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## Factors associated with receiving treatment for dental decay among Medicaid-enrolled children younger than 12 years of age in Iowa, 2010

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### Abstract

**Objectives**—The Iowa Department of Public Health I-Smile program provides dental screening and care coordination to over 23,000 low-income and Medicaid-enrolled children per year. The purposes of this study were to evaluate I-Smile program effectiveness to ensure that Medicaid-enrolled children obtained dental treatment after having been screened and to determine the factors associated with failure to receive dental care after screening through the I-Smile program.

**Methods**—Based on I-Smile program priorities, we limited our sample to children younger than 12 years of age who screened positive for decay and who linked to a paid Medicaid claim for dental treatment ( $n = 1,816$ ). We conducted bivariate analyses to examine associations between children's characteristics who screened positive for decay and received treatment within 6 months of their initial screening. We also performed multivariate logistic regression to assess the association of sociodemographic characteristics with receipt of treatment among children who screened positive for decay.

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**Results**—Eleven percent of children screened positive for decay. Nearly 24 percent of children with decay received treatment based on a Medicaid-paid claim. Being 5 years or older [adjusted odds ratio (aOR): 1.48, confidence interval (CI): 1.17, 1.88] and not having a dental home (aOR: 1.90, CI: 1.41, 2.58) were associated with higher odds of not receiving dental treatment.

**Conclusions**—Children 5 years and older and without a dental home were less likely to obtain dental treatment. Opportunities exist for the I-Smile program to increase the numbers of at-risk children with dental homes and who obtain dental care after screening.

### Keywords

dental home; oral health; dental; dental caries; dental screening; Medicaid; pediatric oral health

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### Introduction

Approximately 42 percent of children aged 2 to 11 years have had tooth decay in their primary teeth; 21 percent of children aged 6 to 11 have had tooth decay in their permanent teeth (1). Children from low-income families have a higher risk for decay compared with children from high-income families (2). Although over two-thirds of low-income children receive public assistance for dental care, such as Medicaid or the State Children's Health Insurance Program (3), disparities exist between decay experience in Medicaid-enrolled children and children covered through other forms of insurance (4,5).

Sociodemographic characteristics may explain decay disparity among children. African-American children (6,7) and children of Hispanic ethnicity (6,8) have significantly more barriers to obtaining dental care than children of other races and ethnicities. A child's sex, age, parents' educational attainment, and household income also have been associated with the frequency of child's dental care (6, 7, 9). Children living in rural communities also are less likely to receive dental visits, fluoride applications, have a dental home (10), and commonly experience dental caries (11).

The American Dental Association recommends children begin dental exams by 12 months while the American Academy of Pediatric Dentistry (AAPD) suggests that children have an established dental home before 12 months to assure good oral health and prevent dental disease (12,13). In December 2006, the Iowa Department of Public Health (IDPH) instituted the I-Smile program to ensure that Medicaid-enrolled children in Iowa have a dental home and that they obtain appropriate dental care. For this program, dental screenings are performed by dental hygienists and nurses at public health settings, such as Women, Infant and Children (WIC) clinics, using the Association of State and Territorial Dental Directors Basic Screening Survey recommendations. The I-Smile program strives to ensure that all children receive follow-up care (exams and treatment) after screening that meets or surpasses the 58 percent of privately insured children (aged 0–20 years) receiving dental services (14).

IDPH funds local public health and private nonprofit agencies through the Title V Maternal and Child Health (MCH) Program to develop community-based systems of preventive health care for uninsured, underinsured, and Medicaid-enrolled low-income pregnant

women, children under 22 years of age, and their families. The I-Smile program, a component of Iowa's Title V MCH Program, provides dental screenings, dental care referrals, and care coordination to Medicaid-enrolled children.

The Iowa Department of Human Services oversees the Iowa Medicaid program. The Medicaid program reimburses Title V MCH agencies for services such as care coordination to link children with dentists and to ensure children obtain appropriate dental care for gap-filling preventive services such as dental screenings and fluoride varnish applications. The purposes of this study were to evaluate I-Smile program effectiveness to ensure that after having been screened, Medicaid-enrolled children obtained dental care at the same or better rate than privately insured children, and to determine the factors associated with failure to receive dental care after screening through the I-Smile program.

## Methods

### Data sources

**Child and Adolescent Reporting System**—The IDPH uses the Child and Adolescent Reporting System (CAREs) to track services provided by local Title V MCH agencies. We selected CAREs data for the time period of January to April 2010. Because the I-Smile program focuses on children younger than 12 years, we limited our data to Medicaid-enrolled children younger than age 12 years (15). Approximately 67 percent of the children seen at Title V agencies are enrolled in Medicaid. CAREs data included the child's name, race, ethnicity, language spoken at home, sex, date of birth, county of residence, dental screening results (positive or negative for decay), dental screening date, medical home (yes/no), dental home (yes/no), parents' educational levels, and child's Medicaid identification number. Per the I-Smile protocol, decay is identified as having a visible cavity or hole in the tooth, brownish color on the wall of the cavity, or a retained root.

In CAREs, the term *medical home* means that the child has a usual source of medical care. This care is available 24 hours a day, 7 days a week, and the source of care maintains the child's medical record. CAREs defines *dental home* as the child having a usual source of dental care (the Title V MCH agency may be considered by the parent as the child's usual source of dental care); the source of care maintains the child's dental record, and the child has seen the dentist within the past 12 months.

**Medicaid-paid claims**—We used paid claims for children who received services between January and October 2010 and with any D2140–2999, D3220–3999, and D7111–7998 dental procedure codes. D2140–2999 codes are procedures that are likely to be performed to treat decay. These procedures are amalgam restorations, filled or unfilled resin restorations, crowns, recement inlay, recement crowns, prefabricated stainless steel crown in primary and permanent teeth, and prefabricated resin. D3220–3999 codes include pulpotomy and root canal procedures. D7111–7998 codes are oral surgery procedures. Children who received only D7111–7998 codes were eliminated from the dataset as many extractions may not have been associated with a cavity versus those conducted for other reasons unrelated to our study. We assumed that children receiving D2140–D2999 and D3220–D3999 codes were treated for decay.

## Linkage procedure and study sample

The study sample was derived from the linked file of CARES data and Medicaid claims data. The initial CARES dataset included information on 23,949 children who received dental screenings (Figure 1). After de-duplication of the CARES dataset, 16,109 children remained in the dataset. The initial Medicaid claims dataset contained 153,008 claims. After de-duplication of the Medicaid claims, 26,378 children remained. We used child's last name, first name, and Medicaid identification number to link the dataset. We used LinkPro and manual review for data linkage. A child was categorized as having received care if the child's CARES record linked to a Medicaid-paid claim. We linked 1,369 CARES records to a Medicaid-paid claim. Of linked records, 935 had a Medicaid-paid claim within 6 months of the screening date. The study sample was then limited to a de-identified dataset of 1,816 children who had screened positive for dental decay; of these, 428 linked to a Medicaid claim and 1,388 did not link to a Medicaid-paid claim. This study was reviewed and approved by the Emory University Institutional Review Board and deemed to be exempt.

## Measures

Treatment was defined as having had a Medicaid-paid claim (any D2000 code or D3000 code) within 6 months of the child's first screening date. The 6-month interval was based on the caries management by risk assessment (CAMBRA) guidelines (16) and an I-Smile risk assessment developed in 2006, adapted from recommendations by the AAPD (17). Using the I-Smile risk assessment guidelines for Title V MCH programs, children screened within I-Smile who are determined to be at moderate risk of tooth decay are recommended to see a dentist within 3–6 months of the screening. The CAMBRA guidelines also indicate the need for a re-care exam within 3–6 months for moderate risk children. Children who had a Medicaid claim after the 6-month interval were not recorded for having dental treatment and therefore were not included in this study.

All continuous variables were re-coded as categorical variables. The final set of independent variables used in analysis were public health region of the state (central, north, northwest, southwest, southeast, east central, and out-of-state/ unknown), level of rurality based on the suggested categorizations by Health Resources and Services Administration (metropolitan standard area excluding central city, central city, rural adjacent to urban, and rural not adjacent to urban) (18), child's race/ethnicity (white non-Hispanic, black non-Hispanic, other non-Hispanic, Hispanic all races, and unknown), language spoken at home (English, Spanish, other, and unknown), medical home (yes/no), dental home (yes/no), child's sex, and child's age (younger than 5 years and 5 years or older). In our interpretation of the age variable, we considered age 5 years and older to be school-aged. Our dichotomous dependent variable was receipt of dental care (yes/no) within 6 months of a positive screen for dental decay.

We excluded variables with less than 80 percent complete information; specifically, parents' educational level (72.9 percent had complete information) and whether the child had a developmental delay (72 percent had complete information). Child's race (84.1 percent complete information) and language spoken at home (93.2 percent complete information) each had sufficient data to complete descriptive statistics and the bivariate analysis, but we

excluded these variables from regression analysis, because including them resulted in disproportionate exclusion of minority groups and children who did not speak English, as CARES program administrators voiced concern that the lack of data recorded most likely reflected data recorders' anxiety to ask minority children about their race/ethnicity.

We used SAS 9.3 (SAS Institute Inc., Cary, NC, USA) to conduct the data analysis. We performed descriptive statistics and chi-square tests for association. We performed logistic regression for the outcome variable of not receiving treatment, and we included all significant variables ( $P < 0.05$ ) in the chi-squared analyses (excluding race/ethnicity and language) into our model.

## Results

Overall, 1,816 of the children (11.3 percent) screened positive for decay (Figure 1); 24 percent of children who screened positive for decay received treatment. In descriptive analysis (Table 1), nearly 67 percent of the children were white non-Hispanic, 92 percent had a medical home, and nearly 70 percent had a dental home. Slightly more children screened positive for decay were younger than age 5 years (56.8 percent) compared with children 5 years and older.

Results of the bivariate analyses are depicted in Table 2. With the exception of child's sex, all variables have a highly significant association ( $P = 0.02$ ) with receipt of treatment. Dental home was significantly associated with receiving treatment. Lack of medical home was significantly associated with lack of dental treatment ( $P = 0.01$ ).

In the full multivariate model, two variables (dental home and age) were significantly associated with children's failure to receive treatment (Table 3). Those children who did not have a dental home were significantly less likely to receive treatment than those with a dental home [adjusted odds ratio (aOR) 1.90, 95 percent confidence interval (CI) 1.41, 2.58]. In addition, among those with decay, children who were at least aged 5 years were less likely than children aged 4 years and younger to receive treatment (aOR 1.48, CI 1.17, 1.88).

## Discussion

A critical component to measure the success of I-Smile is the ability of the program to link children to dental care. Although the I-Smile program uses care coordination, education, and preventive services to link children with dental homes, almost a quarter of children in this study did not have a dental home. I-Smile reports show that many more children are receiving care since the program began, but this evaluation demonstrates that barriers still exist to receiving dental care for some families (19). This evaluation further supports that a dental home is important in linking children to dental treatment and the program should continue its efforts to expand dental homes to all enrolled.

In contrast to other researchers (20), we found that older children were more likely not to receive care for caries, compared with children younger than 5 years. This could reflect the fact that younger children are usually screened with their parent/guardian present, allowing the screener to put emphasis on the importance of completing the needed referral.

Additionally, children aged 3–6 years are required by Iowa law to be screened (21), although there is no requirement for the child to be treated. Prior research has indicated that children enrolled in Head Start are more likely to visit dentists for both preventive visits and treatment (22), which could explain how the influence of another program has helped to improve oral health for children younger than 5 years.

This study had at least four limitations.

- First, the initial data collection had discrepancies and data linking could have introduced additional flaws. Data collected in CARES occasionally differed from data collected in Medicaid claims. These included name misspellings, incorrect numbers for Medicaid identification, and missing sociodemographic characteristics. During the matching process, data were subjected to one match with data blocked (a linkage strategy to partition records by selected variables to reduce number of comparisons needed by comparing only record pairs where links are likely to be found) on birthdate and might have received additional matches if run several times using other blocking variables (23). The matches used were obtained from the matching combination that produced the highest number of matches. We did not submit data through multiple matches using different blocking variables because the blocking variable used (birthdate) had no missing data. The last name variable also did not have missing data, but last names could have been spelled incorrectly or a child may have multiple last names. Blocking only by birth-date was the most credible when matching the data.
- Children identified in the screening data may have received treatment without using Medicaid for payment. Dentists could have provided care at no charge, which would cause these treatment records to be unrecorded in the state's Medicaid claims. Other children may have become ineligible for Medicaid payment during the 6 months after the initial screen.
- We could not analyze parents'/guardians' education and whether the child had a developmental delay and excluded race/ethnicity and language from regression analysis because the data were incompletely recorded. Variables such as race and ethnicity had previously been shown to be negatively associated with dental care receipt. Had we been able to include race and ethnicity, we may have found a stronger relationship between the risk factors and outcome.
- Finally, the Medicaid-paid dental claims may not represent treatment as a result of decay. Because dentistry does not use diagnosis coding, this study inferred that claims for procedure codes D2140–2999 and D3220–3999 were due to presence of decay, yet this cannot be fully determined through the study parameters. The study also infers that the screening initiated a treatment visit. This could be coincidental and not associated with screening. In addition, because dentists have a full year following date of service to submit a claim, some claims may not have been filed by the time the data matches were done. There were 4 months remaining until the 1-year mark (October 2010) when we requested Medicaid-paid claims in June 2011. When requesting data, we used the assumption that most Medicaid claims

were already submitted for that year, as that is the established policy followed for using Medicaid claims data when linked to the birth certificate in Iowa.

About 76 percent of children screening positive for decay did not have a Medicaid claim for receiving dental treatment. Additionally, although not having a dental home was significantly associated with not receiving treatment, 73.3 percent of children who screened positive for caries and who had a dental home were not treated. Understanding whether children received care paid through some other method (private insurance, self-pay, etc.) or if a dentist determined the need to not provide treatment immediately (diagnosing incipient decay and preferring to check again at a later date) would help to better clarify how many children needed treatment but did not receive it. Identifying why dental treatment was (dentist agrees with the determination of decay from screening or dentist accepts Medicaid, for example) or was not provided (unwillingness to accept Medicaid or to provide care for young children, for example) will be beneficial for quality improvement and prioritizing resources within future programming (24,25).

To uncover the barriers to receiving treatment, a longer study period can help to discover if findings from this study are unique to the study period. Including the severity of cavities and their relationship with receiving treatment would strengthen future studies. The dominant finding in the bivariate analysis is that no subgroup achieves I-Smile's objective of receiving documented treatment in the same proportion (58 percent) as the private sector (14). Bivariate results could be because the 58 percent includes all documented dental services for children and young adults aged 0–20 years, rather than just the proportion of those 0–20 who received treatment. To determine whether race and ethnicity play any role in receipt of dental care, Title V child health staff should consistently collect these data. Continuing dental screenings as part of the I-Smile program and care coordination to ensure restorative treatment sought upon screening positive for decay will benefit Iowa children. Because older children who are screened may be less likely to receive their follow-up care, enhanced care coordination services may be important. The findings of the study will further assist IDPH and dentists in better understanding the importance of having a dental home in order to receive treatment for decay.

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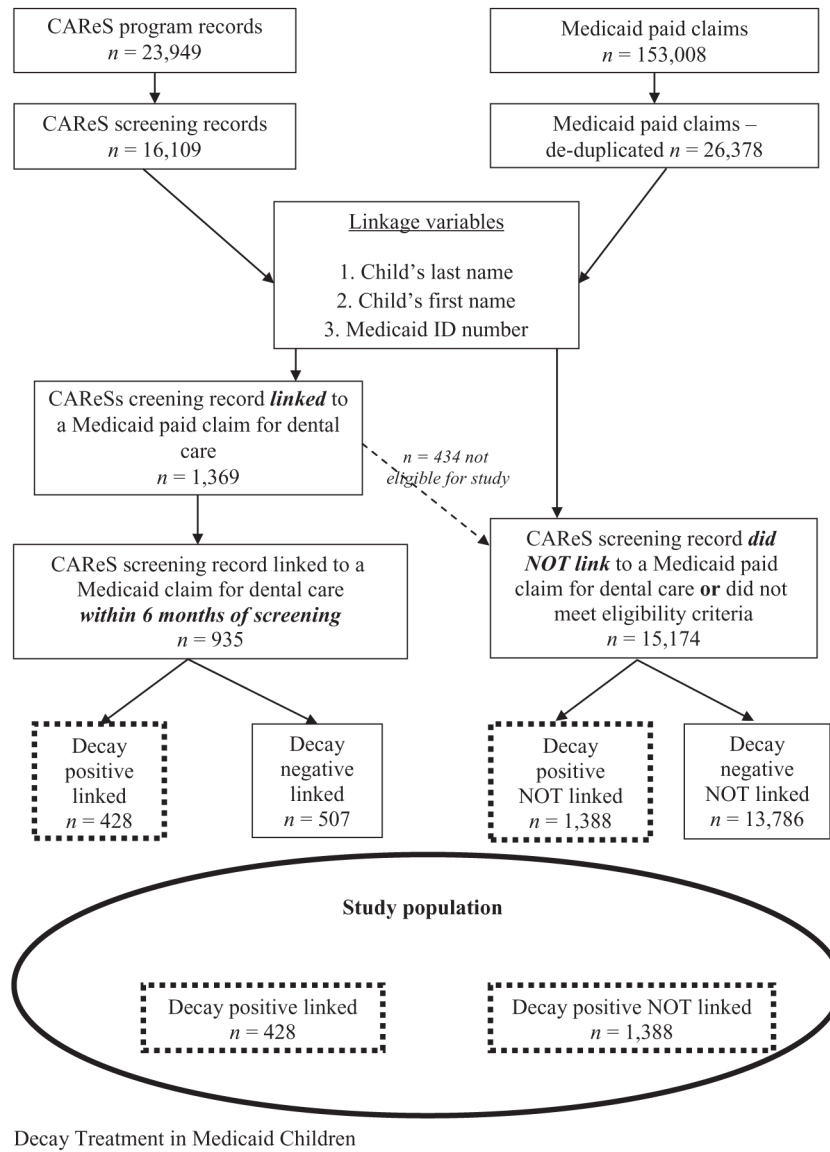
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**Figure 1.** Children less than 12 years of age screened for dental decay, January to April 2010, Iowa. CAREs, Child and Adolescent Reporting System.

**Table 1**

Characteristics of Medicaid-Enrolled Children Who Screened Positive for Decay at Their Initial Screening, Iowa 2010

<b>Total study population</b>		<b>n = 1,816</b>	
<b>Variable</b>	<b>Number</b>	<b>Percent</b>	
Age			
Younger than 5 years	1,031	56.8	
5 years and older	785	43.2	
Race/ethnicity			
Non-Hispanic white	1,211	66.7	
Non-Hispanic black	143	7.9	
Non-Hispanic other races	39	2.2	
Hispanic – all races	132	7.3	
Unknown	291	16.0	
Sex			
Male	957	52.7	
Female	845	46.5	
Unknown	14	0.8	
Language spoken at home			
English	1,461	80.5	
Spanish	184	10.1	
Other	38	2.1	
Unknown	133	7.3	
Rurality of residence			
Central city	571	31.4	
MSA, excluding central city	246	13.6	
Rural adjacent to urban	441	24.3	
Rural NOT adjacent to urban	529	29.1	
Unknown	29	1.6	
Medical home			
Yes	1,674	92.2	
No	74	4.1	
Unknown	68	3.7	
Dental home			
Yes	1,258	69.3	
No	417	23.0	
Unknown	141	7.8	

MSA, metropolitan standard area.

**Table 2**

Bivariate Associations between Medicaid-Qualified Children's Characteristics Who Screened Positive for Decay and Received Treatment within 6 Months of Their Initial Screening, Iowa 2010

<b>Total study population</b>		<b><i>n</i> = 1,816</b>	
<b>Variable</b>	<b>Number</b>	<b>Percent treated</b>	<b><i>P</i> value</b>
Age			<0.0001
Younger than 5 years	1,031	27.0	
5 years and older	785	19.1	
Race/ethnicity			<0.0001
Non-Hispanic white	1,211	24.2	
Non-Hispanic black	143	33.6	
Non-Hispanic other races	39	25.6	
Hispanic – all races	132	27.3	
Unknown	291	14.1	
Sex			0.05
Male	957	22.6	
Female	845	25.1	
Unknown	14	0	
Language spoken at home			0.0006
English	1,461	23.8	
Spanish	184	29.9	
Other	38	29.0	
Unknown	133	10.5	
Rurality of residence			0.01
Central city	571	26.6	
MSA, excluding central city	246	28.9	
Rural adjacent to urban	441	20.4	
Rural NOT adjacent to urban	529	21.2	
Unknown	29	10.3	
Medical home			0.01
Yes	1,674	24.3	
No	74	20.3	
Unknown	68	6.8	
Dental home			<0.0001
Yes	1,258	26.7	
No	417	15.4	
Unknown	141	20.6	

MSA, metropolitan standard area.

**Table 3**

Adjusted Odds Ratios (aORs) for Not Receiving Treatment with 6 Months of Screening among Medicaid-Qualified Children Who Screened Positive for Decay, Iowa 2010

Variable	OR	Confidence interval
Age		
Younger than 5 years	REF	
5 years and older	1.48	1.17–1.88
Rurality of residence		
Central city	REF	
MSA, excluding central city	0.84	0.55–1.29
Rural adjacent to urban	1.24	0.83–1.88
Rural NOT adjacent to urban	1.27	0.89–1.80
Medical home		
Yes	REF	
No	0.98	0.54–1.79
Unknown	2.87	1.21–6.84
Dental home		
Yes	REF	
No	1.90	1.41–2.58
Unknown	1.27	0.80–2.01

CI, confidence interval; MSA, metropolitan standard area; OR, odds ratio.