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Research Article

Analysis of a Dental School Pediatric Patient Population Reveals Growing Inequality in Utilization of Services among Native Americans and Hispanics

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Abstract

Background: Many public dental schools have a mission to serve the local community with a particular emphasis on patients who face multiple barriers to access and dental care. Access to dental care and utilization of pediatric dental services for minority and underserved populations has been the subject of many recent studies. The goal of this project was to evaluate the demographic characteristics of a public dental school (UNLV-SDM) patient population to determine the utilization of dental services.

Methods: A retrospective analysis of pediatric patient demographics was approved by the Institutional Review Board (IRB). Demographic patient data collected between 2010 and 2020 were analyzed for longitudinal comparisons with Nevada population data for the same period from the United States (US) Census.

Results: Longitudinal analysis revealed that the percentage of non-minority (White) pediatric residents in Nevada declined by 12.9% (from 54.2% in 2010 to 47.2% in 2020), while the percentage of minority (non-White) pediatric residents in Nevada increased by 15.3% (from 45.8% in 2010 to 52.8% in 2020). In contrast, the UNLV-SDM pediatric patient clinic population exhibited an overall increase of 34.1% in non-minority patients from 17.6% to 23.6% and an overall decrease in minority patients of 7.3% from 82.4% to 76.4% over the same time period. More detailed analysis revealed increases in UNLV-SDM number of Black pediatric patients by 151.6% (2010, 9.3% to 2020, 23.4%; $R^2 = 0.847$) and Asian patients by 169.2% (2010, 2.6% to 2020, 7.0%; $R^2 = 0.891$), while there were decreases in the number of Hispanic patients by 34.8% (2010, 70.4% to 2020, 45.9%; $R^2 = 0.883$) and Native American patients by 53.5% (2010, 0.16% to 2020, 0.08%; $R^2 = 0.141$).

Discussion: This study demonstrated that although the percentage of racial and ethnic minorities in Nevada increased moderately over the past decade, the UNLV-SDM pediatric clinic population demonstrated a significantly lower increase over the same time period. Moreover, this disparity was specifically related to decreases in Hispanic and Native American population subgroups, which are among the groups most likely to exhibit disparities in utilization of services and preventive dental care. More research will be needed to determine the factors that contribute to these disparities in utilization among specific minority subgroups in order to determine the appropriate measures that may be needed to address these disparities.

Keywords: *Pediatric; Dental; Minority; Underserved; Access to Care*

Introduction

Access to dental care and utilization of pediatric dental services for minority and underserved populations in the United States (US) has been the subject of many recent studies [1,2]. Their findings reveal that some minority populations may face additional challenges to receive dental and other healthcare services due to limited English-language proficiency and barriers to the access of language and interpreter services [3,4]. Other barriers encountered by underserved populations include limited access to dental care insurance coverage for unemployed or under-employed patients, which disproportionately affects children and adolescent pediatric dependents [5,6]. Although many improvements in access to services provided by the passage and implementation of the Affordable Care Act have helped to bring coverage to many underserved populations, significant challenges and barriers remain for a large number of underserved and minority children [7,8].

Based upon this information, many public and private dental schools have implemented a stated core mission or objective of service to the local community with a particular emphasis on patients who face multiple barriers to accessing dental care, which disproportionately affects minority and underserved populations [9,10]. Research has demonstrated that dental and oral health disease prevention and anticipatory guidance may be lowest among minority and underserved populations, which may be contributing factors to the pediatric health disparities and oral health outcomes observed [11,12]. Although much progress has been made through these initiatives to reduce or eliminate these barriers and challenges, it is important to understand the current state of pediatric dental care access within local populations to determine what additional steps may be needed to provide the dental care that is so desperately needed [13,14].

Many studies from this public dental school clinic have sought to evaluate the barriers and challenges to care for the pediatric population, which may be most strongly associated with racial or ethnic minorities, low socioeconomic status, lack of dental insurance coverage and the associated lack of preventive dental care [15-17]. Studies of patient populations from other public dental clinics has elucidated. for example, the problem of poor oral health, limited access to dental care, and low utilization and usage of services among Native American populations in the US [18-20]. However, fewer recent studies within the past decade have focused generally on specific patient population demographics and none within the state of Nevada more specifically [21,22].

Based upon the paucity of information regarding these patient groups, the goal of this project was to evaluate the demographic characteristics of a public dental school patient population at UNLV-SDM to determine their characteristics and comparative utilization of pediatric dental services by racial and ethnic minorities, with a specific emphasis on traditionally underserved populations including Native Americans.

Materials and Methods

Study review and approval

This study was conducted according to the procedures and guidelines provided by the Office for the Protection of Research Subjects (OPRS) at the University of Nevada, Las Vegas (UNLV). The protocol for this retrospective analysis was reviewed and approved by the Institutional Review Board (IRB) under Protocol 1619329-1 titled "Retrospective analysis of Oral Health Status of Dental Population" in July 2020. Summarized data from the UNLV School of Dental Medicine (SDM) pediatric clinic population was reviewed and subsequently deemed Exempt under Federal Regulation 45 CFR 46. Based upon this exemption, Informed Consent was waived pursuant to the Basic Health and Human Services (HHS) Policy for the Protection of Human Research Subjects (46.101) regarding IRB exemption for research that involves the study of existing data, documents or records that currently exist and are not prospectively collected and (1) Participants cannot be directly identified; and (2) Participants cannot be identified through identifiers linked to them. No patient-specific or other identifying information was available to the study authors.

Data provided to the study authors included summary information regarding the total number of pediatric patients seen within each calendar year (e.g. 2010 - 2020), which included the demographic summary information regarding the sex, racial or ethnic information (self- reported) and age of all pediatric clinic patients, as previously described [3]. Data regarding the racial and ethnic demographic information for Nevada used for the longitudinal analyses were derived from the US Census Bureau Quick Facts (www.census.gov), which provides specific population data and estimates for demographic information.

Statistical analysis

Data from the US Census Bureau and summary data from the UNLV-SDM pediatric dental clinic were imported into Microsoft Excel 2021, Office 365 Version from Microsoft (Redmond, Washington). Descriptive statistics such as overall numbers and corresponding percentages were calculated and reported. Differences between demographic percentages from the clinic compared with the Nevada population percentages were compared using Chi Square statistics, which is appropriate for this type of non-parametric data analysis [3]. Longitudinal analysis of demographic variables included the overall change in percentage over time, as well as the Pearson Correlation (R) or Coefficient of Determination (R^2).

Results

Retrospective data analysis of the clinic population of pediatric patients at UNLV-SDM revealed a total of n = 24,849 patients treated between the years of 2010 and 2020 (Table 1). More detailed review of these records demonstrated that 98.4% had complete information regarding patient sex, which was nearly equally distributed between females (52.2%) and males (47.8%) and was not significantly different from the local population (49.5% and 50.5%, respectively, p = 0.5484). More detailed analysis revealed that non-minority (self-identified as Caucasian/White) patients represented 21.9% of patients, which was significantly different from their proportion in the local population (47.2%), p = 0.0001. The percentage of patients that identified as Hispanic or Latino (59.8%), or African American or Black (13.8%) was higher than the relative distributions within the local population (Hispanic 20.5%, Black 9.4%, Asian 3.8%). However, the proportion of Asian or Pacific Islanders (4.3%) and Native Americans (0.2%) was lower than estimates from the local population (9.2% and 0.8%, respectively). Finally, the analysis of patient age revealed an average age of 9.1 years. Most clinic patients were categorized as children (0-10 years, 61.6%) and the remainder were early adolescents (11 - 13 years of age, 21.2%) or middle adolescents (14 - 17 years, 17.2%).

	Females	**Males**	**Statistical Analysis**
UNLV-SDM Clinic Data: Sex (n = 24,460)	52.2% (n = 12,758/24,460)	47.8% (n = 11,702/24,460)	$X^2 = 0.160$, d.f. = 1 p = 0.6892
Nevada pediatric population	49.5%	50.5%	
	Non-minority White/ Caucasian	**Minority non-White**	**Statistical Analysis**
UNLV-SDM Clinic Data: Race (n = 16,889)	21.9% n = 3,703/16,889	78.1% (n = 13,186/16,889)	$X^2 = 14.492$, d.f. = 1 p = 0.0001
Nevada pediatric population	47.2%	52.6%	
UNLV-SDM Clinic Data: Race		Hispanic/Latino 59.8% (n = 10,100/16,889)	
UNLV-SDM Clinic Data: Race		African American 13.8% (n = 2,337/16,889)	
UNLV-SDM Clinic Data: Race		Asian American 4.3% (n = 721/16,889)	

UNLV-SDM Clinic Data: Race		Native American 0.2% (n = 28/ 16,889)	
UNLV-SDM Clinic Data: Age (n = 24,824)	Average: 9.1 years STD +/- 4.88 years	Range: 0 - 17 years	Children: 0 - 10 years 61.6% (n = 15,292/24,824) Early adolescents: 11-13 years 21.2% (n = 5,263/24,824) Middle adolescents: 14 - 17 years 17.2% (n = 4,269/24,824)

Table 1: *Demographic analysis of study population.*

To evaluate if there were any longitudinal changes in the demographics of the UNLV-SDM pediatric patient dental clinic population or the corresponding Nevada population, data from each year between 2010 and 2020 were plotted and graphed (Figure 1). The US Census data revealed that the ratio of non-minority (White) pediatric residents in Nevada declined from 54.2% in 2010 to 47.2% in 2020, a percentage reduction of 12.9% (R^2 = 0.998). Conversely, the ratio of minority (non-White) pediatric residents in Nevada increased from 45.8% in 2010 to 52.8% in 2020, a percentage increase of 15.3% over the same time interval (R^2 = 0.998). During the same time period, the UNLV-SDM pediatric patient clinic population exhibited an overall percentage increase of 34.1% in the ratio of White or non-minority patients from 17.6% to 23.6% (R^2 = 0.537), but the UNLV-SDM pediatric clinic population experienced an overall percentage decrease in the ratio of minority (non-White) patients of 7.3% from 82.4% to 76.4% between 2010 and 2020 with some year-to-year fluctuations observed (R^2 = 0.537).

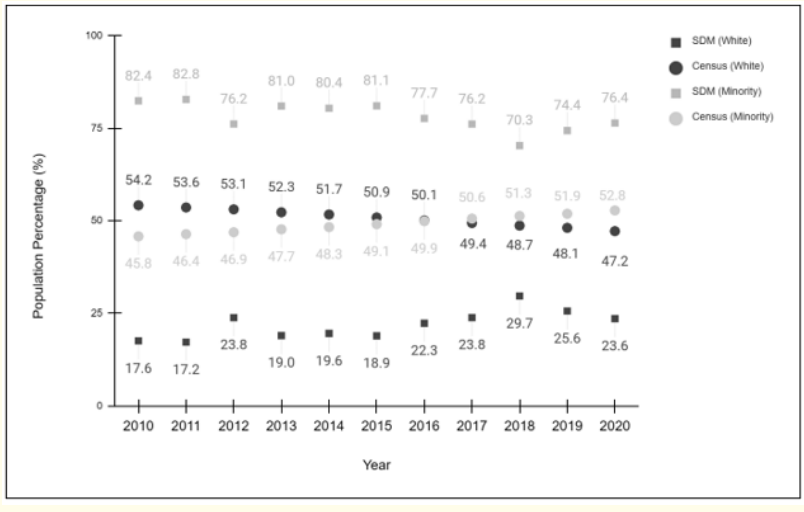

Figure 1: *Longitudinal analysis of Nevada and UNLV-SDM pediatric patient demographics. Analysis of data between 2010 and 2020 revealed that the ratio of non-Minority (White) pediatric residents in Nevada declined by 12.9% (54.2% in 2010 to 47.2% in 2020), while the ratio of minority (non-White) pediatric residents in Nevada increased by 15.3% (45.8% in 2010 to 52.8% in 2020). In contrast, the UNLV-SDM pediatric patient clinic population exhibited an overall increase of 34.1% in the ratio of non-Minority (White) patients from 17.6% to 23.6% and an overall decrease in the ratio of minority (non-White) patients of 7.3% from 82.4% to 76.4% over the same time period.*

To more closely evaluate the temporal and longitudinal changes observed in the minority pediatric patient population, specific subgroups were analyzed in detail (Figure 2). More specifically, the US Census data regarding the African American or Black pediatric population in Nevada was analyzed revealing an overall growth of approximately 20.5% over the ten-year period (2010, 7.8% to 2020, 9.4%) - a significant positive increase ($R^2 = 0.981$) (Figure 2A). Similarly, the Asian population demonstrated an overall increase of 18.1% over the same time period (2010, 7.2% to 2020, 8.5%; $R^2 = 0.985$). An analysis of the UNLV-SDM data for the same time period revealed similar but even more exaggerated trends (Figure 2B). For example, the percentage of Black pediatric patients increased by 151.6% over this ten-year period (2010, 9.3% to 2020, 23.4%; $R^2 = 0.847$), and the pediatric Asian patient population increased 169.2% (2010, 2.6% to 2020, 7.0%; $R^2 = 0.891$).

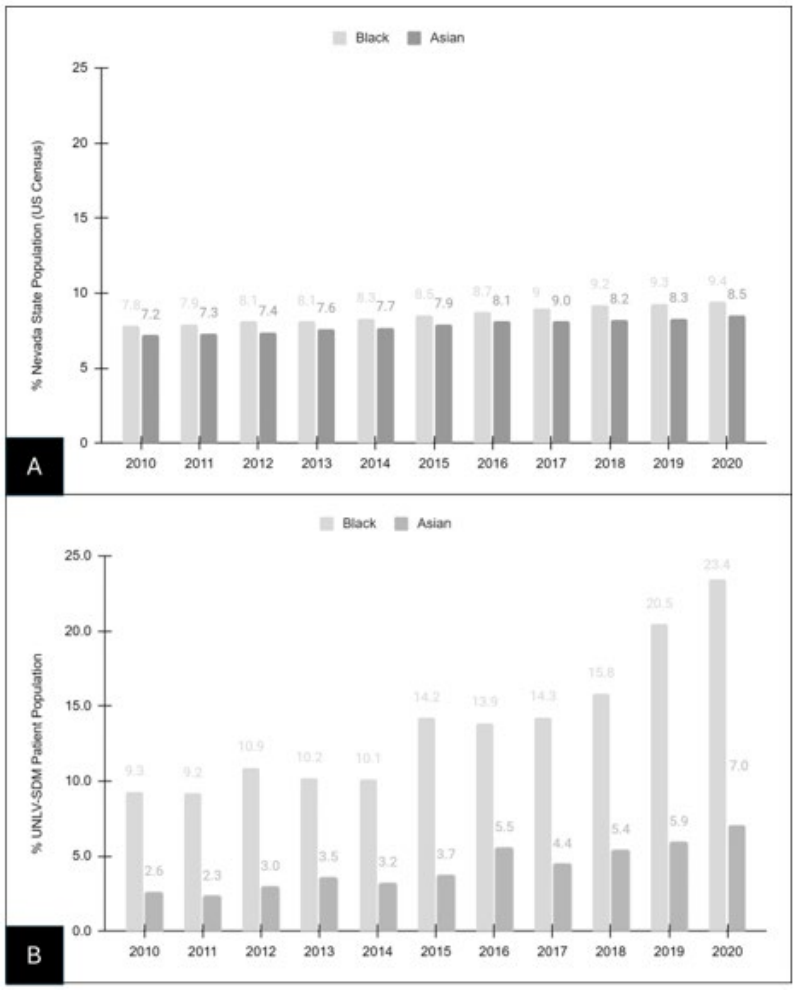

Figure 2: *Temporal analysis of Nevada and UNLV-SDM pediatric minority patient demographics. A) The Black pediatric population in Nevada increased approximately 20.5% over the ten-year period (2010, 7.8% to 2020, 9.4%; R2 = 0.981), while the Asian population increased 18.1% over the same time period (2010, 7.2% to 2020, 8.5%; R2 = 0.985). B) UNLV-SDM Black pediatric patients increased by 151.6% over this ten-year period (2010, 9.3% to 2020, 23.4%; R2 = 0.847) with the Asian patient population increasing 169.2% (2010, 2.6% to 2020, 7.0%; R2 = 0.891).*

Further detailed subgroup analysis of the temporal and longitudinal changes observed in the minority pediatric patient population composed solely of Hispanics and Native Americans, was conducted (Figure 3). Specifically, the US Census data regarding the Hispanic population in Nevada demonstrated an overall increase of approximately 11.3% over ten years (2010, 26.6% to 2020, 29.6%) - a significant positive increase (R^2 = 0.998) (Figure 3A). Similarly, the Native American population also demonstrated an overall increase of 33.3% over this interval (2010, 1.2% to 2020, 1.6%; R^2 = 0.441). However, further analysis of the UNLV-SDM data regarding these population subgroups revealed contrasting results (Figure 3B). For example, the percentage of Hispanic pediatric patients decreased by 34.8% over this same ten-year period (2010, 70.4% to 2020, 45.9%; R^2 = 0.883), and the pediatric Native American patient population significantly decreased by 53.5% (2010, 0.16% to 2020, 0.08%; R^2 = 0.141).

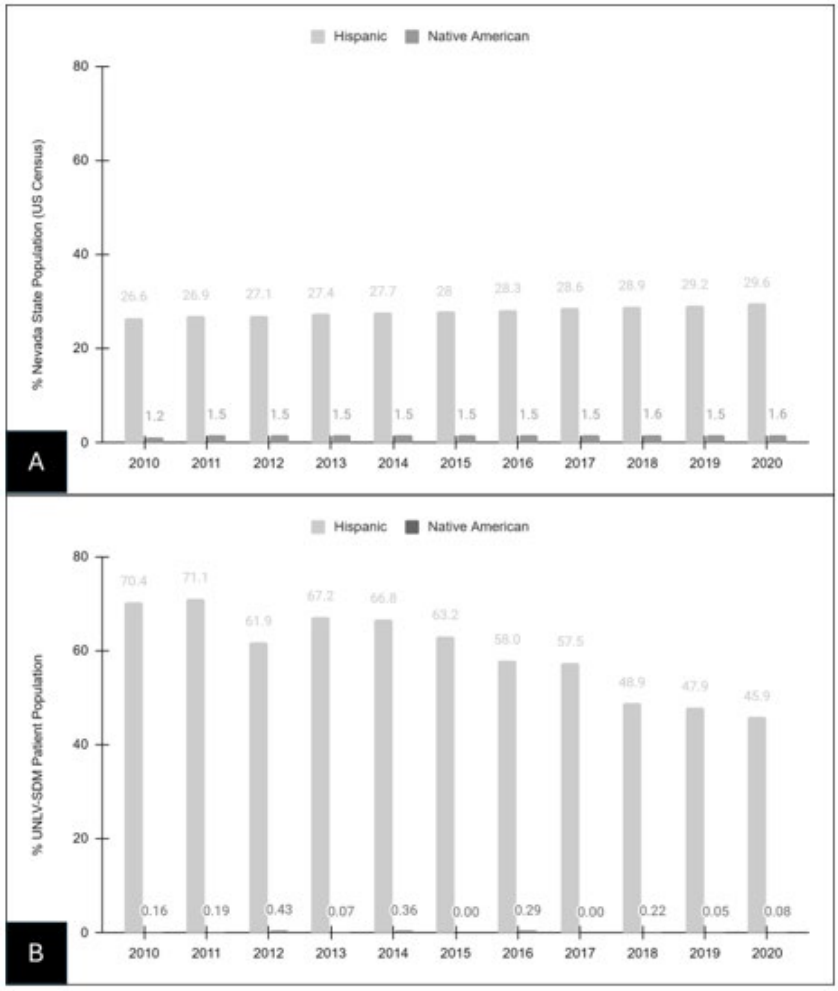

Figure 3: *Temporal analysis of Nevada and UNLV-SDM pediatric minority patient demographics. A) The Hispanic population in Nevada increased 11.3% over ten years (2010, 26.6% to 2020, 29.6%; R2 = 0.998) as did the Native American population 33.3% (2010, 1.2% to 2020, 1.6%; R2 = 0.441). B) However, UNLV-SDM pediatric Hispanic patients decreased by 34.8% over this period (2010, 70.4% to 2020, 45.9%; R2 = 0.883) similar to the decrease in the pediatric Native American patient population of 53.5% (2010, 0.16% to 2020, 0.08%; R2 = 0.141).*

To elaborate the divergent trends observed within these data, correlations between the US Census data and the UNLV-SDM pediatric populations were evaluated (Table 2). These data revealed significant positive correlations between the US Census data and UNLV-SDM clinic population data for both African American (Black) and Asian minority population subgroups (R = 0.918, R = 0.953, respectively). However, inverse or negative correlations were observed between the US Census data and the UNLV-SDM clinic population data for both Hispanic (R = -0.941) and Native American (R = -0.14) patients.

	US Census (change 2010 to 2020)	UNLV-SDM Clinic (change 2010 to 2020)	Statistical Analysis Correlation (R)
African American or Black	20.5%	151.6%	R = 0.918
Asian	18.1%	169.2%	R = 0.953
Hispanic	11.3%	-34.8%	R = -0.941
Native American	33.3%	-53.5%	R = -0.014

Table 2: *Correlation between US census and UNLV-SDM patient population.*

Discussion

The primary objective of this study was to assess the demographics of a public dental school (UNLV-SDM) pediatric patient population to evaluate the utilization of dental services by racial and ethnic minorities, specifically evaluating traditionally underserved populations including Native Americans [21,22]. The results of this study demonstrated that although the percentage of racial and ethnic minorities in Nevada increased over the past decade, the UNLV-SDM pediatric clinic population significantly decreased over the same time period. Moreover, these changes were specifically related to decreases in Hispanic and Native American population subgroups within the clinic, which are among the groups previously shown to be the most likely to exhibit disparities in utilization of services and preventive dental care [23-25].

This study is the first to complete this type of longitudinal evaluation for utilization of dental services among these patient subgroups at this public dental school in Nevada, although other studies have evaluated and identified significant challenges and barriers to dental care and access within various minority groups within this institution [3,15-17,26]. For example, this study highlights trends in utilization of services by specific minority subgroups that indicate successful outreach and utilization among Black and Asian patients that have traditionally faced pervasive and historical barriers to dental care and access [27,28]. However, this study highlights the contrasting situation with the Hispanic and Native American patient populations that have seen significant decreases in utilization over time at this institution, a distressing and worrisome trend as the current data suggests these patients are among the most vulnerable and least served dental populations with their own significant barriers and challenges to access and dental care [29-31].

Despite its strengths including sits large sample size and relatively complete data on all patients, this study also has some limitations that should be considered. For example, the UNLV-SDM clinic patient data disclosure for race and ethnicity is entirely voluntary and may also be subject to implicit reporting bias due to longstanding issues regarding mixed ethnicity with specific minority populations and the hesitance to ask probing questions during initial patient intake and screening visits [32,33]. Furthermore, additional factors and barriers to dental care and utilization may not be readily apparent from this type of data analysis, as some the fact that some population subgroups including Native Americans may be increasing in number but may also be physically located in remote areas (i.e. tribal reservations) that are not immediately accessible to the services of this public dental school [34,35]. Finally, this study does not address the lack of concordant healthcare professionals, such as the presence of Native American dentists, which may also be a contributing factor to the disparate outcomes highlighted in this current study [36,37].

Conclusion

The information presented in this study may be critically important to understand the trends in utilization of dental care and services at this public dental institution over time. Moreover, in order to meet the mission of the school to improve the oral health of the citizens of Nevada, it is necessary to determine if any of these citizens or subgroups within the population may be facing underutilization of services or barriers and challenges to access and care. The information provided by this study shows that Hispanics and Native Americans have exhibited steady declines in utilization of available services and provides a starting point for outreach efforts and other methods to improve access and reduce barriers and challenges for accessing dental care [38].

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Author Contributions

KK was responsible for the overall project design. EO and KK were responsible for data generation, analysis, and the writing of this manuscript.

Conflict of Interest

The authors declare that they have no conflicts of interest to report.

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