Determinants of Dental Referral Practices Among WIC Nutritionists in North Carolina

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Abstract

Objectives: *To examine the effects of knowledge and confidence on dental referral practices among WIC nutritionists in North Carolina.* ***Methods:*** *A questionnaire consisting of 118 Likert scale-type questions was administered to 92% of all WIC nutritionists in North Carolina (n=324). The relationship of knowledge and confidence with frequent dental referrals was tested using logistic regression.* ***Results:*** *Regression results found that confidence in performing oral health risk assessments (OR=2.12; 95% CI=1.13, 3.96), confidence in making dental referrals (OR=3.02; 95% CI=1.45-6.29), and confidence in expected outcomes that parents would seek dental care when advised to do so (OR=3.11; 95% CI=1.62, 5.97) were associated with more frequent dental referrals.* ***Conclusions:*** *The more confident WIC nutritionists feel about oral health, the more likely they are to make dental referrals. Screening and referral by WIC workers may benefit children by improving access to dental care, as the WIC clinic is frequently the first point of contact with a health professional.*

Key Words: oral health; dental knowledge; dental confidence; WIC; self-efficacy; self-confidence

Introduction

The oral health of children in the United States has improved dramatically over the past 25 years with the prevalence of dental caries experience in permanent teeth declining from 53% to 24% (1). During this same time period, the prevalence of dental caries experience in primary teeth increased, now having a prevalence of more than 44%. This high prevalence has led policy makers, researchers and public health workers to consider it a major health problem, particularly for preschool-aged children (2,3). The prevalence of caries in children far exceeds that of asthma, the second most common childhood illness (4).

This increase in need for dental services is particularly problematic with a growing shortage of dental professionals. A recent analysis of the funding of dental education showed that in FY 2000 approximately 42 states had six or fewer dental students per 100,000 population, which is not enough to adequately serve the dental needs of the US (5). In view of the imminent shortage of dental professionals, some public health preventive efforts have focused on training non-dental providers in public health programs to screen children for dental disease and refer to dentists for care as appropriate.

The Special Supplemental Food Program for Women, Infants and Children (WIC) is one program that could be targeted for dental public health intervention to help improve the oral health status of its participants. Currently, less than 10% of children ages 1-5 years have any dental utilization in a given year (6). From a public health perspective, involving non-dental health and social service professionals may be a very practical solution for identifying preschool-age children who need to see dentists.

The WIC program is the nation's largest public health nutrition program and serves a large percentage of low-income children and their mothers in the US. It was established by the Food and Nutrition Services of the Department of Agriculture (USDA) to target low-income women, infants and children who are nutritionally at risk. The goal of the WIC program is to improve the health of its participants by providing nutritious foods, nutrition education, and medical and dental health referrals as adjuncts to good health care during pregnancy, the postpartum period, infancy and early childhood. WIC nutritionists may be the only source of oral health and nutrition education available to some infants and children (7, 8). In FY 2004, the national WIC program served slightly less than nine million participants per month with approximately 218,000 served monthly by the North Carolina WIC program (9).

Referrals for medical care and social services by WIC nutritionists are well documented and have been shown to improve the use of medical care by infants and children (6,10). Considering the potential for primary prevention and referral for dental services for infants and young children in WIC programs, it is surprising that dental activities of WIC nutritionists have not been investigated more thoroughly. McCunniff and colleagues (11) studied dental referral rates in Iowa WIC clinics and reported that during a two-month period, 27% of children and 17% of infants were referred for any type of health service outside the WIC clinic; 10% of health service referrals were for dental services. Sergent and colleagues (12) surveyed New York WIC employees and concluded that dental referrals

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comprised the majority of all health care referrals. Lee and colleagues (13) have demonstrated that Medicaid children in North Carolina who participated in the WIC program were more likely to use dental care than those not enrolled in WIC.

The current investigation seeks to describe what occurs within the WIC program that might lead to these high-risk children using dental care. In this study, the social cognitive theory of self-efficacy developed by Bandura was applied to the professional activities of WIC workers (14). This theory holds that the more confident individuals are in their ability to perform a task and that it will have a positive outcome, the more likely they are to undertake that task. In the case of WIC, the authors of the study hypothesized that increased self-efficacy would lead to dental referrals. Accordingly, the purpose of this study was to examine the effects of WIC nutritionists' oral health knowledge and confidence in making dental referrals.

Methods

Overview of study design. A cross-sectional study design was used to assess the oral health knowledge, confidence levels, oral health counseling activities, oral health risk assessment activities and referral practices of WIC nutritionists in North Carolina. The survey instrument was approved by the Institutional Review Board at the University of North Carolina School of Dentistry and by the North Carolina WIC Local Health Director Liaison Committee. The survey instrument completed by nutritionists consisted of 118 items using Likert Scale type responses for most questions.

Population studied. A census of WIC workers in North Carolina was used to identify survey participants. The primary inclusion criterion was whether the worker performed certifications and re-certifications to enroll clients into the WIC Program. This selection strategy identified mostly nutritionists and nurses, and a few workers with other training, but all respondents are referred to as "nutritionists" for purposes of this paper.

Instrument development and testing. To guide instrument development, a recently published framework used to study the dental referral practices of pediatricians and family physicians was used (15). The framework, modified to apply to the environment and practices of WIC workers, draws on a classic health behavior theory (16). Andersen's Behavioral Model and Access to Medical Care offers a framework that explains how individuals' use of health care is affected by the environment and by population characteristics such as their predisposing characteristics, enabling resources and their health care needs. Such a framework may be used to predict or explain health care utilization behaviors, which then translate to overall health outcomes. For the purposes of this study, the specific health behavior was dental referral practices of North Carolina WIC nutritionists. The authors of the paper were interested in examining the knowledge and confidence levels of WIC nutritionists as predictors of how they behave in their professional practice.

Where possible, survey questions were derived from previously developed and tested questionnaires used in research on pediatric oral health issues (15,17,18). Questions were modified and new ones developed as necessary and appropriate to apply to the WIC Program and to the specific research aims. Questions for the initial survey instrument were discussed among investigators and refined after multiple sessions with the State WIC Director. The survey was pilot tested in three North Carolina WIC programs to aid in clarifying questions and finalizing the survey prior to distribution.

Data collection. The surveys were mailed by inter-office courier system from the WIC Central Office in Raleigh, North Carolina to 85 agencies employing 355 nutritionists. Consent was implied by the cover letter and return of the questionnaire. They were returned to the Department of Pediatric Dentistry at UNC-Chapel Hill by US mail over a five-month period. Data collection occurred from November, 2003 until March, 2004.

Variable construction. The principle outcome variable was the practice of making dental referrals for infants and children by WIC nutritionists. This variable was derived from two questions asking the nutritionists if they made referrals and if so how frequently (not very frequently, somewhat frequently, frequently, very frequently) referrals were made for infants aged 0-11 months and children aged 1-5 years.

Seven explanatory variables were used: the nutritionist's confidence in performing oral health risk assessments; confidence in performing general oral health counseling; confidence in making dental referrals; confidence in expected outcomes that parents will heed their advice about general oral health; confidence in expected outcomes that parents will seek dental care after advised to do so; knowledge of oral health risks; and fluoride knowledge. Responses to confidence questions were grouped as "somewhat confident, confident, or very confident" versus "not confident or not at all confident." Each knowledge question, with responses on a five-point scale from "strongly disagree" to "strongly agree" was scored as correct or not. Overall summary measures for confidence and knowledge were calculated by summing the number of responses for which the respondent indicated that they were confident and the number of correct responses for each of the five confidence and two knowledge domains, respectively.

Twelve control variables were included in the analysis: WIC nutritionist's age; frequency of exposure to dental problems among their clients; frequency with which parents ask for dental referrals; perceived severity of dental problems; perceived external barriers to obtaining dental care; appointment time being too short to talk about dental problems; difficulty finding a local dentist for a child; how frequently parents ask about risk factors;

number of oral health continuing education hours received in the last five years; number of years working as a WIC nutritionist; business measured as number of children seen each month for certification; and perceived barriers that limit the ability of a WIC participant to obtain dental care.

Data analysis. Descriptive statistics reporting percentage frequency distributions of responses for WIC characteristics, confidence, and knowledge with referral practices were run using SAS statistical software. After an examination of bivariate associations of independent variables and referral, logistic regression models were developed to test the effects of nutritionists' knowledge and confidence on dental referral rates while accounting for control variables. To facilitate interpretation of the regression parameter estimates, categorical variables were created from the continuous summary scores for the seven explanatory variables by using either the upper or lower 20% to 35% of responses as one category and the other responses as another.

The generalized estimating equations (GEE) method was used to obtain regression parameter estimates and their variances. Cluster correlation effects within WIC programs were controlled using the REPEATED statement with compound symmetry (CS) covariance structure in the GENMOD procedure in SAS. The backward elimination method was performed for variable selection at a significance level of p=0.2 for keeping variables in the model.

Cronbach's alpha coefficients were derived for all items contained in each confidence score: performing oral health risk assessments; confidence in performing general oral health counseling; and confidence in

TABLE 1
WIC nutritionists' confidence performing oral health risk assessments, general oral health counseling, referral activities, and expected outcomes (n=324)

Stem question: How confident are you that you can... (1=Not at all confident, 2=Not confident, 3=Somewhat confident, 4=Confident, 5=Very confident)	%Somewhat confident, Confident, or Very confident	Mean Score	Standard Deviation	Range
Confidence performing oral health risk assessments				
Recognize baby bottle tooth decay	91.3	3.62	0.94	1.00-5.00
Recognize tooth decay in back teeth	56.0	2.77	1.10	1.00-5.00
Recognize a dental abscess	27.4	2.03	1.00	1.00-5.00
Recognize gingivitis	28.3	2.01	1.02	1.00-5.00
Look into a child's mouth and examine the teeth and gums	39.3	2.24	1.08	1.00-5.00
Look into an infant's mouth and examine the teeth and gums	42.6	2.28	1.09	1.00-5.00
Evaluate a child's risk of having dental disease some time in the future	34.7	2.14	1.14	1.00-5.00
Confidence performing general oral health counseling				
Advise parents about their child's oral hygiene	96.2	3.83	0.88	1.00-5.00
Make dietary recommendations to prevent early childhood tooth decay	98.5	4.37	0.73	1.00-5.00
Determine clients' possible fluoride sources	89.2	3.75	0.99	1.00-5.00
Advise parents about the use of fluoride supplements during infancy or childhood	81.1	3.46	1.11	1.00-5.00
Advise parents about the use of fluoride varnish	51.6	2.78	1.34	1.00-5.00
Advise parents about the use of fluoride toothpaste	88.5	3.60	1.02	1.00-5.00
Confidence making dental referrals				
Advise parents about dental visits during infancy or childhood	90.1	3.76	0.95	1.00-5.00
Make a dental referral for a child or infant	91.1	3.85	1.04	1.00-5.00

TABLE 2
WIC nutritionists' confidence in expected outcomes (n=324)

Stem question: How confident are you that you can... (1=Not applicable, 2=Not at all confident, 3=Not confident, 4=Somewhat Confident, 5=Confident, 6=Very confident)	% Somewhat confident, Confident, or Very confident	Mean Score	Standard Deviation	Range
Confidence in expected outcomes that parents will follow general dental advice				
Parents will follow my advice about cleaning their child's teeth	81.8	3.94	0.93	1.00-6.00
Parents will follow my advice regarding eating habits that will help prevent tooth decay in their child	78.6	3.96	0.88	1.00-6.00
Parents value the information I give them regarding oral health	82.0	4.02	0.86	1.00-6.00
Confidence in expected outcomes that parents will seek dental care after advised				
Parents will seek dental care for their child after I advise them to go to do so	76.2	3.02	1.22	1.00-6.00

expected outcomes that parents will follow advice to determine internal consistency and found to be 0.89, 0.86, and 0.85, respectively.

Results

Of the 355 surveys distributed, 324 nutritionists (92% individual response rate) from 82 agencies (96% agency response rate) responded. In general, WIC nutritionists were a highly educated (75 % had a BA degree or higher) and stable workforce. The most common age category was 41-50 years, and WIC workers reported high dental utilization rates for themselves. Approximately 32% had worked for WIC for 1-5 years while 29% had worked for WIC 11-20 years. The majority reported certifying or recertifying more than 40 clients per month. Slightly more than 53% relied on a public health dentist or hygienist as their primary source of oral health information.

In terms of confidence in performing oral health risk assessments (Table 1), nutritionists were most confident in their ability to recognize baby bottle tooth decay, with 91% responding positively. In contrast, only 39.3% were confident that they could "look into a child's mouth and examine the teeth and gums" and only 34.7% felt confident that they could "evaluate a child's risk of having dental disease some time in the future." Nutritionists felt very confident about performing general oral health counseling activities except for "advising parents about the use of fluoride varnish." Similarly, nutritionists felt very confident about counseling parents about dental referrals (90.1%) and making dental referrals (91.1%). When asked about expected outcomes (Table 2), 78% to 82% of nutritionists were confident that parents would follow their general dental advice. Outcome expectancy was high for "dental referral." Seventy-six percent reported that they were confident that parents would follow their advice to seek dental care after referral.

The nutritionists' knowledge about risk factors for dental caries was very high with a few exceptions. Most nutritionists were knowledgeable

TABLE 3
Reported dental referral practices of WIC nutritionists

Dental Referral Practice	n*	%
Refer children 1-5 years old (%Frequently or Very frequently)	168	52.3
Referral practice used by nutritionists (%Yes)		
Tell the parent to take the child to a private dental office without giving them the name of a dentist	56	18.1
Tell the parent to take the child to a private dental office and give them the name of a dentist	179	58.1
Tell the parent to take the child to a private dental office and give them the name and telephone number of a dentist	194	62.6
Tell the parent to take the child to a local health department clinic	205	68.1
Tell the parent to take the child to the emergency room	8	2.7
Call a local dentist office yourself to help the parent make a dental appointment	56	18.1
Go with the parent to the dental office or clinic to help make a dental appointment	12	3.9
Referral site most often used		
Local health department	188	60.3
Private dental office	99	31.7
Hospital emergency room	0	0
Other	25	8.0
Perceived barriers that limit the ability of a WIC participant to obtain dental care (%Limits a great deal)		
Clients' insurance coverage (including Medicaid)	178	55.8
Clients' reluctance to see a dentist	94	29.4
More pressing medical problems	68	21.7
Their difficulty finding a dentist who will see an infant 0-12 months old	198	62.1
Their difficulty finding a dentist who will see a child 1-5 years old	157	48.9
Their difficulty getting transportation for a dental appointment	141	44.1
Clients' belief that baby teeth do not need to be treated	134	41.9
Language barriers	145	45.7
Clients have little knowledge or understanding of dental health	134	42.4
Other	7	0.31
Age and risk status of child who needs a dental referral (%Yes)		
A 1 year old child at low risk	133	41.8
A 1 year old child at high risk	277	86.6
A 3 year old child at low risk	285	89.3
A 3 year old child at high risk	312	97.5
Exposure to dental problems (% 1-2 times/month in the past 6 months or more)		
A 1-5 year old child with tooth decay	232	71.8
A child with pain in the teeth, mouth, or jaws	69	21.4
A child having trouble eating or drinking hot/cold food or drinks because of problems with teeth, mouth, or jaws	55	17.0
A child having trouble sleeping because of problems with teeth, mouth or jaws	20	6.2
A parent upset because of his or her child's dental problems	72	22.4
A child who was hospitalized because of dental decay	8	2.5
How frequently parents ask about obtaining dental care for their child (% Somewhat frequently, Frequently, or Very frequently)		
Finding routing dental care with a local dentist	231	71.5
Obtaining a dental referral	147	45.8

*Results based on n=321 for all items except for 'Referral practice used by nutritionists' and 'Referral site most used,' which are based on n=308.

about basic oral hygiene and dietary recommendations. However, only 33% were aware of the possibility of vertical transmission of dental caries-causing bacteria from caretakers to children, a relatively new concept in dentistry. The nutritionists demonstrated low knowledge of fluoride. A surprising number of respondents incorrectly believed that all children older than six months of age should use fluoride supplements (34%) or that all young children should use fluoride mouth rinse (39.1%).

Less than one-half (47.2%) of nutritionists reported making dental referrals for infants, and of those 74.6% reported that they referred "not very frequently." Therefore, for the purposes of this study, dental referral practices concentrated on children ages 1-5 years. Most respondents (95.6%) made a dental referral for 1- to 5-year-old children, 52.3% frequently or very frequently (Table 3).

The majority of nutritionists said that they would make a referral by telling the parent to take the child to a private dentist or public health clinic and by giving them the contact information such as the dentist's name and phone number. The most common referral site was a local health department.

When asked what they thought were the major barriers that impeded children age 1- 5 years old from obtaining dental care (Table 3), nutritionists' most frequent response was the client's type of insurance coverage (including Medicaid), followed by their inability to find a dentist in the area who would see children of this age. Nearly half reported language and lack of transportation as additional barriers to obtaining dental care for their children. Four questions in the survey dealt with nutritionists' knowledge of referring high-risk children. The majority of respondents recognized when an appropriate referral should be made for a 1-year-old child at high risk for dental caries, a 3-year-old at low risk and a 3-year-old at high risk. Fewer (41.8%) responded that a 1-year-old child at low risk for dental caries should be referred. Over 70% of the nutritionists reported that they saw dental disease a couple times a month.

TABLE 4
Results of logistic regression analysis for the practice of making dental referrals for children 1-5 years old (n=273)

Variables	Estimated Coeff.	Odds Ratio	95% CI
Intercept	-3.91 (0.88)		
Confidence in performing oral health risk assessments (score=4-7 v/s 0-3)	0.75* (0.32)	2.12*	1.13-3.96
Confidence in general oral health counseling (score=6,7 v/s 0-5)	-0.16 (0.27)	0.85	0.50-1.45
Confidence making dental referrals (score=3-5 v/s 1,2)	1.10* (0.37)	3.02*	1.45-6.29
Confidence in expected outcomes that parents will follow advice (score=3 v/s 0-2)	-0.23 (0.33)	0.79	0.41-1.52
Confidence in expected outcomes that parents will seek dental care after advised (score=4-6 v/s 1-3)	1.13* (0.33)	3.11*	1.62-5.97
Knowledge of oral health risk factors (score=6,7 v/s 1-5)	0.32 (0.29)	1.37	0.78-2.42
Age (≥40 years v/s other)	0.76* (0.36)	2.14*	1.06-4.34
Exposure frequency to dental problems (score=2-6 v/s 0,1)	1.10* (0.28)	3.02*	1.73-5.26
How frequently parents ask about obtaining dental care for their child (score=2 v/s 0,1)	0.91* (0.37)	2.49*	1.21-5.12
Perceived barriers that limit the ability of a WIC participant to obtain dental care (score=5-8 v/s 0-4)	0.79 (0.41)	2.20	0.99-4.89

Standard errors are in parentheses ( )
* Significance $p<0.05$ level

Results of the logistic regression analysis are presented in Table 4. Three of the explanatory variables and three control variables were significant ($p<.05$). Those nutritionists who felt confident in performing oral health risk assessments (OR=2.12), confident in making dental referrals (OR=3.02), and confident in achieving expected referral outcomes (OR=3.11) were more likely to refer 1- to 5-year-old children frequently or very frequently than those who were not confident. WIC nutritionists who were 40 years of age or older were more likely to refer than younger workers (OR=2.14). WIC nutritionists who had increased frequency of exposure to dental problems in their clients (OR=3.02) and to parents who asked for dental referrals more frequently (OR=2.49) also were more likely to refer compared to the reference groups. No other variables in the model were statistically significant.

Discussion

The results of this study are encouraging because nutritionists in North Carolina WIC programs are making referrals for dental care for children one to five years old. However, a smaller percentage of nutritionists supported the referral of a 1-year-old child at low risk for dental caries (41.8%) than a high-risk 1-year-old (86.6%), or a low- (89.3%) or high- (97.5%) risk 3-year-old child. Because children in the WIC program fall below 185% FPL, they can all be considered "high risk." The finding that WIC nutritionists would refer most chil-

dren is promising. These findings suggest that these nutritionists are more in agreement with referral guidelines of the American Academy of Pediatrics than those of the American Academy of Pediatric Dentistry, which recommend a dental visit by age 1 for all children (19). These results on the nutritionists' views on referral of young children probably reflect the difficulties of dental access for very young, low-income children in North Carolina and the US. Many general dentists do not feel comfortable in managing young children, and there are not enough pediatric dentists to serve the demand.

The major finding of this study is that nutritionists with greater sense of self-efficacy and outcome expectancy related to their ability to perform oral health risk assessments and counsel parents were more likely to make dental referrals than those who lacked confidence. Social cognitive theory of self-efficacy developed by Bandura supports the idea that the greater one's self-efficacy for completing a task successfully, the more likely that person is to engage in the task (14). Traditional self-efficacy theory applies to individuals and how they promote their own behavior. A more recent application of social cognitive theory is its use in helping to explain how health care professionals behave professionally as they counsel and treat patients. This study is the first to examine the role of nutritionists' confidence in their professional dental behaviors, and their relationship to dental referrals.

Few studies exist in nutrition and dentistry that examine the role of self-efficacy and outcome expectancy in professional behaviors. However, a number of recent studies in medicine and nursing illustrate the effects of self-efficacy on professional behavior. Silverstein and colleagues (20) reported that pediatricians with greater confidence in their ability to make referrals to Head Start were more likely to refer patients to this program than those with lower self-efficacy. Recent work by Cabana *et al.* (21) found that physicians with greater self-efficacy in counseling about smoking cessation were more likely to engage in this activity with their patients. In a similar study by Ozer *et al.* (22), physicians' confidence in their ability to screen for risky health behaviors was positively correlated with the provision of preventive services. This study is consistent with these findings and suggests that greater self-efficacy in performing certain professional services are related to an increase in providing these services.

This finding has important implications for public health and may indicate where training efforts should be directed. Because of the growing problem of access to dental care, health providers must work together to ensure the health and well being of children. WIC nutritionists often see children before any dental health professionals see them. Therefore, oral health policy makers recently have targeted nutritionists as a logical part of the public health workforce to augment the provision of preventive oral health care. They can provide valuable services to many children if they have the proper training and confidence in their abilities. The more confidence they have in recognizing dental problems and making referrals, the more children are likely to benefit from finding a dental home and beginning preventive oral health care early in life.

Self-efficacy and outcome expectancy appear to be better predictors of referral behavior than knowledge and a number of other characteristics of nutritionists and their work environment. Training efforts may need to be focused on boosting confidence and self-efficacy through continuing education that involves techniques such as hands-on training sessions. Encouraging ease of making dental referrals and establishment of amiable relationships between dentists in the community and WIC nutritionists may also increase their confidence in making referrals for clients. Future research should also work to identify what follow up is done after dental referrals are made.

The effectiveness of training geared toward confidence boosting has been studied most often in the field of nursing. For example, Murdock and Neafsey (23) illustrated that self-efficacy increased after an intensive continuing education course. Further, Lorenz *et al.* (24) found that training efforts geared towards mastery of clinical skills will increase self-efficacy. Their study also suggests that changes in self-efficacy are related to changes in practice. Training aimed at increasing self-efficacy and confidence of WIC nutritionists may lead to increased rates of dental referrals and if so, more children will benefit from appropriate dental care. However, intervention studies are needed to determine if professional dental educational interventions directed toward WIC nutritionists will increase confidence and result in increased referral activities.

The results of this study should be considered in light of a few study limitations. First, results are based on a self-completed questionnaire and therefore all responses are subject to self-reporting bias. Questions that asked the frequency of performing an activity might be influenced by recall bias on the part of the nutritionists. The authors also did not collect data on dentist availability and success of the referral. Another limitation is that the study uses a cross-sectional design. Thus, statistical associations between confidence and referral practices may not be causal and will need confirmation in studies that can determine that confidence occurs before practice rather than the reverse. Third, the results might not have external validity. Results are based on nutritionists working in North Carolina WIC programs, and they might not be representative of nutritionists in other state programs. Finally, the constructs used to measure confidence have not been tested for reliability and validity.

Conclusions

This study represents the first effort to assess the knowledge, self-efficacy, outcome expectancy and dental referral practices of WIC nutritionists. Confidence in performing oral health risk assessments, confidence in making dental referrals, and confidence

that parents will seek dental care after advised to do so were associated with an increased likelihood of making dental referrals for children one to five years of age. Public health efforts centered on training WIC nutritionists about oral health, how to perform risk assessments and how to effectively refer a child to a dentist may need to use those methods that are most successful in increasing confidence. More training of public health workers such as WIC nutritionists may lead to improvements in access to care, as many children are seen in the WIC program before any dental health care provider sees them. However, intervention studies are needed to confirm that increasing WIC nutritionists' confidence in oral health practices will lead to improved use of dental services. Additional studies are also needed to examine how to assist WIC families to overcome perceived barriers such as language and transportation.

References

1. Brown JL, Wall TP, Lazar V. Trends in untreated caries in children 2-10 years old. J Am Dent Assoc. 2000;131:93-100.
2. Vargas CN, Crall JJ, Schiender DA. Sociodemographic distribution of pediatric caries: NHANES III, 1988-1994. J Am Dent Assoc. 1998;129:1229-38.
3. Weinstein P. Research recommendations: Pleas for enhanced research efforts to impact the epidemic of dental disease in infants. J Public Health Dent. 1996;56:55-60.
4. Centers of Disease Control. Progress reviews for Healthy People 2000: oral health. Briefing book materials: disparity charts. December 1999.
5. Bailit HL, Beazoglou TJ. State financing of dental education: impact on supply of dentists. J Dent Educ. 2003;67: 1278-85.
6. Lewitt EM, Monheit AC. Expenditures on health for children and pregnant women. Center for Future of Children. US health care for children. Los Altos, CA: Center for the Future of Children, David and Lucille Packard Foundation, 1992.
7. North Carolina Food and Nutrition Services. The Supplemental Program for Women, Infants and Children training manual, 1999.
8. Faine MP, Oberg D. Survey of dental nutrition knowledge of WIC nutritionists and public health dental hygienists. J Am Diet Assoc. 1995;95:190-4.
9. Food, Nutrition and Consumer Services. Nutrition program facts. Available at: www.fns.usda.gov.
10. Ripa LW. Nursing caries: a comprehensive review. Pediatr Dent. 1988;10:268-82.
11. McCunniff MD, Damiano PC, Kanellis MJ, Levy SM. The impact of WIC dental screening and referral on utilization of dental services among low-income children. Pediatr Dent. 1998;20:181-7.
12. Sergent JD, Attar-Abate L, Meyers A, Moore L, Kocher-Ahern E. Referrals of participants in an urban WIC program to health and welfare services. Public Health Reports. 1992;107:173-8.
13. Lee JY, Rozier RG, Norton EC, Kotch JB, Vann WF. Effects of WIC participation on children's use of oral health services. Am J Public Health. 2004; 94:772-7.
14. Bandura A. (1986) "Social foundation of thought and action: a social cognitive theory." Prentice-Hall, Englewood Cliffs, NJ.
15. Dental screening and referral of young children by pediatric primary care providers. Pediatrics. 2004;114:e642-52.
16. Andersen R, Revisiting the Behavioral Model and access to medical care: Does it matter? J Health Soc Behav. 1995; 36:1-10.
17. Centers for Disease Control and Prevention. Brush up on healthy teeth quiz for parents. Available at: www.cdc.gov/oralhealth.
18. Talekar BS, Rozier RG, Slade GD. Development of an instrument to measure oral health-related quality of life of preschool children. Quality of Life Research (Under Review)
19. American Academy of Pediatrics and American Academy of Pediatric Dentistry. Available at: www.aap.org and www.aapd.org.
20. Silverstein M, Grossman DC, Koepsell TD, Rivara FP. Pediatricians' reported practices regarding early education and Head Start referral. Pediatrics. 2003;111:1351-7.
21. Cabana MD, Rand C, Slish K, Nan B, Davis MM, Clark N. Pediatrician self-efficacy for counseling parents of asthmatic children to quit smoking. Pediatrics. 2004;113:78-81.
22. Ozer EM, Adams SH, Gardner LR, Mailloux DE, Wibbelsman CJ, Irwin CE. Provider self-efficacy and the screening of adolescents for risky health behaviors. J Adolesc Health. 2004;35: 101-7.
23. Murdock JE, Neafsey PJ. Self-efficacy measurements: an approach for predicting practice outcomes in continuing education? J Contin Educ Nurs. 1995;26(4):158-165.
24. Lorenz R, Gregory RP, Davis DL. Utility of a brief self-efficacy scale in clinical training program evaluation. Evaluation & the Health Professions. 2000;23(2):182-193.