Predicting dentists' decisions: a choice-based conjoint analysis of Medicaid participation

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Abstract

Objectives: Private practice dentists are the major source of care for the dental safety net; however, the proportion of dentists who participate in state Medicaid programs is low, often due to poor perceptions of the program's administration and patient population. Using a discrete choice experiment and a series of hypothetical scenarios, this study evaluated trade-offs dentists make when deciding to accept Medicaid patients.

Methods: An online choice-based conjoint survey was sent to 272 general dentists in Iowa. Hypothetical scenarios presented factors at systematically varied levels. The primary determination was whether dentists would accept a new Medicaid patient in each scenario. Using an ecological model of behavior, determining factors were selected from the categories of policy, administration, community, and patient population to estimate dentists' relative preferences.

Results: 62 percent of general dentists responded to the survey. The probability of accepting a new Medicaid patient was highest (81 percent) when reimbursement rates were 85 percent of the dentist's fees, patients never missed appointments, claims were approved on first submission, and no other practices in the area accepted Medicaid. Although dentists preferred higher reimbursement rates, 56 percent would still accept a new Medicaid patient when reimbursement decreased to 55 percent if they were told that the patient would never miss appointments and claims would be approved on initial submission.

Conclusions: This study revealed trade-offs that dentists make when deciding to participate in Medicaid. Findings indicate that states can potentially improve Medicaid participation without changing reimbursement rates by making improvements in claims processing and care coordination to reduce missed appointments.

Introduction

The American dental safety net provides care to traditionally underserved populations (1). One-third of the population can be categorized as underserved – including primarily low-income individuals, but also individuals who are uninsured, institutionalized, suffering from multiple chronic health conditions, or living in remote areas (2). Private practitioners who accept Medicaid participate in the dental safety net and represent the greatest source of dental care for low-income

and Medicaid-enrolled populations in the United States (1). The demand for dental care among Medicaid enrollees, however, often exceeds the number of available providers (1). Over half of US states report serious challenges to ensuring enough dentists are available to treat Medicaid patients – more than any other health care provider group (3).

State Medicaid programs are required to provide dental coverage for children through the Early Periodic Screening, Diagnosis, and Treatment (EPSDT) Program (4), but adult
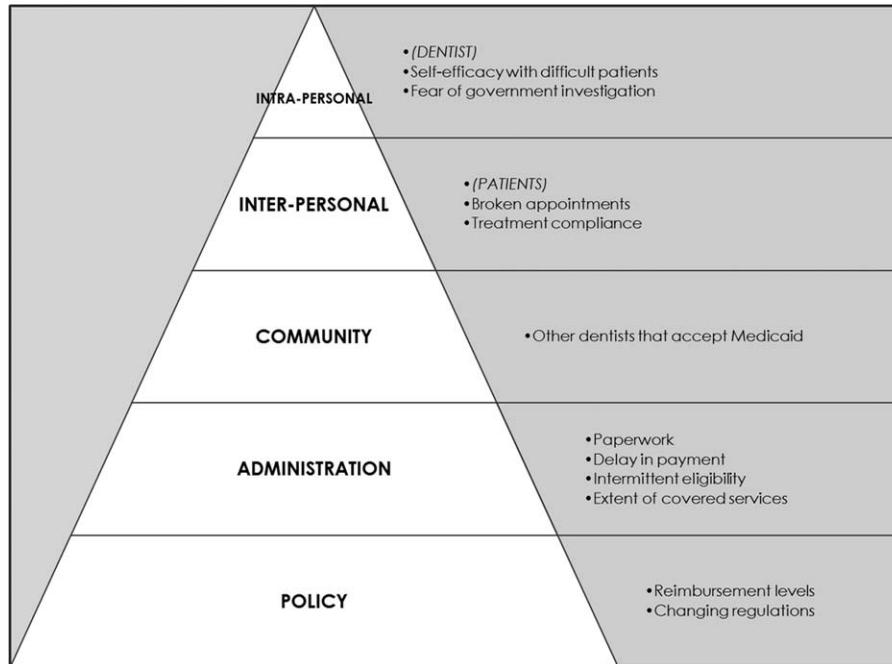
Figure 1 Ecological model of dentists' decisions to accept Medicaid patients.

dental benefits through Medicaid vary by state. The Affordable Care Act (ACA) is expected to provide public dental benefits to approximately 18 million non-elderly adults over the next several years, but expanded benefits will differ by state (5). Additionally, even the provision of dental benefits does not ensure access to services, especially for Medicaid enrollees. In 2009, 12 percent of Medicaid-enrolled adults in the United States reported having difficulty obtaining necessary dental care compared to only 4 percent of privately insured adults (3). In 2010, 28 percent of adults with public insurance reported a dental visit, compared with 73 percent of adults with private insurance (6).

Iowa is one of 19 states that provides relatively comprehensive dental coverage for Medicaid adult enrollees, including comprehensive restorative and specialty services (7). Despite having insurance coverage, one recent survey of Medicaid enrollees in Iowa found that, among respondents, 19 percent of children and 13 percent of adults reported unmet dental needs (8). One of the most common reasons cited for that need was the inability to find a dentist who accepts Medicaid.

Previous studies indicate that low reimbursement rates are one of the most significant factors in determining dentists' willingness to participate in Medicaid (9-11). As a result, several state Medicaid programs report initiatives to increase reimbursement payments to improve access to dental care for Medicaid patients (12). While increasing reimbursement rates may make Medicaid more attractive to some dentists, reimbursement rates alone are not always sufficient to encourage participation in Medicaid among dentists (13,14).

The previous studies examining factors influencing dentists' Medicaid participation have major limitations. First, researchers have typically examined factors related to Medicaid participation one at a time and not as constructs grounded in an integrated conceptual framework (9-11). Second, many of these studies used ranking or rating to measure the importance of Medicaid policies and Medicaid patients' characteristics on the dentists' decision to participate.

In this study, we used an ecological framework of human behavior to emphasize the environmental and policy contexts of behavior, while also incorporating social and psychological influences (15). This framework can guide behavioral intervention strategies from five levels of influence (Figure 1), including:

- State policy.
- Medicaid program administration.
- Professional community in the surrounding area.
- Inter-personal relationships between dentists and patients.
- Intra-personal (individual) dentist factors.

Additionally, we used a technique called conjoint analysis, which offers an alternative to more traditional methods of rating and ranking by embedding attributes in a more realistic context. Conjoint analysis is based in economic theory and assumes that individuals will make choices that maximize their satisfaction, or utility (16). In conjoint analysis, scenarios present combinations of factors at systematically

Table 1 Factors and Levels Used in the Conjoint Survey Design by Ecological Domain

Domain	Factor	Level 1	Level 2	Level 3
Policy	Reimbursement rate	35%	55%	85%
Administration	Claim approval	The first submission is unlikely to be approved	The first submission may or may not be approved	The first submission will be approved
Community	Other practices in the area that accept new Medicaid patients	No other practices	A few other practices	Many other practices
Inter-personal	Patient behavior	Often misses an appointment	Sometimes misses an appointment	Never misses an appointment

varied levels and each combination of factors is assessed as a whole. In choice-based conjoint analysis (CBCA), respondents are asked to determine whether or not a given scenario is acceptable (17). Utility is the primary output of conjoint analysis and provides a scaled, relative importance that indicates the perceived value of each factor included in the scenario (18). Utility also quantifies the intensity and direction of the individual factor level's impact (16).

The overarching objective of this study was to evaluate how dental providers trade between different factors which affect their participation in Medicaid and to determine the relative weights they place on those factors. To attain this objective, we tested our working hypothesis that factors other than reimbursement may modify the decision to accept a new Medicaid patient. CBCA was used to assess the impact of different factors by designing scenarios that reveal the optimal combination of those factors which encourage provider participation. Results from this study offer information about how to effectively leverage existing resources in order to maximize dentist participation in Medicaid.

Methods

The CBCA survey was the second of two surveys conducted among private practice dentists as part of a larger project designed to assess the oral health safety net in Iowa. A national advisory committee, including representatives from federal and state agencies, organized dentistry, and safety net providers, was assembled to provide input and feedback at all stages of this project. In early 2013, we administered an initial survey to private practice general dentists in the state of Iowa ($N = 1,101$) (19). The sampling frame for the CBCA was also developed from the first survey when respondents were asked if they would be willing to participate in a follow-up CBCA survey; 272 general dentists provided us with email addresses and were contacted to participate in this study.

In the initial survey of this project (19), respondents were asked to rate 11 factors selected from previous states' Medicaid participation reports and then rank the top three they felt were most important. The project's advisory committee helped to categorize factors in each domain of the ecological

model and a factor analysis was used to validate how those items load to their domains (Table 1). Results from the initial survey were used to select representative factors with the highest mean rating and overall score ranking for each domain in the CBCA.

The final conceptual model in this study (Table 1) emphasized that the decision to accept Medicaid patients is influenced by factors in four policy-sensitive domains of the ecological model: reimbursement rates (policy level), claim approval (organizational level), other dentists in the community who accept Medicaid (community level), and patient appointment-keeping behavior (inter-personal level).

For each factor, we developed a set of three levels, or values (Table 1). For example, the reimbursement rate factor was assigned levels of 35 percent, 55 percent, and 85 percent of "dentist's usual fees." Levels were chosen to represent least desirable conditions (Level 1), the most desirable conditions (Level 3), and a point somewhere in the middle of those two extremes (Level 2). Levels were selected to represent realistic or relevant options under existing state Medicaid policies. Iowa Medicaid currently reimburses dentists' charges at approximately 40–50 percent (19). While reimbursement levels of 85 percent of usual fees is unrealistic in most states, we wanted to test the effects of setting this at a highly desirable level.

We hypothesized that dentists would have clear preferences among the four factors related to accepting Medicaid patients, ordering the relative impact as follows: a) higher reimbursement rates; b) higher likelihood of a claim being approved on the first submission; c) patients who did not miss appointments; and d) the presence of other dentists in the area who accept Medicaid. We also hypothesized that certain factors associated with participation in Medicaid, when included in a specific hypothetical patient scenario, would encourage provider acceptance of the patient in that scenario.

To test and quantify our hypotheses, we developed an online CBCA survey that simulates dentists choosing patients. The CBCA modeled this choice behavior by eliciting tradeoffs among the factors in hypothetical patient scenarios, allowing us to estimate the relative utility of each factor. Conjoint analysis, in general, has been used previously to

investigate dentists' choice of treatment plans (20,21), and because it is less susceptible to socially biased responses, it is particularly well suited to assess their decisions to accept Medicaid patients.

An email invitation contained required elements of consent, instructions to complete the online survey, the link to the survey, and a unique subject ID. Reminders were sent at 2, 3, and 4 weeks after the initial invitation. The survey was open for a total of 6 weeks. Representativeness of survey respondents was evaluated by comparing respondents with all general dentists using demographic and practice characteristics variables (i.e., sex, age, practice type, practice urbanicity, and full-time status) obtained from the Iowa Dentist Tracking System. The Iowa Dentist Tracking System is maintained by the University of Iowa Carver College of Medicine and produces a provider dataset available for commercial and research purposes (22).

The on-line survey contained nine hypothetical scenarios which were generated using a statistically efficient fractional factorial design. This allowed for independent analysis of the main effects at each level (i.e., utility) without having to use the full factorial of possible scenarios ($3^4 = 81$) in the survey (23). Scenarios were presented in random order to the respondents along with two holdout scenarios that were used for model validation.

Each scenario concerned the acceptance of the hypothetical patient in their practice and specified a uniform set of background information: *A healthy 32 year old contacts your practice about the replacement of a lost two-surface restoration (filling) on a molar that is asymptomatic (i.e., the patient was not experiencing any pain)*. The four factors were then varied to complete the scenario.

Sample scenario

At the time this patient calls your practice, you know there are no other practices in your area accepting Medicaid patients. You are also aware that this patient often misses an appointment. Medicaid will reimburse you at 85 percent of your usual fees for this service and the first submission of your claim will be approved.

For each scenario, dentists were asked whether or not they would accept the patient given the conditions described. This choice design, with a forced "yes" or "no" response, was chosen to correspond to the actual decision-making process. The survey was pre-tested by the aforementioned national advisory committee, and revised through an iterative process whereby feedback was solicited and incorporated throughout the survey design process.

Power calculations in CBCA depend on the number of total questions per respondent (t), the maximum number of factor levels (c), the number of response options (a), and the number of respondents (n) (23). In this study, $c = 3$, $a = 1$

(option to accept or reject the patient), and $t = 9$ main questions. Using the recommendation that ($nta/c \geq 500$), a minimum sample size of 166 was suggested for this study (24).

Multinomial logistic regression was used to calculate the utility values for all factor levels, represented by model parameters (Table 3, Model A). The dependent variable was the response choice (yes or no). The relative importance of each factor as a whole was calculated using these utility values as [*exp (highest utility per factor) – 1*]. Model parameters were then used to calculate the overall likelihood of accepting a Medicaid patient for each scenario. Only main effects were estimated; interaction effects involving two or more factors were assumed to be zero.

A second regression model was generated that included dentist demographic and practice characteristics collected through the initial dentist survey and the Iowa Dentist Tracking System (Table 3, Model B). In the initial dentist survey, respondents were asked to report gross practice production during the previous year and the proportion of their patients enrolled in Medicaid. Perceived workload was assessed using the standard busyness question – "How would you best describe busyness of your practice during the past 12 months?" Provider-specific characteristics cannot vary within the hypothetical scenarios and therefore, could not be treated in the same way as CBCA factors. This second model allows us to capture the effect, if any, of dentists' individual characteristics on the likelihood of accepting a Medicaid patient in general.

Holdout scenarios are extra CBCA scenarios presented to respondents but are not used in model estimations (utility estimation); rather, they are used to assess the predictive validity of the model. Holdout scenarios are presumed to represent how the respondent would choose in the real world (25). We assessed predictive validity of Model A by comparing model predictions for each holdout scenario with what respondents actually chose in those two scenarios.

Given the fractional-factorial design of the survey, we were also able to use the model parameters to estimate the probability of dentists accepting a Medicaid patient for any possible combination of factors and levels (simulation scenarios). For this study, we focused on simulation scenarios that represented potentially modifiable conditions with policy relevance.

The University of Iowa Institutional Review Board (IRB) approved the protocol for this project, including the survey questionnaire. All analyses were conducted using SPSS Version 18.0 (SPSS Inc. Released 2009. PASW Statistics for Windows. SPSS Inc., Chicago).

Results

A total of 168 general dentists engaged in private practice responded to the online survey, for a response rate of 61.8

Table 2 Demographic Characteristics of Survey Respondents and All General Dentists in Iowa

	Survey respondents N (%)	All general dentists N (%)	P value
Number	168	1,101	
Age (years)			0.606
<30	14 (8.3)	73 (6.6)	
30–59	117 (69.6)	763 (69.4)	
≥60	37 (22.0)	263 (23.9)	
Sex			0.049*
Male	141 (83.9)	834 (75.8)	
Female	27 (16.1)	266 (24.2)	
Practice type			0.546
Solo	82 (48.8)	509 (46.2)	
Other	86 (51.2)	592 (53.8)	
Practice urbanicity			0.082
Metro	91 (54.2)	663 (60.2)	
Non-metro	77 (45.8)	438 (39.8)	
Full-time† status			0.075
Full-time	149 (88.7)	917 (83.3)	
Part-time	19 (11.3)	184 (16.7)	

*$P < 0.05$.

†Full-time defined as working 32 hours or more per week.

percent, representing 15.3 percent of general dentists in the state. Table 2 describes demographic and practice characteristics of survey respondents and compares our study popula-

tion with all general dentists in Iowa. Respondents did not differ significantly from the overall population of dentists with regard to age, full-time status, or practice urbanicity. However, males were significantly more represented among survey respondents than females when compared to the general dentist population in Iowa.

Table 3 presents the results of the regression models; Model A includes the four factors from the ecological model, while Model B also includes dentist demographic characteristics. Parameters from Model A were used to calculate the utility of the CBCA factors and their levels (Figure 2). Relative importance was highest for reimbursement rate followed by patient behavior, claim approval, and the presence of other local practices accepting Medicaid patients.

Dentists had the strongest preference for reimbursement rates set at 85 percent (Table 3). The difference between acceptance of patients with reimbursement rates of 85 percent and 55 percent was statistically significant ($P < 0.0001$) and both were significantly different from 35 percent ($P < 0.0001$).

The second most important factor was patient behavior; patients who never miss appointments were significantly preferred to patients who often miss appointments ($P < 0.0001$). Regarding the effect of other providers in the area, respondents were more willing to accept a patient when no other local practices accepted Medicaid ($P = 0.001$).

Table 3 Multinomial Regression Models Predicting Likelihood of Medicaid Patient Acceptance ($N = 168$)

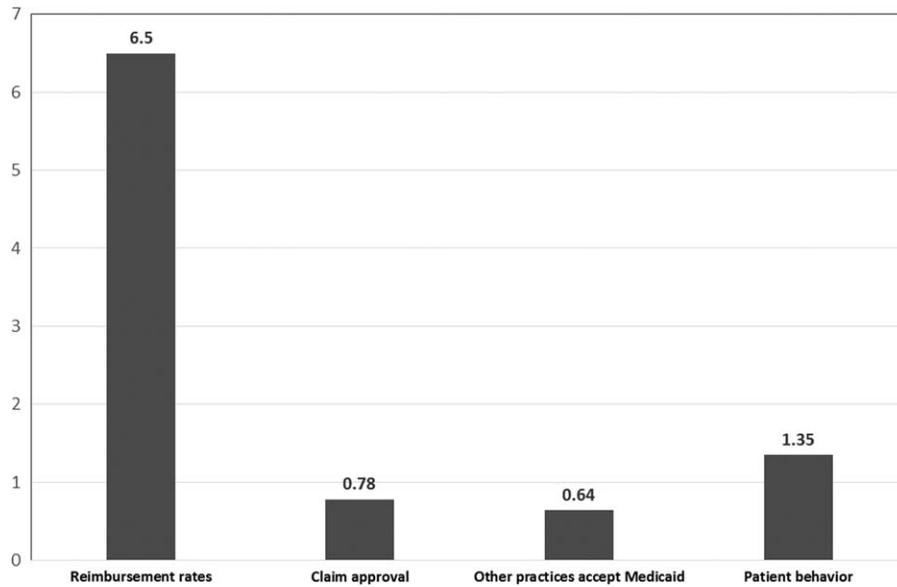|	Model A		Model B	
	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value
Claim approval on first submission				
Approved	1.78 (1.35–2.39)	<0.0001*	1.86 (1.33–2.61)	<0.0001*
May or may not be approved	1.16 (0.85–1.57)	0.334	1.22 (0.86–1.72)	0.262
Unlikely to be approved	Ref.	Ref.	Ref.	Ref.
Patient behavior				
Never misses an appointment	2.35 (1.74–0.16)	<0.0001*	2.40 (1.72–3.35)	<0.0001*
Sometimes misses an appointment	1.30 (0.95–1.77)	0.930	1.31 (0.92–1.86)	0.133
Often misses an appointment	Ref.	Ref.	Ref.	Ref.
Other practices that accept Medicaid				
No other practices in the area	1.65 (1.21–2.27)	0.001*	1.76 (1.25–2.48)	0.001*
Few other practices in the area	1.16 (0.86–1.56)	0.351	1.14 (0.82–1.59)	0.444
Many other practices in the area	Ref.	Ref.	Ref.	Ref.
Reimbursement rate				
85% UCR	7.52 (5.57–10.13)	<0.0001*	9.18 (6.50–12.95)	<0.0001*
55% UCR	2.26 (1.65–3.09)	<0.0001*	2.48 (1.73–3.55)	<0.0001*
35% UCR	Ref.	Ref.	Ref.	Ref.
Demographic characteristics				
Sex				0.051
Male			Ref.	
Female			1.47 (0.99–2.17)	
Age			0.99 (0.98–0.99)	0.022*
Medicaid patients (%)			1.03 (1.02–1.04)	<0.0001*
Perceived workload			1.03 (0.87–1.21)	0.748
Gross production ($)			0.93 (0.88–0.98)	0.008*

*$P < 0.05$.

Figure 2 Relative importance[†] of factors affecting dentists' decisions to accept Medicaid. [†]Calculated as exp (highest utility per factor) − 1.

Predictive validity for the CBCA model (Model A) was relatively high. For the first holdout scenario, the CBCA model predicted a 7.4 percent probability that dentists would accept the patient in the given scenario. This compared favorably to the reported 7.7 percent probability of acceptance. For the second holdout, the model predicted a 9.5 percent probability of acceptance compared to the reported probability of 9.3 percent.

Model B (Table 3) tested whether preferences varied with demographic and practice characteristics. Dentists' age, percentage of Medicaid patients currently served by the dentist's practice, and gross production were significantly associated with the decision to accept a new Medicaid patient. In general, dentists who served a higher percentage of Medicaid patients had greater odds of reporting they would accept new Medicaid patients under the circumstances provided in the scenarios (OR = 1.03, $P < 0.0001$). Age of the dentist was significantly associated with the odds of accepting a new Medicaid patient (OR = 0.99, $P < 0.022$); for every additional 10 years of age, dentists had 10 percent lower odds of accepting new Medicaid patients. Additionally, dentists with higher net gross production (OR = 0.93, $P < 0.008$) had a significantly lower odds ratio of reporting they would accept new Medicaid patients in the scenarios.

We used model parameters to estimate the probability of dentists accepting a new Medicaid patient for several simulation scenarios, including a "best case" scenario in which reimbursement was set at 85 percent, the first claim submission was approved, the patient never missed an appointment, and no other local practices accepted Medicaid. Given these preferred conditions, the probability of Medicaid acceptance was 81 percent. The probability of accepting a new Medicaid patient was as low as 7.4 percent when conditions were set to their lowest levels. However, if reimbursement was increased from 35 percent to 55 percent and all other parameters remained constant in the worst case scenario, the predicted probability of acceptance increased to 16 percent. If only patient behavior and claim approval were optimized, the predicted probability of acceptance increased to 45 percent.

Seventy-seven percent of our respondents varied responses to scenarios based on the conditions presented ($n = 129$). Further bivariate analyses were conducted to assess differences between these dentists, dentists who refused all scenarios, and those who accepted all scenarios. There were no statistically significant differences by age, gender, busyness of the dental practice, or gross production (i.e., $P > 0.05$ for all bivariate comparisons). However, dentists who varied their responses were significantly more likely to accept Medicaid than those who refused all scenarios (Chi-square = 11.0; $P = 0.03$).

Discussion

Although previous research has examined the ranking and rating of perceived problems with the Medicaid program, to our knowledge this is the first study that has quantified the relative importance of these factors or assessed these factors in a choice-based context. The CBCA design required dentists to make trade-offs between factors and aimed to minimize social desirability bias, while the ecological framework helped clarify the relative importance of multiple levels of influence.

In general, our findings were similar to previous findings in the existing literature (9-11). However, CBCA results from this study were based on a richer context which presented a patient scenario, and therefore assessed more than one factor

at a time in order, over multiple levels of influence, to demonstrate how dentists trade-off between factors. For example, reimbursement rates were still the single most important factor, but clearly could be influenced by other information affecting the decision-making process.

The influence of having other local practices that accept new Medicaid patients was counter to our original hypothesis. The simple ranking process used in the initial 2013 survey of Iowa dentists demonstrated that the presence of other local practices that accept Medicaid patients was an important factor (19). However, when considered in combination with other issues, dentists were more willing to accept the patient if no other local practices accepted Medicaid. While multiple dentists in our first survey commonly indicated via free response comments that they did not want to be the only local dentist who treated Medicaid patients, feelings of social responsibility may take precedence to that concern – at least in certain situations.

The simulation scenarios present the results of the CBCA in an easy-to-understand format and may also be especially important for policy-related discussions. For example, the majority of dentists were willing to accept a new Medicaid patient when they were offered less reimbursement as long as the patient would never miss an appointment and the claim would be approved on initial submission. From a policy perspective, this could be extremely important because Medicaid programs cannot control reimbursement rates, which are typically set by state legislatures, but they can assist with issues like improving claims processing and the provision of care coordination to assist with transportation and other factors affecting appointment keeping.

When all factors were set to their least desirable levels, 8 percent of dentists were willing to accept a Medicaid patient. This reflects a strong commitment to care for this vulnerable population, corresponding to findings from the initial 2013 survey of dentists (19). Conversely, when factors were set to optimal levels – including reimbursement rates at 85 percent of usual fees – nearly 20 percent of dentists still refused to accept any Medicaid patients. These dentists are unlikely to participate regardless of any programmatic change, suggesting that the most gain in Medicaid participation can be achieved by focusing on the dentists in the middle – those who varied their responses based on conditions presented in the survey scenarios. Among the 129 dentists who varied their responses to survey scenarios, 30 percent ($n = 39$) reported in the initial survey (19) that they were currently not accepting new Medicaid patients. Future research is planned to examine how attitudes about Medicaid participation vary across these categories.

There are several potential limitations to these findings. First, respondents may not be representative of the overall population of general dentists in Iowa or representative of dentists in other states. For example, they self-selected to participate in the CBCA survey after they had already participated in the first survey about their general participation in Medicaid. Second, conjoint analysis, like all stated preference methods, has been critiqued for its cognitive burden and design issues, such as information bias (i.e., framing in an overly "logical" way) and hypothetical bias (i.e., lack of realism) (26). Despite this limitation, conjoint analysis has been shown to predict actual decisions quite well when stated and actual choices are compared (27). However, our findings are based on self-reported responses and are subject to the limitations inherent to survey research.

Finally, beyond the individual demographic variables collected, we did not assess intra-personal factors such as dentists' self-efficacy to treat vulnerable populations, which appear to play an important role in Medicaid participation. Intra-personal factors can be addressed by interventions that focus on providing education to dentists rather than system reforms and community support, which were the focus of this study. Other factors beyond those in our survey affect dentists' decisions; future research should explore this area through the use of a "revealed preference" follow-up survey, in which stated and actual choices are combined.

Our study has many strengths and provides new insights about the decision-making process dentists employ when considering acceptance of a new Medicaid patient. Our results provide a snapshot of current preferences and valuations among dentists, options for policymakers, and also offer a framework for other researchers interested in evaluating changes to program policy and administrative reforms.

Acknowledgment

References

1. Edelstein B. The dental safety net, its workforce, and policy recommendations for its enhancement. *J Public Health Dent.* 2010;**70**(S1):S32-9.
2. Mertz EA, Finocchio L. Improving oral healthcare delivery systems through workforce innovations: an introduction. *J Public Health Dent.* 2010;**70**(s1):S1-5.
3. United States Government Accountability Office. Medicaid: States made multiple program changes, and beneficiaries generally reported access comparable to private insurance [cited 2014 Mar 10]. November 2012. Available from: http://gao.gov/assets/650/649788.pdf
4. Health Resources and Service Administration. EPSDT Overview: EPSDT program background [cited 2014 Mar 10]. Available from: http://mchb.hrsa.gov/epsdt/overview.html

5. Nasseh K, Vujicic M, O'Dell A. *Affordable care act expands dental benefits for children but does not address critical access to dental care issues.* Chicago: American Dental Association; 2013.

6. Kenney GM, McMorrow S, Zuckerman S, Goin DE. A decade of health care access declines for adults holds implications for changes in the affordable care act. *Health Affair.* 2012;**31**(5): 899-908.

7. American Dental Association, Office of State Government Affairs. *Adult dental benefits in Medicaid: FY2002-2010.* Chicago: American Dental Association; 2009.

8. Damiano PC, Willard JC, Momany ET, Park K. Evaluation of Iowa's Medicaid Managed Care Program: The Consumer Perspective. Results of the 2011 Survey of Iowa Medicaid Managed Care Enrollees. Final Report to the Iowa Department of Human Services. 2011 [cited 2014 Mar 10]. Available from: http://ir.uiowa.edu/cgi/viewcontent. cgi?article=1075&context=ppc_health

9. Agili D, Pass MA, Bronstein JM, Lockwood SA. Medicaid participation by private dentists in Alabama. *Pediatr Dent.* 2007;**29**(4):293-302.

10. Shulman JD, Ezemobi E, Sutherland JN. Louisiana dentists' attitudes toward the dental Medicaid program. *Pediatr Dent.* 2001;**23**(5):395-400.

11. Blackwelder A, Shulman J. Texas dentists' attitudes toward the dental Medicaid program. *Pediatr Dent.* 2007;**29**(1):40-6.

12. United States Government Accountability Office. Medicaid: State and federal actions have been taken to improve children's access to dental services, but gaps remain. September 2009 [cited 2014 Mar 13]. Available from: http:// www.gao.gov/assets/300/296224.pdf.

13. Scheffler R, Foreman S, Feldstein P, Hu T-W. A multi-equation model of payments and public access to services: the case of dentistry. *Appl Econ.* 1996;**28**:1359-68.

14. Daneman BS. Oral health access for Medicaid-enrolled children: an unfulfilled promise [dissertation]. [Internet]. Kansas City (MO): University of Missouri – Kansas City. 2009. 169 p [cited 10 Mar 2014]. Available from: http:// gradworks.umi.com/33/94/3394767.html

15. Glanz K, Rimer BK, Viswanath K. Ecological models of health behavior. In: Sallis JF, Owen N, Fisher ED, editors. *Health behavior and health education: theory, research and practice.* San Francisco: Jossey-Bass; 2008: p. 465-85.

16. Phillips KA, Maddala T, Johnson FR. Measuring preferences for health care interventions using conjoint analysis: an application to HIV testing. *Health Serv Res.* 2002;**37**(6):1681-705.

17. Elrod T, Louviere JJ, Davey KS. An empirical comparison of ratings-based and choice-based conjoint models. *J Mark Res.* 1992;**29**:368-77.

18. Louviere JJ, Hensher DA, Swait JD. *Stated choice methods: analysis and applications.* Cambridge: Cambridge University Press; 2000.

19. McKernan SC, Reynolds JC, Momany ET, Kuthy RA, Kateeb ET, Adrianse NB, Damiano PC. Relationship between altruistic attitudes and dentists' Medicaid participation. *J Am Dent Assoc.* 2015;**146**(1):34-41.

20. Koele P, Hoogstraten J. Determinants of dentists' decisions to initiate dental implant treatment: a judgment analysis. *J Prosthet Dent.* 1999;**81**(4):476-80.

21. Kateeb ET, Warren JJ, Gaeth G, Damiano P, Momany E, Kanellis MJ, Weber-Gasparoni K, Ansley T. The willingness of US pediatric dentists to use Atraumatic Restorative Treatment (ART) with their patients: a conjoint analysis. *J Public Health Dent.* 2014;**74**(3):234-40.

22. Kuthy RA, McKernan SC, Hand JS, Johnsen DC. Dentist workforce trends in a primarily rural state: Iowa 1997–2007. *J Am Dent Assoc.* 2009;**140**(12):1527-34.

23. Johnson FR, Lievense K. *Stated-preference indirect utility and quality-adjusted life years.* Durham: Triangle Economic Research; 2000.

24. Orme BK. Getting started with conjoint analysis. In: Sawtooth Software, editor. *Strategies for product design and pricing research chapter.* Orem: Research Publishers, LLC; 2005.

25. Melles T, Laumann R, Holling H. Validity and reliability of online conjoint analysis. Sequim, WA: September 2000 Sawtooth Software Conference Proceedings; 2000 [cited 14 May 2014]. Available from: http://www.conjointanalysis.net/ CANet/Manuskripte/ValidityOCA.pdf/

26. Viney R, Lanscar E, Louviere JJ. Discrete choice experiments to measure preferences for health and health care. *Expert Rev Pharmacoecon Outcomes Res.* 2002;**2**:319-26.

27. Whitehead JC. Environmental risks and averting behavior: predictive validity of jointly estimated revealed and stated behavior data. *Environ Resour Econ.* 2005;**32**:301-16.