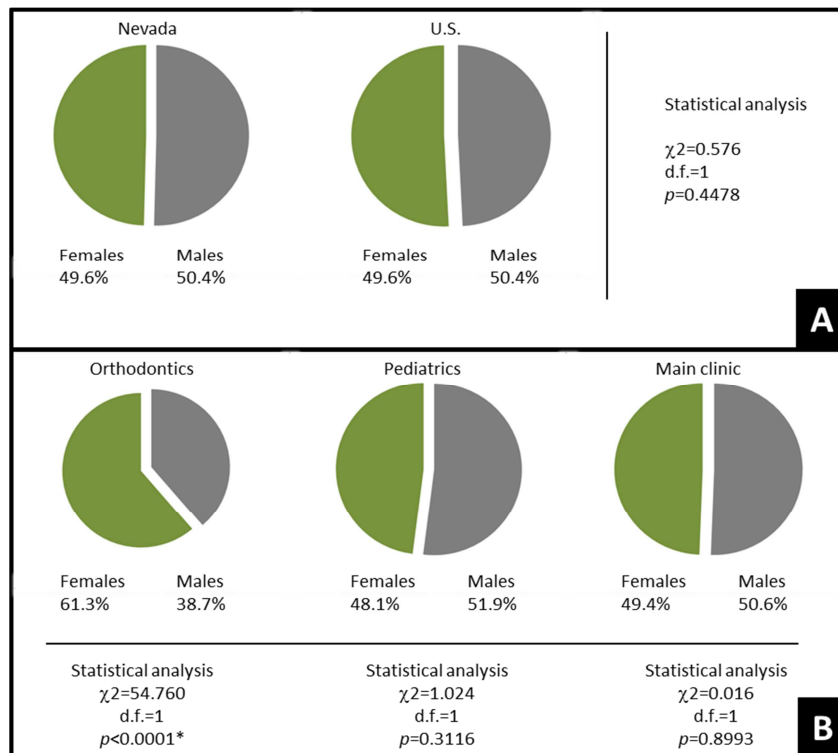


Figure 3. Sex or gender analysis of National, State, and Clinic populations. A) Percentages of females and males within Nevada closely resemble nationwide statistics, $p=0.4478$. B) Analysis of UNLV-SDM clinic summary data reveal that female patients represent a significantly higher percentage within the orthodontic clinic (61.3%) than in the pediatric (48.1%) or main clinic (49.4%) populations, which was statistically significant $p<0.0001$. [* denotes statistical significance] Main clinic N=71,051; Pediatric clinic N=3,042; Orthodontic clinic N=1,220.

All of the remaining demographic information was also examined (Figure 3). These data demonstrated that the Nevada population is nearly equally distributed among males and females, similar to the overall U.S. population (Fig. 3A). Moreover, these data also reveal that the main and pediatric patient clinics are also nearly equally divided between male and female patients (Fig. 3B, $p>0.05$). However, the orthodontic clinic patient population has significantly higher percentages of females (61.3%) than males, which was significantly different from the other clinic, state and national demographic statistics ($p<0.0001$).

In addition, the general and oral health data from patient samples previously collected was also reviewed and analyzed (Table 1). This information was restricted to body mass index (BMI), decayed missing and filled teeth (DMFT) score, depth of periodontal pockets, and number of sealants (pediatric patients only). Analysis of these data revealed that there were no significant differences between BMI among Orthodontic and Pediatric patients samples, although adult patients from the main clinic had a slightly higher average BMI – this was not statistically significant ($p=0.188$). However, more detailed analysis of these data revealed that among all patients regardless of clinic, males had an overall average BMI higher than females. In addition, BMI averages among White patients from all three clinics were also found to be higher than those of Minority patients although these differences were not found to be statistically significant.

When the decayed missing and filled teeth (DMFT) scores were analyzed many differences were revealed, which may be expected. For example, DMFT scores among Pediatric patients (with the lowest average age) were the lowest (6.68),

with slightly higher DMFT scores for Orthodontic patients (10.75) and significantly higher scores among adult patients (23.56). Furthermore, DMFT scores were similar between males and females in the Orthodontic and Adult clinics, but were much lower among females in the Pediatric clinic sample. Finally, DMFT scores from White patients were lower than those from Minority patients from all three clinics, on average, which was statistically significant ($p<0.001$).

When periodontal pocket depth (PPD) data were analyzed, several trends were observed. First, males in all three clinics (Orthodontic, Pediatric and Main or Adult) had greater PPD averages than females. In addition, Minority patients had higher PPD scores in both the Orthodontic and Main clinic, but were similar among Pediatric patients. However, the average PPD scores in total were not significantly different patients from these three clinic samples (lowest p -value, $p=0.169$).

Finally, some data were available regarding the number of sealants from patients under 18 years of age from the Orthodontic and Pediatric clinics. No clear patterns emerged from this analysis, however. For example, Males in the Orthodontic clinic had a slightly higher number of sealants (on average) than Females – although the opposite was found among Pediatric patients. Minority patients did have a slightly higher average number of sealants in both the Pediatric and Orthodontic populations, but when the combined numbers for all patients within each clinic was analyzed, no statistically significant differences were found (lowest p -value, $p=0.114$).

Table 1. Analysis of general and oral health parameters from a study sample.

	Orthodontic (n=54)	Pediatric (n=76)	Main clinic (n=53)	Statistics two-tailed t-test
BMI (M)	28.17+/-2.83	26.44+/-4.82	27.89+/-7.94	
BMI (F)	24.01+/-4.78	25.1+/-4.36	27.09+/-8.19	
BMI (W)	26.34+/-6.72	25.41+/-6.25	27.99+/-9.20	
BMI (Mi)	24.34+/-6.05	25.12+/-5.92	28.09+/-9.01	
BMI	25.67+/-6.36	25.64+/-4.53	27.54+/-8.12	$p=0.188$
DMFT (M)	11.4+/-1.23	8.17+/-2.21	24.65+/-6.25	
DMFT (F)	10.0+/-1.63	5.80+/-3.81	22.29+/-7.65	
DMFT (W)	9.40+/-1.08	5.32+/-4.94	20.78+/-5.71	
DMFT (Mi)	12.1+/-0.99	7.39+/-4.59	25.26+/-8.69	
DMFT	10.75+/-1.21	6.68+/-4.74	23.56+/-7.56	$p<0.0001$
PPD (M)	6.67+/-0.52	3.5+/-1.69	4.05+/-5.56	
PPD (F)	2.66+/-0.88	2.81+/-1.26	2.67+/-2.21	
PPD (W)	2.21+/-1.84	2.50+/-1.49	3.15+/-1.84	
PPD (Mi)	4.67+/-1.15	2.47+/-1.87	3.84+/-5.38	
PPD	3.12+/-0.78	2.83+/-1.77	3.42+/-2.44	$p=0.169$
Sealants (M)	1.75	1.28	N/A	
Sealants (F)	1.15	2.64	N/A	
Sealants (W)	1.01	1.5	N/A	
Sealants (Mi)	1.80	2.82	N/A	
Sealants	1.60	2.03	N/A	$p=0.114$

4. Discussion

The primary objectives of this study were to evaluate and analyze the demographic composition of the patient

population within this orthodontic clinic to determine if the mission to serve minority and low-income residents was being met, and to evaluate the general information collected about the oral health of these patients for comparison with young adult patients without orthodontic appliances. These

analyses revealed that UNLV-SDM currently serves a large percentage of Medicaid and CHIP patients (>62%), which represents a much greater share than would be found in the local community (~37%). These results are also encouraging, despite the fact that Medicaid and CHIP participation rates are lower in Nevada than in the US, on average.

Moreover, the analysis of minority patients within the Main (~59%), Orthodontic (~65%) and Pediatric (~82%) at UNLV-SDM is also much higher than the local population (~48%). These analyses strongly suggest that UNLV-SDM is currently meeting the mandate to provide services to low-income, Medicaid and Minority patients. Finally, the ratio of females to males is nearly equal in both the Pediatric and Main patient clinics – although there are more females currently seeking Orthodontic care at UNLV-SDM. Finally, the overview of patient health revealed that BMI was not significantly different among the three clinic patient samples analyzed, although adults had slightly higher average BMI than either Orthodontic or Pediatric patients analyzed.

5. Conclusions

The analysis of oral health parameters, however, including DMFT score and PPD revealed that Minority patients were more likely to have significantly elevated markers for oral disease than non-Minority patients. Due to their large percentages and representation in all UNLV-SDM clinics, including Orthodontics – these data are critical in order to provide more in depth prevention and treatment options for patients that may face greater barriers to health information and other types of social access.

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