Dentists' treatment of underserved populations following participation in community-based clinical rotations as dental students

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Abstract

Objective: The purpose of this study was to identify which underserved populations are being treated by dentists after participation in community-based clinical rotations as dental students and to determine which predictor variables are associated with dentists' treatment of these populations.
Methods: A 25-item written survey was developed and mailed to University of Iowa College of Dentistry alumni (1992-2002; $N = 745$) to assess what percentage of their current total patient population was composed of each of the twelve identified populations. Separate statistical analyses (descriptive, bivariate, and generalized logistic regression) were performed for each underserved population.
Results: Three-hundred seventy-two dentists responded for an adjusted response rate of 50 percent. Respondents were most likely to treat "other ethnic groups" and low income populations. In contrast, 70 percent or more of all respondents said they never treat the homebound, homeless, and incarcerated. Additionally, over 40 percent of respondents said they never treat HIV+/AIDS patients and Medicaid patients. Logistic regression models showed that comfort in treating a population, treating more than seven populations, and having the total percentage of underserved populations treated within a practice total more than 50 percent were the most frequently associated ($P < 0.05$) and strongest predictors of treating the listed underserved populations.
Conclusions: Although respondents reported treating most populations, community leaders and dentists should identify at-risk populations and develop protocols to help ensure that these populations are able to obtain, at a minimum, emergency care. Additionally, dental schools should develop educational curricula to help increase students' comfort in treating underserved populations.

Introduction

There is optimism that problems associated with the current healthcare system will be addressed, thus enabling more people the opportunity to obtain healthcare. Although the ability to obtain dental treatment is partially associated with finances, other variables, such as the availability of a dentist in one's geographic region and the willingness of dentists to treat individuals with certain characteristics (e.g., special needs), are also important (1,2). Some studies have examined predictor variables associated with dentists' likelihood to treat underserved populations, but these studies have been limited to specific populations such as children, the elderly, and people who have special needs (3-5). In contrast, few studies have examined dentists' willingness to treat various other groups, such as the homeless and the homebound (6-8). By better understanding which dentists are likely to

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treat traditionally underserved populations, other healthcare providers and social workers may be able to identify potential sources of referrals for clients who need dental services. Furthermore, identifying the populations least likely to compose dental practitioners' offices will provide valuable information for communities and dental educational programs as they develop programs to target underserved populations. The purpose of this study is to identify which traditionally underserved populations are being treated by recent University of Iowa dental graduates and to determine which predictor variables are associated with alumni's likelihood to treat these populations.

Methods

A 25-item written survey was developed to assess which traditionally underserved populations were being treated by University of Iowa College of Dentistry alumni (1992-2002; $N = 769$; known addresses $n = 745$). This study focused on 12 populations whom dentists were likely to have encountered as senior dental students during their community-based clinical experiences. Specifically, the survey asked dental alumni to estimate what percentage of their current total patient population was composed of each of the identified populations (e.g., "What percentage of your total patient population is low income?"). Because patients could be categorized into multiple groups (e.g., the same person could be considered frail elderly, medically complex, and low income), the sum total of the recorded percentages did not have to equal 100 percent. The survey also included: dentist demographic information and practice related questions; a Likert-type scale to assess alumni's comfort in treating these underserved populations; and alumni's perceptions of how valuable the University of Iowa College of Dentistry's community-based clinical experiences were in preparing the respondents to treat the selected underserved populations.

The following is a brief summary describing the main community-based clinical locations in which the respondents may have participated. Broadlawns Medical Center is a county hospital located in Des Moines, Iowa. It has an associated medical and dental outpatient facility where indigent populations can obtain care. The Special Care program is jointly composed of the Geriatric and Special Needs clinic, housed within the University of Iowa College of Dentistry, and the Geriatric mobile unit. Students who participate in this rotation utilize portable dental equipment to provide care to residents at long-term care facilities. Additionally, students treat ambulatory frail adults and mentally challenged patients in the Geriatric and Special Needs clinic. Respondents who participated in "other" experiences may have attended any of the following locations: community health clinics, rural private practice preceptorships, or Veterans Affairs hospitals (IA); Colorado Migrant Program (CO); or Indian Health Service clinics (MI, MT, NM, AZ).

After the survey was developed, a mailing list from the University of Iowa alumni office was obtained to identify all dental alumni who graduated between 1992 and 2002. Because community-based clinical experiences have been a mandatory component of the pre-doctoral curriculum since 1975, all graduates who had been in practice for 1-11 years at the time of data collection were invited to participate in the study. The first mailing occurred in July 2003. Nonresponders received a second mailing in August 2003 and a follow-up postcard in September 2003. Prior to beginning the study, IRB approval was obtained, and the survey was pilot tested for content validity and clarity.

In order to facilitate statistical analyses and to more clearly describe the results of the study, the dependent variable (percentage of "x" population treated in the practice) was dichotomized. Because fewer than 50 percent of all responding dentists reported treating homebound, homeless and incarcerated populations, the variable "percentage treated" was dichotomized into 0 percent versus >0 percent treated for those populations. In contrast, at least 50 percent of respondents reported treating the remaining populations. As a result "percentage treated" was dichotomized into $\leq$5 percent versus >5 percent treated for other ethnic groups, low income, Medicaid, medically complex, non-English speaking, frail elderly, mentally compromised, known drug users, and HIV+/AIDS populations (See Table 1 for a summary of all re-categorizations).

Similarly, selected predictor variables were re-categorized. Years since graduation were dichotomized into 1998-2002 versus 1992-1997, and current practice status was dichotomized into non-solo versus solo. The size of the community in which the respondent's practice is located was divided into three categories: >250,000; 25,000-250,000; and 0-24,999 people. Respondents' answers pertaining to "comfort in treating each population" and "perceived value of the community-based clinical experiences" were dichotomized based on two issues: a) splitting the groups into "positive" versus "negative" responses; and b) creating a relatively even distribution of replies. As a result, comfort in treating each population was dichotomized into "No problem/OK versus Some concern/Rather not/Will not," and the perceived value of the community-based clinical experiences was dichotomized into "Great/Much value versus Some/Little/No value."

Because all alumni participated in two consecutive 5-week community experiences as senior dental students, respondents' participation in these experiences was divided into 4 categories: Broadlawns Medical Center-Special Care (BMC-SC); Broadlawns Medical Center-Other (BMC-Oth); Special Care-Other (SC-Oth); and Other-other (Oth-Oth). These categorizations were created based on the most frequently attended program combinations. Since so few respondents

Table 1 Summary Table Describing Dependent and Predictor Variable Re-Categorizations

Original variable	Re-categorized variable
Dependent variable	
Percentage of "x" population treated within your practice-continuous variable	Percentage treated-0% versus >0%: homebound, homeless and incarcerated Percentage treated-≤5% versus >5%: other ethnic groups, low income, Medicaid, medically complex, non-English speaking, frail elderly, mentally compromised, known drug users, and HIV+/AIDS populations
Predictor variables	
Graduation year: continuous variable	1998-2002 versus 1992-1997
Practice status: Solo practice, associateship, partnership, group practice, salaried employee of HMO, salaried employee of hospital, military, academic appointment, other	Non-solo versus Solo
Community size (# of people): >250,000; 25,000-250,000; 5,000-24,499; <5,000	>250,000; 25,000-250,000; and 0-24,999
Comfort in treating each population: No problem, ok, some concern, rather not, or will not	"No problem/OK versus Some concern/Rather not/Will not"
Perceived value of the community-based clinical experiences: Great, much, some, little, or no value	"Great/Much value versus Some/Little/No value"
Community-based clinical experiences: Special Care (SC), Broadlawns (BMC), Other (Oth)-list your two experiences	BMC-SC; BMC-Oth; SC-Oth; Oth-Oth (dropped from analysis)
New variables that were created	
	# of categorizes of patients treated: >7 groups versus ≤7 groups % of underserved patients treated: >50% versus ≤50%

participated in Oth-Oth rotations ($n = 22$), they were removed from analysis. Because time may have made it difficult to distinguish what one learned in one program versus another, respondent's rotations were categorized as program combinations rather than including each individual program location as a predictor variable.

Additionally, two predictor variables were created to reflect the mix of underserved populations treated within a practice. For each respondent, the total number of categories of populations treated by the respondent was calculated. Respondents were dichotomized into treating ≤7 groups versus >7 groups in order to obtain a relatively even split of respondents. Similarly, the total percentage of underserved populations treated by each respondent was dichotomized into "≤50 percent of the respondent's total population is composed of underserved populations" versus ">50 percent of the total population is composed of underserved populations." These categorizations were developed to analyze whether dentists were treating high percentages of only a select few groups of underserved populations, low percentages of several groups of underserved populations, or other various combinations.

Alumni survey data were double entered into a database and statistically analyzed using SAS®9.0 (SAS Institute, Inc., Cary, NC, USA). Separate statistical analyses, including descriptive, bivariate, and generalized logistic regression, were performed for each underserved population. The dichotomized dependent variable values (0 percent versus >0 percent or ≤5 percent versus >5 percent treated) were utilized for bivariate and generalized logistic regression analyses. Bivariate analyses examined associations between each dependent variable (e.g., ≤5 percent versus >5 percent low income populations treated) and each predictor variable (e.g., sex) by utilizing chi-square, Fisher's exact, or Cochran-Mantel-Haenszel tests. Predictor variables that were statistically significant ($P < 0.05$) in the bivariate analyses for a specific population were included into a generalized logistic regression model for that population using forward stepwise inclusion procedures to identify the variables associated ($P < 0.05$) with respondents' likelihood to treat the identified population. All possible two-way interactions among statistically significant predictor variables were also examined for each model. Additionally, nonresponse biases were analyzed utilizing chi-square and Cochran-Mantel-Haenszel tests.

Results

Three hundred seventy-two dentists responded for an adjusted response rate of 50 percent. As shown in Table 2, nonresponders were more likely to: 1) be male (70.5 percent); 2) have graduated between 1992 and 1997 (53.2 percent); and 3) have participated within the BMC-SC community-based clinical program combination (57.0 percent) compared with respondents. Among respondents, dentists were most likely to treat "other ethnic groups," and low income populations (Table 3). In contrast, more than 60 percent of

Table 2 Demographic and Practice Comparisons Between Responders ($n = 372$) and Nonresponders, University of Iowa Graduates ($n = 397$)

	Responders	Nonresponders	*P*-value
Sex			
Males	234 (62.9%)	280 (70.5%)	0.02
Females	138 (37.1%)	117 (29.5%)	
Years since graduation			
2002-1998	230 (61.8%)	186 (46.9%)	<0.01
1997-1992	142 (38.2%)	211 (53.1%)	
Extramural student program combination			
BMC-SC	181 (48.7%)	225 (57.0%)	0.02
SC-Oth	134 (36.0%)	134 (33.9%)	
BMC-Oth	35 (9.4%)	26 (6.6%)	
Oth-Oth	22 (5.9%)	10 (2.5%)	
Practice community size			
>250,000	91 (24.5%)	Unknown	NA
25,000-250,000	187 (50.2%)		
<25,000	94 (25.4%)		
Practice type			
Solo	122 (32.8%)	Unknown	NA
Other	250 (67.2%)		

all respondents said that each of the other listed populations composed less than 5 percent of their practices. For example, 65.5 percent of respondents reported that Medicaid patients composed ≤5 percent of their total population. Furthermore, 70 percent or more of all respondents said that they never treat the homebound, homeless, and incarcerated. Additionally, 47.1 percent of respondents said they never treat HIV+/AIDS patients, and 41.7 percent said they never treat Medicaid patients.

Several predictor variables were statistically significantly ($P < 0.05$) associated with respondents' treatment of underserved populations (Tables 4 and 5). Bivariate analyses were conducted to examine associations between each individual population and all of the predictor variables. The significance ($P < 0.05$) of each predictor variable differed based on the population (Table 4). The predictor variables "comfort in treating," "total number of groups of underserved populations served," and "total percentage of underserved patients treated" were most frequently significantly associated with each population. In contrast, practice type (non-solo versus solo) was not statistically significantly associated with any population.

Logistic regression models were run for each underserved population. Similar to the bivariate analyses, the statistically significant predictor variables that were associated with each model differed by population (Table 5). For example, the final

Table 3 Mean Percentages of Patients Treated Within Practices, and the Percentage of Dentists Whose Practice Does Not Treat Anyone Within a Population or Whose Total Practice Is Composed of ≤5% of a Population

Population	*n*	Mean % treated	None treated	≤5% treated
Other ethnic groups	322	19.8	3.1	31.4
Low income	328	17.1	4.9	36.6
Medicaid	319	10.8	41.7	65.5
Medically complex	328	8.6	5.8	61.9
Non-English speaking	329	7.9	10.9	76.3
Frail elderly	322	4.9	18.6	74.8
Mentally compromised	322	3.9	9.3	84.2
Drug users	313	2.7	38.3	91.1
HIV+/AIDS	310	1.3	47.1	97.7
Homebound	313	0.7	73.2	98.4
Homeless	309	0.7	81.2	97.7
Incarcerated	316	0.5	80.1	99.7

Table 4 Bivariate Analyses Between Treating Twelve Traditionally Underserved Populations* and Selected Predictor Variables ($N = 372$)

Population	Sex	Years since graduation	Community size	Comfort in treating	# of groups treated	Total % of patients treated	Community-based rotations	Perceived value of rotations
Other ethnic groups			<0.01		0.02	<0.01	0.03	
Low income			<0.01		<0.01	<0.01		
Medicaid	0.04		0.03	<0.01		<0.01		
Medically complex	0.02			<0.01	<0.01	<0.01		
Non-English speaking	0.03	<0.01	0.04	<0.01		<0.01	0.02	
Frail elderly				<0.01	0.02	<0.01	<0.01	0.01
Mentally compromised	0.01			<0.01		<0.01		
Drug users				<0.01	<0.01	<0.01		0.02
HIV+/AIDS			0.04	<0.01	<0.01	<0.01		
Homebound*	0.01		0.03	<0.01	<0.01		<0.01	
Homeless*				<0.01	<0.01	<0.01		
Incarcerated*			0.02	<0.01	<0.01	<0.01	<0.01	

* Homebound, homeless, and incarcerated were dichotomized as 0% versus >0% treated. All other populations were dichotomized as ≤5% versus >5% treated.

logistic regression model for "other ethnic groups" demonstrated that when holding all other variables constant, respondents who lived in communities with >250,000 people were 4.08 times as likely to treat other ethnic groups compared with respondents who lived in towns with <25,000 people. Furthermore, respondents whose total practice was composed of at least 50 percent or more underserved populations were 9.55 times as likely to treat other ethnic groups compared with respondents who treated fewer underserved populations. In contrast, different predictor variables were statistically significantly associated with treating other populations. For example, holding all other variables constant, respondents who were comfortable treating frail elderly populations were 2.53 times as likely to treat frail elderly patients compared with those who had marked "some concern/rather not/will not." Respondents whose total practice was composed of at least 50 percent or more underserved populations were 5.53 times as likely to treat frail elderly patients compared with respondents who treated fewer underserved populations. Respondents who were assigned to the Broadlawns-Special Care extramural program rotation as a dental student were 4.47 times as likely to treat frail elderly compared with respondents who were assigned to the Special Care-Other rotation. There was no difference in the likelihood to treat frail elderly patients for those who participated in the Broadlawns-Other rotation compared with the Special Care-Other rotation. General trends demonstrate that comfort, treating more than seven populations, and having the percentage of underserved populations treated within a practice total more than 50 percent were the most frequently associated ($P < 0.05$) and strongest predictors of treating the listed underserved populations. The high odds ratios associated with treating more than seven populations is of particular interest since they were associated with the populations least likely to be treated by respondents (i.e., homeless). Neither practice type nor perceived value of the community-based clinical experiences was statistically significantly associated with any of the populations in the final models. No significant interactions were found in any of the models.

Discussion

While University of Iowa dental alumni reported that Other Ethnic Groups composed a mean percentage of 19.8 percent of dentists' total patient populations, most of the other traditionally underserved populations that were identified in this study contributed to less than 10 percent of dentists' patient populations. Because some patients may have contributed to multiple categories (e.g., a frail elderly patient with multiple medical concerns would have been counted as a "frail elderly" patient and a "medically complex" patient), the percentage of underserved patients receiving dental care within a practice may be less than portrayed in Table 2.

Table 5 Logistic Regression Models Highlighting Statistically Significant Differences for Treating Each Underserved Population* in Their Practices ($N = 372$)

Population	Sex	Years since graduation	Community size	Comfort in treating	# of groups treated	% of patients treated	Community-based rotations
	OR (*P* value)	OR (*P* value)	OR (*P* value)	OR (*P* value)	OR (*P* value)	OR (*P* value)	OR (*P* value)
Other ethnic groups			4.08 (<0.01)			9.55 (<0.01)	
Low income			0.34 (0.02)			11.17 (<0.01)	
Medicaid				9.56 (<0.01)		6.69 (<0.01)	
Medically complex	1.92 (0.02)			2.38 (<0.01)	1.95 (0.01)	6.30 (<0.01)	
Non-English speaking		3.23 (<0.01)		7.14 (<0.01)		19.76 (<0.01)	
Frail elderly				2.53 (<0.01)		5.53 (<0.01)	
BMC-Oth versus SC-Oth							Not significant
BMC-SC versus SC-Oth							4.47 (0.02)
Mentally compromised	2.05 (0.03)			2.69 (<0.01)		9.64 (<0.01)	
Drug users				2.14 (0.02)	30.84 (<0.01)		
HIV+/AIDS			3.57 (<0.01)	2.99 (<0.01)	14.98 (<0.01)	1.99 (0.01)	
Homebound			3.03 (0.01)	4.01 (<0.01)	9.02 (<0.01)		
Homeless				3.70 (<0.01)	32.81 (<0.01)	4.26 (<0.01)	
Incarcerated				9.02 (<0.01)	17.49 (<0.01)		
BMC-Oth versus SC-Oth							4.97 (<0.01)
BMC-SC versus SC-Oth							Not significant

* Homebound, homeless, and incarcerated were dichotomized as 0% versus >0% treated. All other populations were dichotomized as ≤5% versus >5% treated.

Reference Groups(†): Sex: females versus males†; years since graduation: ≤5 years versus >5 years†; community size: >250,000 versus <25,000† people; only >250,000 was significant ($P < 0.05$) in any model, thus the results for 25,000-250,000 versus <25,000 are not presented on the table; comfort in treating: no problem/OK versus some concern/rather not/will not†; # of groups treated: >7 groups versus ≤7 groups†; % of total patient population: >50% versus ≤50%†; community-based rotations: BMC-Oth or BMC-SC versus SC-Oth†.

BMC-SC, Broadlawns Medical Center-Special Care; BMC-Oth, Broadlawns Medical Center-Other; SC-Oth, Special Care-Other; Oth-Oth, Other-other; OR = odds ratio.

Nearly 50 percent of all responding dentists reported that they did not treat any HIV+/AIDS patients, and over 70 percent of respondents did not treat any homebound, homeless or incarcerated patients. More than 50 percent of all respondents stated that each underserved population queried in this study composed 5 percent or fewer of their total patient population, with the exception of "other ethnic groups" and "low income patients." It is unclear whether alumni were not treating these populations by choice, because these populations were not able or willing to seek care, or due to lack of opportunity to treat a specific population. For example, some dentists may not have the opportunity to provide care to specific populations (e.g., incarcerated, group home residents, long-term care facility residents) if their care is contracted to a limited number of dentists. Furthermore, national statistics show that less than 1 percent of the national population is incarcerated (9), homeless (10), or living with HIV/AIDS (11).

In a complementary report utilizing the same study population as this study, University of Iowa College of Dentistry alumni were asked how comfortable they were treating the underserved populations listed in this current study. A vast majority of respondents answered "No problem or ok" when asked how comfortable they were treating "other ethnic

groups" (98.5 percent) and low income populations (86.7 percent) (12). The current study shows that these two groups were the most likely to be treated by respondents. However, "comfort" was not statistically significantly associated with respondents' treatment of either population in the final logistic regression models. This finding may be due to the high percentage of respondents who were comfortable treating these groups, thus reducing the ability to find a statistically significant difference.

In contrast, comfort was statistically significantly associated with whether dentists treated the other populations. In general, respondents who were comfortable treating a specific population were more likely to treat that population. Although over 50 percent of respondents in the complementary report stated they were comfortable treating almost every population [exceptions: incarcerated (49.1 percent); drug users (46.8 percent); and homebound (32.2 percent)] (12), a majority of dentists in this study reported most populations composed fewer than 5 percent of their total patient population (see Table 3).

There are many reasons why some underserved populations do not receive dental care. These reasons are associated with dentist and patient characteristics and opinions. Some dentists are unwilling to treat special needs patients due to the practitioner's anxiety and lack of education related to treating special needs populations (13-15). Additionally, it may be economically disadvantageous to treat some special needs populations due to the amount of time needed to treat the patients and their likelihood to be covered by public insurance (13,16). Likewise, people who need dental treatment may not seek care due to the cost associated with obtaining dental treatment (17,18). In addition to economic barriers, individuals may face physical barriers due to the lack of availability of dentists in a geographic region, lack of transportation, and dental office design impediments (13,18,19). Some report not seeking dental treatment due to perceived lack of need (17,18) and fear of pain (18). Culturally isolated groups may face barriers due to language, political status, and/or values (19). Additionally, some patients report dentists' communication skills and lack of confidence in the dentist as barriers to care (18).

Nonetheless, it is important that all individuals are able to obtain dental care when needed and desired. This study suggests that dentists who treat large numbers of underserved populations are more likely to treat populations who are the least likely to find dentists who are willing to treat them (e.g., homebound, homeless, and incarcerated). If possible, other healthcare providers, social workers, and patient advocates should refer patients who historically have had a difficult time obtaining dental care to dentists who treat multiple categories of underserved populations.

Interestingly, variables pertaining to the community-based clinical experiences had minimal or no association with respondents' treatment of underserved populations. Specifically, program combination was only associated with treating frail elderly and the incarcerated, and the perceived value of the community-based clinical rotations was not statistically significantly associated with the treatment of any underserved population. The lack of significance may be related to memory recall as opposed to alumni not valuing their experiences. Another reason for the lack of significance may be because every respondent participated in community rotations, thus it was not possible to compare results with a control group. Institutions associated with the Dental Pipeline Program (20), who have only recently implemented community-based clinical rotations, may find different results with similar longitudinal studies due to the ability to examine the differences of treatment patterns of alumni prior to and after the implementation of community programs. Although it is hoped that community-based clinical experiences directly influence students' desires to treat underserved populations post graduation, this study suggests that other variables, such as comfort, are more influential in predicting who treats underserved populations. Perhaps community-based clinical experiences should be developed to enhance students' comfort in treating underserved populations as opposed to being created with the intention to directly influence students' willingness to treat these populations, especially since intentions may be short-lived whereas comfort may be longer lasting.

Indeed, studies examining dentists' treatment of children and special needs populations suggest that dentists who perceive they received adequate didactic and clinical exposure to these populations within dental school are more likely to treat these populations within their current practices (3,21). It is likely that dentists are willing to treat these populations because they had clinical exposure to children and special needs patients in dental school, thus increasing their clinical competency and comfort working with these populations. Students should receive substantial, continuous clinical experiences with targeted populations because Cunningham, Beck, and Ettinger showed that dental students' self-perceived competence in providing care to long-term care facility residents decreased from baseline after participating in a nursing home rotation for two weeks but significantly increased above baseline after 4 weeks (22). Thus, it is important to ensure that students have ample time to experience the challenges in providing care to some populations and then gain the clinical skills and confidence to treat these populations.

With the exception of the medically complex and the mentally compromised, dentists' gender was not statistically significantly associated with the likelihood to treat any population. Although some authors have suggested that female dentists are more willing to treat some underserved populations (23,24), this study suggests that gender

differences are rarely associated with underserved populations' ability to obtain dental care. As more women enter the dental workforce, trends in the populations treated by male and female practitioners should continue to be monitored.

This study found that dentists in larger cities were more likely to treat homebound, other ethnic groups, and HIV+/AIDS populations than dentists in more rural areas. One reason for this difference may be attributed to larger numbers of patients with these characteristics living in urban areas, thus the opportunity to treat these populations within dental practices is increased. Another reason for the difference may be related to the greater infrastructure (e.g., availability of translators, dental, and medical specialists) found within larger communities. Efforts should be taken by smaller communities to help assist underserved populations obtain dental care within their communities or neighboring larger communities.

There are some limitations with this study. Nonresponse bias testing demonstrated that respondents and nonrespondents differed by sex, year of graduation, and program combinations. This suggests that the results may not be generalizable to nonrespondents. Another limitation is that respondents were asked to estimate the percentage each population composed of their total patient population. This may have been difficult for respondents as some patients may represent multiple patient categories. Additionally, some respondents may have felt pressure to provide a socially desirable response regarding the type and percentage of patients treated within their practice. Since most respondents reported treating low percentages of each population, it does not appear that respondents artificially inflated the percentage of patients that they treat. Recall bias about the perceived value of the extramural programs may also exist. In order to minimize recall bias, the study was limited to dentists who had graduated 10 years or less at the time of the study. Lastly, respondents may have gained comfort and experience in working with some of these groups elsewhere (i.e., other dental school patients, dental residency programs, etc.). Thus, caution is needed in interpreting the impact of the community-based student programs.

In general, University of Iowa College of Dentistry graduates who participated in community-based clinical rotations are willing to treat some underserved populations. However, the percentage of underserved populations within dental practices is low. Further studies should be conducted to determine whether these low percentages are due to dentists not being willing to treat more patients within these populations, the populations not seeking dental care, or a combination of both issues. Community leaders and dentists should identify at-risk populations and develop protocols to help ensure that these populations are able to obtain, at a minimum, emergency care. Additionally, dental schools should develop educational curricula to help increase students' comfort in treating underserved populations. Examples of curricular changes include, but are not limited to the following: a) exposing dental students to traditionally underserved populations throughout their four year curriculum through didactic, clinical, and service learning experiences; b) incorporating critical incident papers and discussions into the curriculum to help students more thoroughly process their experiences; and c) providing situations for students to meet with dentists and community leaders who interact with specific populations. The latter will provide students with the opportunity to learn how to treat underserved populations within their practices and within the community (e.g., prisons, nursing homes). Additionally, students will have the chance to learn about specific populations on a personal level "beyond the mouth." Regardless of which programs schools implement, it is important that they incorporate comprehensive cultural awareness training in order to account for the population shifts (e.g., age, ethnicity) occurring within the United States.

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