

EVALUATING THE QUALITY AND EFFICACY OF CARE PROVIDED BY
EXTENDED CARE PERMIT DENTAL HYGIENISTS IN A SCHOOL
BASED DENTAL HOME

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by
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ABSTRACT

Lack of access to oral health care is a growing problem for low income children in the United States. One proposed solution to this problem is utilizing dental hygienists to the full extent of their education and training. In 2003, Kansas altered the dental hygiene scope of practice and supervision regulations through the creation of the extended care permit (ECP) dental hygienist. In 2008, a school-based oral health intervention, that utilized ECP dental hygienists to provide preventive oral health care and referrals, was established in a Midwestern city suburb. The purpose of this case study was to assess the quality of oral health care provided by ECP dental hygienists. The central hypothesis of this investigation was ECP dental hygienists provide quality oral health care that improves the oral health of underserved children in a school-based setting. Using a case-study design, electronic medical records of children (n=986) who participated in the intervention were mined for data. Numerators and denominators from the Dental Quality Alliance Concept Set provided the framework for measurement. Patient-oriented outcomes were examined in a multi-encounter cohort (n=295) using MANOVA and Kruskal Wallace. Results revealed 26.3% of the

children eligible to participate in the intervention chose to do so. On average 96.6% of the children were provided a minimum of one topical fluoride application and 34.0% had at least one sealant placed. Nearly half (48.7%) of the program participants had two or more topical fluoride applications. On average 52.8% of the children had sealants placed. The number of encounters with ECP dental hygienists had a statistically significant effect on changes in decay ($p=0.014$), changes in restorations ($p=0.002$) and changes in treatment urgency ($p=0.022$). A statistically significant effect of the number of fluoride applications on changes in restorations ($p=0.031$) was also present. These results suggest ECP dental hygienists can provide access to and the provision of timely and appropriate quality oral health care for low income children in a school-based setting and oral health care provided by ECP dental hygienists can improve the oral health status of low income children who lack access to oral health care.

APPROVAL PAGE

The faculty listed below, appointed by the Dean of the School of Graduate Studies have examined a dissertation titled “Evaluating the Quality and Efficacy of Care Provided by Extended Care Permit Dental Hygienists in a School Based Dental Home” presented by Melanie Simmer-Beck, candidate for the Interdisciplinary Doctor of Philosophy degree, and certify that in their opinion it is worthy of acceptance.

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CHAPTER 1

INTRODUCTION

Anna, a five year old child in kindergarten, had brown decayed teeth, stagnant breath, and did not smile. Her family and teachers noticed the poor condition of her teeth and rancid smell, but, did not comprehend the gravity of her infection and its associated complications. The severely diseased condition in Anna's mouth was not addressed until Anna received preventive dental care, in her elementary school, by a dental hygienist with an extended care permit (ECP). Anna was immediately referred to a local dentist who diagnosed extreme decay in every tooth and severe malnourishment. She was instantly scheduled for dental care in a hospital under general anesthesia. Anna had one tooth removed and all the remaining teeth had root canals and crowns. The cost for this care was more than \$20,000 (Vaughn-Barker 2008).

Unfortunately, Anna's scenario is not unusual. Accessing oral health care is a growing problem for children in the United States (U.S.) where an estimated 1 out of 5 children go without dental care each year (The Kaiser Commission on Medicaid and the Uninsured 2010). Poor children are twice as likely to have untreated decay as their peers (Dye et al. 2007). A 2007 survey of 86,730 households, with children ages 1-17, revealed 16.3% of children at or under 100% federal poverty level (FPL) experienced a toothache within the last six months (Lewis and Stout 2010). According to a 2007 federal Centers for Disease Control and Prevention (CDC) study, the proportion of children between 2 and 5 years old with caries increased 15 percent during the past decade and poor children continue to suffer the most from dental decay (Dye et al. 2007). Nationally, in 2007, just 38.1 percent

of Medicaid-enrolled children between ages 1 and 18 received any dental care. In contrast, an estimated 58 percent of children with private insurance receive care each year (Manski and Brown 2008). The US Department of Health and Human Services reported over 16 million children enrolled in Medicaid were not provided any type of dental care in 2009 (U.S. Department of Health and Human Services and Centers for Medicare and Medicaid Services 2009). These statistics are reflective of the difficulty low income children have accessing oral healthcare often as a result of the small number of Medicaid providers (Mouradian et al. 2000; U.S. Department of Health and Human Services and Centers for Medicare and Medicaid Services 2009; The Kaiser Commission on Medicaid and the Uninsured 2010; Weno K. et al. 2012).

The burden of untreated oral and dental disease falls more heavily on children without health insurance, than those with insurance, as they are more likely to lack a dental home, to delay care, or to have unmet needs (The Kaiser Commission on Medicaid and the Uninsured 2010). The Kaiser Foundation reviewed the basic profile of the uninsured population and discovered uninsured children with common childhood illnesses and injuries do not receive the same level of care as children with insurance (The Kaiser Commission on Medicaid and the Uninsured 2010). Similar to uninsured children, the burden of untreated oral and dental disease also falls on children with Medicaid. A significant number of these children include racial and ethnic minorities (US Government Accountability Office 2008).

Poor oral health commonly leads to dental caries, the most prevalent chronic disease in children, occurring 5 to 8 times more frequently than the second most common condition, asthma (U.S. Department of Health and Human Services 2000). As a result of untreated dental disease, children experience unnecessary pain, miss a significant number of school

days, are less engaged in class, have low self-esteem, and eventually poor oral health may lead to difficulty finding a job and other health problems such as diabetes and heart disease (US Government Accountability Office 2008; The PEW Center for the States 2010; Jackson et al. 2011). The long term consequences of poor dental health among children are far worse than most people realize.

Untreated oral disease also results in large dental bills that could be avoided with proper oral hygiene habits and preventive care (US Government Accountability Office 2008). Significant costs are incurred when hospital emergency rooms provide emergency oral health care (Davis et al. 2010). In 2010, Kansas hospitals reported more than 17,500 dental-related visits to emergency rooms (The PEW Center for the States 2012). At the same time the Kansas City, MO Community Health Assessment revealed the costs for dental-related visits to the emergency room at approximately \$6.9 million dollars (Health Department Kansas City MO 2010).

Oral Health Delivery Structure and Access to Care

Oral health disease is a complex problem resulting primarily from the structure of the oral healthcare delivery system which does not provide access for individuals living in dental health provider shortage areas (DHPSAs), individuals with low income, and individuals who are uninsured (U.S. Department of Health and Human Services 2000). Dental providers are frequently located in metropolitan areas and the provision of care routinely occurs in private offices via one or two oral health care providers. It has been estimated that 94 percent of the people living in DHPSAs have unmet dental care needs (U.S. Department of Health and Human Services 2000). A variety of factors contribute to inadequate dental access for high risk populations, these include; geographic maldistribution

of clinicians, inadequate numbers of oral health professionals treating Medicaid eligible children, few pediatric dentists, individuals' knowledge and attitudes concerning oral health, lack of dental insurance, and difficulties interacting with culturally-diverse populations (Mouradian et al. 2000).

Currently, the Health Resources Services Administration (HRSA) estimates a shortage of 10,000 dentists in the United States (HRSA Data Warehouse 2012). Deficiencies in the structure of the oral health work force and shortage of providers has been a chronic problem in the U.S. At a recent oral health conference, the former Surgeon General, David Satcher issued a “renewed call for action to expand access to oral health care” (WorldDental.org 2012). Satcher accentuated how the Affordable Care Act will provide an opportunity to increase dental benefits coverage to more than five million additional children. He said, “Adding dental benefits will not translate into access to care if we do not have providers in place to offer treatment” (WorldDental.org 2012).

A disproportionate number of vulnerable and underserved populations encounter unrelenting and systemic social, cultural, economic, structural, and geographic barriers accessing oral health care in a typical setting (Committee on Oral Health Access to Services Institutes of Medicine and National Research Council 2011). The Department of Health and Human Services reported in 2012 only 18% of Kansas children enrolled in Medicaid or CHIP received preventive dental services and only 7% of the children received dental treatment. This is well below the 2012 U.S. mean where 41% of children enrolled in Medicaid or CHIP received preventive dental services and 23% received dental treatment (Department of Health and Human Services 2012).

The target population of this study is not immune to the deficiencies in the current oral healthcare structure. During the 2010-2011 school year 64 parents, whose children were patients in the school-based oral health program, were surveyed about their ability to access care. Results revealed 22% of the children had been in pain and could not access care, 11% percent were having difficulties eating, while 17% of the parents reported that it had been 3 or more years since their child had last visited a dentist, and 11% reported their child had never visited a dentist (Simmer-Beck 2011). Oral health resources for poor and underserved children in the target community were virtually non-existent.

The setting for this project was in a prosperous metropolitan suburb that is known for being one of the best places to live in the U.S. (Asher et al. 2012). It is not a location where one would expect to find access to care disparities and significant oral health needs. However, the target population lacks access to oral healthcare as a consequence of the small number of providers accepting Medicaid. This is not uncommon. A mere 10% of dentists nationwide participate in Medicaid, leaving many children who qualify for benefits without a clinician to provide the needed dental care (Mouradian et al. 2000). In 2008, the year the prescribed intervention began, the community had 7 dental providers accepting Medicaid for 2232 children, ages 6 to 17 years old, who had Medicaid benefits (Kansas Health Policy Authority 2008; U.S. Census Bureau 2011). A phone survey of these providers revealed only 4 of the providers routinely accepted new cases (Simmer-Beck et al. 2011).

A notable difference between the structure of medical and dental practices are the lack of independent mid-level dental providers. This is a result of the strict state dental supervision laws. While the medical model utilizes Nurse Practitioners and Physician's Assistants as mid-level providers, dentistry is reluctant to embrace a similar independent

provider system that could expand access to dental care (Beetstra et al. 2002). Furthermore, despite the existence of national accreditation standards on education and training of mid-level oral health care professionals, copious regulations and policies delineating supervision levels and scope of practice vary widely from state to state.

In 2009 the National Research Council and the Institute of Medicine (IOM) formed the Committee on Oral Health Access to Services. The purpose of this committee was to assess the current oral health care system focusing on the delivery of oral health care to vulnerable and underserved populations. The committee constructed 10 recommendations to transform targeted investments in oral health programs and policies. Two of the recommendations target fully utilizing dental hygienists (expanded scope of practice) and filling gaps in research (Committee on Oral Health Access to Services Institutes of Medicine and National Research Council 2011).

RECOMMENDATION 2: State legislators should amend existing state laws, including practice acts, to maximize access to oral health care. At a minimum dental practice acts should

- Allow allied dental professionals to practice to the full extent of their education and training
- Allow allied dental professionals to work in a variety of settings under evidence-supported supervision levels; and
- Allow technology-supported remote collaboration and supervision

RECOMMENDATION 6: The Center for Medicare and Medicaid Services should fund and evaluate state-based demonstration projects that cover essential oral health benefits for Medicaid beneficiaries.

- State-based demonstration projects will help establish a basis for sound policy and fiscal decision making both for participating states and for future federal and state actions.

The committee acknowledged “Improving access to oral health care will necessarily require multiple solutions that use an array of providers in a variety of settings” and concluded “If the current approaches to oral health education, financing, and regulation

continue unchanged, equitable access to oral health care cannot be achieved” (Committee on Oral Health Access to Services Institutes of Medicine and National Research Council 2011).

Relationship of Dentistry to the Public

Throughout history, the scope of dental hygiene practice has been debated at both federal and state levels by policymakers, and it continues to be a source of contention. Disputes over scope of practice have been ongoing since the beginning of dental hygiene in 1910 when Alfred Fones, a well-known dentist in Bridgeport CT, began his campaign to educate a new level of dental care provider, the dental hygienist. Fones argued that the low fees associated with cleaning teeth, combined with the considerable amount of education required to become a dentist, did not make good business sense for dentists to spend time cleaning teeth (Picard 2009). Despite the commitment to financial success of dentists, represented by the National Dental Association, there were concerns that the dental hygienists would overstep boundaries and harm the dentists’ professional status (Picard 2009).

The controversial history between dentists and dental hygienists illustrates the resistance to, and political nature of, expanded scope of practice models. Although dentists don’t have the time, resources, nor desire to provide preventive care to children directly in schools, or to provide care to older adults in long term care facilities, there is a hesitancy to allow dental hygienists expanded scope of practice with direct patient access. Meanwhile individuals at both ends of the lifespan suffer from oral diseases and continue to lack access to oral healthcare. Ultimately it is the patient and the taxpayer who pays the price. Numerous regulations and policies determine how and by whom oral health care is provided. Despite the existence of national accreditation standards on education and training of health

care professionals, regulations delineating supervision levels and scope of practice vary widely from state to state.

Allison Picard addresses the phenomenon between consumer culture, behavior, and dentists in “*Making the American Mouth.*” The book, published in 2009, begins in 1910 in Cleveland Ohio where local officials, in cooperation with the National Dental Association, began a new program of publically funded oral hygiene education and dental prophylaxis for school children. This was a comprehensive school based program, much like the unit analysis for the present study, with four dental clinics located directly in schools. The inauguration of the Cleveland campaign, referred to as “the greatest ever organized for the abolition of disease,” had national significance and unmitigated chronicles of the opening rally were featured in the concurrent issues of the prominent national dental journal, *The Dental Brief* (Litch W.F. 1910). Picard reports dentists were motivated to begin a school based program because they wanted to reshape the way Americans view good health as it relates to preventive dental care and periodic consultation with a licensed dentist. Cleveland dentists and school officials linked the new oral hygiene program with their own personal aspirations of “inculcating good citizenship” in children (Picard 2009).

In one of the poorest schools, Marion Elementary, dentists selected forty students with “the worst dental health” to participate in a study known as Marion School Dental Squad (The Marion School Squad 1911). The purpose of this study was to determine the effect of bad teeth on behavior. Children were offered free dental care and a five dollar gold piece in return for cooperation with dentists’ and teachers’ instructions, performing the tasks “with proper spirit,” and completing all recommended dental treatment. Twenty-eight children completed the study. The results of this program purported “clean, bright, healthy

children with clear complexions, better classroom behavior, improved memory, quickness and accuracy of perception, and a spirit of self-respect” (Report on the activities of the dental nurse in Marion School, Cleveland, Ohio 1911; O'Neill C. 1919; Ebersole W.G. date unknown). Psychological testing of the children and measures in work efficiency showed a at 54% average intellectual improvement (Ebersole W.G. date unknown). The most profound improvement was observed in the children’s classroom behavior where “A spirit of self-respect was engendered that corrected disobedience, truancy, and incorrigibility” (O'Neill C. 1919). Dentists and scientists traveled from locations around the U.S. to observe first-hand the improved dental health and behavior of the children and a variety of journals published the results. The Marion School Dental Class exhibited these results by attending the 1911 annual meeting of the National Dental Association. This began the oral health culture of routine prevention as we know it today (Picard 2009).

Dental Workforce Models

There is widespread agreement among dental providers, dental professional organizations, oral health stakeholders, and states that pockets of the U.S. population have poor oral health and lack access to oral healthcare. The solution to resolving this problem; however, is highly contested. As a result, numerous dental workforce models have been proposed and in some circumstances implemented, to expand the dental workforce. The models vary in types of care that can be provided, supervision, work setting, education, and certification/licensure. The three models described below are most prominent.

In addition to the models described below, individual states have responded through regulatory change. In 2003, Kansas altered the dental hygiene scope of practice and supervision regulations, through the creation of the ECP dental hygienist, ensuring a broader

range of competent oral health care professionals to provide care throughout the state (Kansas Dental Board 2009). This model is also described below in detail.

Community Dental Health Coordinator

The Community Dental Health Coordinator (CDHC) model was developed by the American Dental Association. This provider is designed to help organize community oral health programs, provide preventive services (education, fluoride application, sealants, gingival scaling and coronal polishing), and perform palliative temporization of conditions (limited to hand instrumentation). Direct supervision by a dentist is required. The CDHC is designed to work at Federally Qualified Community Health Centers, Indian Health Services, state or county public health clinics, and private practices that are located in dentally underserved or unserved locations. The recommended education is 18 months training from an academic program designed specifically for this new provider. Certification will be required (American Dental Association 2013).

Dental Health Aide Therapists

The Dental Health Aide Therapists (DHAT) model, originally developed in New Zealand, has been replicated in more than forty countries. Most recently the primary care model has been replicated by the Alaska Tribal Health Care System and the Indian Health Services. The DHAT model provides care under general supervision, operating under standing orders from a dentist who is on the team. The DHAT program targets prevention, pain relief, infection management, and a full range of diagnostic and restorative services. Services are provided at Indian Health Service Clinics located in remote areas of Alaska. The first year of training is provided in Anchorage Alaska and the second year in Bethel Alaska. Training is provided by DENTEX, an Alaska based program that educates dental

health aide therapists, in collaboration with the University of Washington. The program takes two years to complete. Certification by the Indian Health Service Board is required (American Dental Hygienists' Association 2013; MEDEX Northwest University of Washington 2013).

Advanced Dental Hygiene Practitioner

The Advanced Dental Hygiene Practitioner (ADHP) model was developed by the American Dental Hygienists' Association. This expanded function dental hygiene model mimics the nurse practitioner model. This provider is designed to be part of a comprehensive team that provides direct care and identifies and refers individuals who need more extensive care to a dentist. The proposed ADHP will provide a wide range of primary oral health care services; diagnostic services, preventive services, and therapeutic services in a wide range of settings, such as rural clinics and schools, where underserved and unserved populations are located. The ADHP will provide care in unsupervised settings or under general supervision, in collaboration with a dentist, physician, or clinic manager. The recommended education is a two year master's program that builds upon a baccalaureate degree in dental hygiene. Full licensure will be required (American Dental Hygienists' Association 2013).

Extended Care Permit Dental Hygienists

The ECP dental hygienist was developed by the Kansas Dental Association, Kansas Dental Hygienists' Association, and other key stake holders interested in the oral health of Kansans. This model utilizes dental hygienists to the full extent of their education and training and allows them to work in a variety of settings with less restrictive supervision. Figure 1 describes the services an ECP dental hygienist can provide. Tasks and procedures performed by the ECP dental hygienist are preventive in nature and can be provided for

“dentally underserved” children birth to age five, children in public and nonpublic schools kindergarten through grade 12 regardless of the time of year, and children participating in youth organizations. To qualify for the permit, the dental hygienist must have performed 1,200 hours of dental hygiene care within the past three years or have been an instructor at an accredited dental hygiene program for two academic years within the past three years. ECP dental hygienists must be sponsored by a dentist licensed in the state of Kansas. Sponsorship must include a signed agreement stating that the dentist shall monitor the dental hygienist’s activities (Kansas Dental Board 2009; Kansas Legislative Research Department 2012).

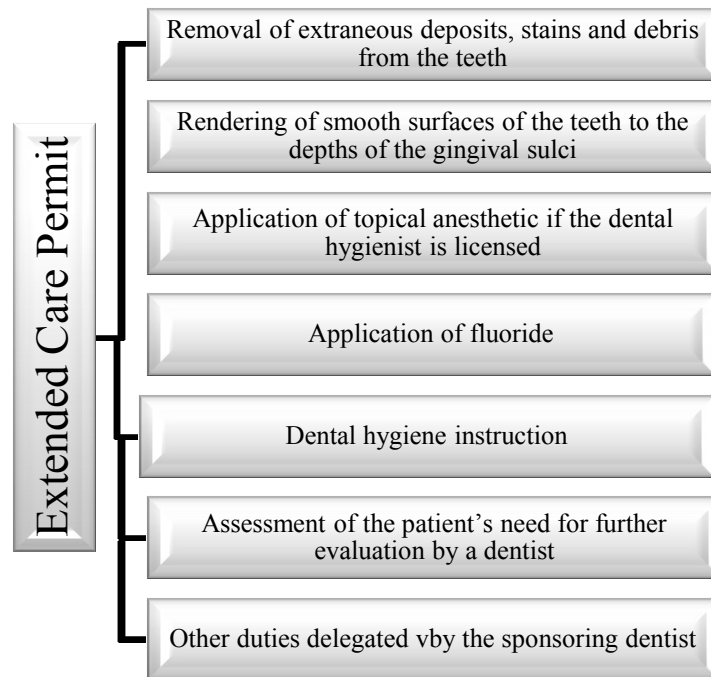


Figure 1. Extended Care Permit Tasks and Procedures

Organized dental associations often oppose models such as the ECP and ADHP models based on concerns related to public safety and decreased quality of care; however, that has not been the case in Kansas with the ECP model (Academy of General Dentistry

2008; American Academy of Pediatric Dentistry 2010; American Academy of Pediatric Dentistry Council on Clinical Affairs 2011; American Dental Association 2011). The ECP model has resulted in improved access to oral health care for children (Simmer-Beck et al. 2011; Weno K. et al. 2012). In 2000, only 20% of Kansas children with Medicaid/CHIP benefits received any dental care and only 14% received preventive dental services. This was well below the national average of 27% and 21% respectively. In 2009, after the scope of practice was altered, the number of children who received any dental care increased to 40% and the number who received preventive dental services increased to 38%. These outcomes meet and exceed the national average of 40% and 35% (Sebelius 2011). While other factors may have contributed to improved access to oral health care, the ECP dental hygienist undoubtedly played a role in this improvement. The ECP model suggests success in providing access to oral healthcare; however, there are no data describing the quality of care and patient outcomes resulting from this model. In 2011, the IOM discussed the paucity of quality of care and patient outcomes measures and recommended increased research funding in this area (Committee on Oral Health Access to Services Institutes of Medicine and National Research Council 2011).

Quality of Care

Quality of care is characterized by the Institute of Medicine as providing “*the right care for every person, every time*” and providing care that is “*safe, timely, effective, efficient, equitable, and patient-centered*” (Committee on Oral Health Access to Services Institutes of Medicine and National Research Council 2011). Historically, dentistry has lacked performance measures to define, gauge, and measure the quality of oral health care delivery (Crall et al. 1999; National Committee for Quality Assurance 1999; Institute for Oral Health

2009a; U.S. Institute of Medicine Committee on Quality of Health Care in America 2009). In 1999, the National Committee for Quality Assurance identified several pediatric quality measure deficiencies; lack of scientific evidence and professional quality guidelines for pediatric oral health care, absence of universally accepted diagnosis codes, limited electronic data that documents performance measurement data, and differences in the oral health needs of uninsured children and children with Medicaid insurance compared to children with commercial insurance (Crall et al. 1999; National Committee for Quality Assurance 1999). Efforts to develop quality assessment measures have been hampered by a deficiency in the collection, analysis, and use of data related to important aspects of oral health, the lack of evidence-based guidelines, and the absence of data measuring the impact risk assessments and interventions have on improving patient health (Institute for Oral Health 2009a, b; Committee on Oral Health Access to Services Institutes of Medicine and National Research Council 2011; Dental Quality Alliance 2012c). The best predictor of quality is using clinical records to measure the health status of patients; however, administrative and claims data continue to be the only aggregated data in dentistry (Dental Quality Alliance 2012c). These scarcities were the topic of concern at the 2009 Institute for Oral Health Conference (IOHC) “Defining Quality in Oral Health Care (Institute for Oral Health 2009a).

Confronted with the need to improve the availability of oral health quality measures, the Institute of Medicine (IOM) also focused on quality assessment shortcomings at the 2009 IOM “U.S. Oral Health Workforce in the Coming Decade” conference noting “overall, quality assessment in dentistry today is relatively weak, and does not assess either the appropriateness or effectiveness of care.” This report stated that the only clinical outcome measure is technical excellence, which is not related to long-term outcomes. The only

patient-centered outcome measured is patient satisfaction, which is inherently flawed and unable to effectively compare delivery systems”(U.S. Institute of Medicine Committee on Quality of Health Care in America 2009). For more than a decade, the IOM has articulated that contemporary models of quality assessment should consider “the right care for every person, every time.” Care should be “safe, effective, efficient, patient-centered, timely, and equitable” (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001). The IOM asserts that as quality is measured across diverse socio-economic populations, numerous variables will influence the definition of quality. As such, the focus may need to be on “what is most appropriate for a given environment, based on the population’s degree of burden”(U.S. Institute of Medicine Committee on Quality of Health Care in America 2009).

In 2011, guided by the Children’s Health Insurance Program and Reauthorization Act, the Centers for Medicare & Medicaid (CMS) established an “Initial Core Set of Children’s Health Care Quality Measures” to strengthen quality measurement efforts. Only two of the twenty-four measures addressed the provision of preventive dental services and the provision of dental treatment services (Centers for Medicare and Medicaid Services and Center for Medicaid and CHIP Services 2011). Measure 13 targets “Prevention and Health Promotion” using the measure “the percentage of eligibles that received preventive dental services.” Measure 17 targets the “Management of Acute Conditions” using the measure “the percentage of eligibles that received dental treatment services.” These measures provide negligible guidance for measuring the quality of oral health care delivery. The Department of Health and Human Services Children’s Health Insurance Program Reauthorization Act

2011 Annual Report on the Quality of Care for Children in Medicaid and CHIP discussed these two quality measures and acknowledged they were less than ideal (Sebelius 2011).

In addition to CMS, several other federal programs and legislative developments are working with states and each other to design and implement quality oral health measures and improvement strategies. Health Resources and Services Administration (HRSA) is collecting quality measures through the Uniform Data System (UDS) and requiring grantees to include a minimum of one oral health clinical performance measure in organizations' annual application for federal funding (Department of Health and Human Services 2011). Agency for Healthcare Research and Quality (AHRQ) has developed a family of health care databases, called the Healthcare Cost and Utilization Project, with the intent of generating a resource for patient level health care data. This organization is also working with CMS to improve the Pediatric Quality Measures program (Agency for Healthcare Research and Quality 2013). The Institute for Healthcare Improvement (IHI) developed framework, called Triple Aim, to optimize the healthcare system and improve accountability. This framework seeks to improve the patient experiences of care, improve the health of populations, and reduce the per capita costs of health care (Institute for Healthcare Improvement 2013). Lastly, the Affordable Care Act established a National Strategy for Quality Improvement in Health Care (the National Quality Strategy) to pursue better care, healthy people/healthy communities, and affordable care (Department of Health and Human Services 2013).

As healthcare expenditures continue to rise, assessing quality and outcomes of care by establishing measures that identify and monitor innovative strategies for the provision of oral health service delivery while improving effectiveness and efficiency of care, has become a national priority (U.S. Institute of Medicine Committee on Quality of Health Care

in America 2001; Institute for Oral Health 2009a, b; U.S. Congress 2009; U.S. Institute of Medicine Committee on Quality of Health Care in America 2009; Centers for Medicare and Medicaid Services 2010; U.S. Department of Health and Human Services 2010; Committee on Oral Health Access to Services Institutes of Medicine and National Research Council 2011; Glassman P. 2011; Sebelius 2011; U.S. Department of Health and Human Services 2011; Dental Quality Alliance 2012c). Multiple stakeholders have necessitated the need for well-defined oral health measures of quality to ascertain whether or not high-quality care has been delivered consistently throughout the healthcare system. Experts in the field propose models of oral health care delivery that reward “value and not volume” by paying for performance and not for procedures (Glassman P. 2011). In response to this need, Dental Quality Alliance (DQA) was established in 2008 to develop oral health performance measures (Dental Quality Alliance 2012c). In 2011, the DQA conducted an environmental scan that revealed a “proliferation of measure development activity that is often duplicative and not standardized”(Dental Quality Alliance 2012b). DQA identified several significant limitations to the existing pediatric measures; “limited availability of clear numerator and denominator descriptions, lack of standardization in measurement with many duplicates, lack of quality with majority of measures on utilization, and lack of measures assessing patient safety” to name a few (Dental Quality Alliance 2012b).

In 2012 the DQA, in collaboration with twenty-nine member entities and American Dental Association agencies, established the first quality measure concept set in dentistry. The measure concept set is designed overcome the limitations described above and to “lay the foundation for measures to: 1.) uniformly assess quality of care for comparison of results across private/public sectors and across state/community and national levels; 2.) inform

performance improvement projects longitudinally and monitor improvements in care; 3.) identify variations in care; and 4.) develop benchmarks for comparison”(Dental Quality Alliance 2012c, a). Using the modified Delphi rating approach, 59 pediatric quality measures were scored on a 9-point scale that rated validity, feasibility, and importance while considering the provision of safe, timely, efficient, effective, equitable and patient centered care. Twenty-one measures, that scored 7 or higher in all three criteria, were included in the starter set of measures (Dental Quality Alliance 2012b).

The initial DQA concept set measures quality as a function of: Use of Services, Access, Process, and Costs (Dental Quality Alliance 2012a). The measures are divided into three categories; care delivery, clinical measures, and costs measures. Care delivery measures include utilization of services, usual source of services, and care continuity. Clinical measures include oral evaluation, prevention as a function of the provision of preventive services (topical fluoride and/or sealants) for children at elevated caries risk, the provision of sealants for 6-9 and 10-14 year old children, and the provision of topical fluoride 1-4 times yearly (fluoride intensity) for children at elevated caries risk, and receiving treatment the same year oral health/dental services were accessed. The measures of cost include the user cost of clinical services and the percentage of health expenditures expended on oral health for the reporting year. These functions are defined in Appendix 1 (the glossary). The DQA Concept Set is available in Appendix 2. The initial DQA Concept Set provides the starting point for measuring quality in dentistry. The concept set does not measure care coordination and care continuity which are “important aspects of high quality, patient-centered care” (Dental Quality Alliance 2012b). The DQA affirmed the most accurate predictor of quality is measuring the patient’s health status. At the present time only

administrative and claims data are aggregated in dentistry (Dental Quality Alliance 2012c). Additional research using data from the electronic medical record (EMR) to measure the patient's health status must be conducted to further refine the concept set (Dental Quality Alliance 2012b). Conducting this research is problematic; however, because of limited access to EMR data (Dental Quality Alliance 2012b).

Impact of the Proposed Research

In 2010 the US Government Accountability Office reported 4,377 health provider shortage areas (HPSAs) present in the U.S. and that it would take 7,008 full time dentists to fully eliminate the HPSAs (US Government Accountability Office 2010). In the same report, less than half of the states (14 out of 39) reported dentists provide care to children with Medicaid or Children's Health Insurance Program (US Government Accountability Office 2010). These numbers clearly demonstrate a lack of access to oral health care. The ECP model of oral health care delivery has demonstrated great potential to help solve access to care disparities; however, research examining the quality of care and patient health outcomes from this model is desperately needed. The outcomes of this proposed study will provide detailed information about the quality of care and effectiveness of care provided in a school-based setting by ECP dental hygienists. The *long term goal* of this project is to translate findings into new oral health workforce model legislation. Study findings will contribute to the development of an oral health delivery model that provides high quality oral health care, which will be designed to improve the oral health of low income children who lack access to care. Findings will also address the Dental Quality Alliance need for additional research using EMRs to measure the patient's health status (Dental Quality Alliance 2012b). This is significant because data generated through this research will be translated into information

and knowledge that will ultimately advance the processes and outcomes of oral health care and it will be used to further refine the Dental Quality Alliance concept set.

CHAPTER 2

METHODS

Case Study Research

Case study research has an extensive, prominent history “across many disciplines” and can be useful in gaining insights into an entire program (Veney and Kaluzny 1998; Creswell 2007). It examines a bounded issue, over time, through “detailed in-depth data collection involving multiple sources” of one or more cases while seeking to answer “how” and “why” a phenomenon occurs without experimentally controlling for independent variables (Creswell 2007; Issel 2009; Yin 2009b). Although the case study approach is well accepted among social scientists, controversy exists among case study researchers regarding how the research should be categorized. Many researchers consider it a methodology, strategy of inquiry, or comprehensive research strategy (Merriam 1998; Yin 2003; Denzin and Lincoln 2005). In contrast it is considered a selection of what will be studied by others (Stake R.E. 2005). Creswell chooses to view it as both (Creswell 2007).

Case study research has multiple definitions with highly esteemed authors presenting a variety of paradigmatic viewpoints. Stake’s view of case study research is artistic and creative drawing meaning from the case as data emerge. Stake views the most crucial role of the researcher as interpreting the data (Stake R.E. 1995). In contrast, Yin’s interpretation of case study research is a methodical, systematic, and logical research design. He recommends five distinct components of a case study; the study’s questions, the study’s objectives that reflect on a theoretical issue, the unit(s) of analysis, linking of data to the study’s objectives,

and the criteria for interpreting the findings (Yin 2009d). According to Yin (2009) case study is defined as:

“an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. The case inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulation fashion, and as another result benefits from the prior development or theoretical propositions to guide data collection and analysis.” (Yin 2009b)

The design of this study was a single program, multisite case study. A case study design was selected because the investigator was answering “how and why” the phenomenon occurred and there was no attempt to experimentally control independent variables (Yin 2003; Issel 2009). This case study was bound by time (5 years) and place (school-based dental clinics located in a suburb of a Midwestern city). Methodical, systematic, logical research methods described by Yin (2009) guided the research methods of this study.

Model

The intervention for this study is the provision of place-based oral health care, by ECP dental hygienists, in a school-based oral health program. Senior dental hygiene students from a nearby educational program rotated through this school-based clinic as part of the clinical curriculum. Typically there were two or three students at the site two days per week. These students provided preventive services of prophylaxes, sealants and fluoride treatments under the license of the ECP dental hygienists. The place-based intervention replicates a nationally recognized community oral health model called “Community Collaborative Practice”, established in 2004 by Apple Tree Dental, a non-for-profit organization in Minnesota. The Apple Tree model provides place-based care by rolling full-scale dental

offices, with all the modern amenities, into a convenient place that is comfortable and familiar to the patient. This model increases access to oral health care by expanding the role of dental hygienists in the delivery of preventive care services and establishing telehealth links with dentists. The “Community Collaborative Practice” model forms inter-professional partnerships with caregivers, educators, and social service providers. This model has led to the transformation of the roles of dentists, dental hygienists, and other care givers and serves as an avenue for educating future dental hygienists (Apple Tree Dental 2009, 2013).

The intervention examined in this study expanded the role of dental hygienists by allowing dental hygienists direct access to patients. ECP dental hygienists, provided comprehensive preventive care (prophylaxis, radiographs, topical fluoride application (varnish), sealants, oral health education and supplies, and nutritional counseling), and referral coordination. The ECP dental hygienists established inter-professional relationships with school nurses, speech pathologists, occupational therapists, teachers, and translators. For example, ECP dental hygienists collaborated with school nurses when a child presented with high blood pressure. They collaborated with translators to communicate with non-English speaking parents for both written and verbal communication. And, they collaborated with speech pathologists to identify dental conditions that contributed to a child’s inability to verbally communicate. A unique characteristic of this school-based oral health program is that all children who qualify are provided care regardless of their insurance status or ability to pay. Children who presented with decay were referred to a dentist and referral compliance was monitored by the program manager, school nurses, and the school district.

The Student Health Services Coordinator at the school district organized a referral network prior to implementing the intervention, Dentists Community Cares (DCC), for

children without insurance or resources to pay for care. Ten community dentists volunteered to provide free care for 1 child monthly as participants. DCC did not meet all of the children's needs. In 2010 the ECP dental hygienists began coordinating a field trip to a local pediatric dentist who provided restorative care one Friday a month for children participating in the intervention. Prior to the field trip the ECP dental hygienists consulted with the dentist, provided a copy of the child's assessment findings, and furnished a digital copy of each child's radiographs so the dentist could determine in advance how much time to allot for each child. The ECP dental hygienists and school nurses secured health history and informed consent forms specific for the dental practice. This dentist discounted his fees to Medicaid rates for all children and billed Medicaid if applicable. Uninsured care was paid for by a grant and/or provided pro-bono. The school district provided transportation to the dental office for the field trips. The ECP dental hygienist provided supervision for the children and was on site to answer questions.

Figure 2 illustrates the logic model for the intervention examined in this study. Logic models are recognized for illustrating a complex chain of events over an extended period of time (Yin 2009a). The logic model for this study was developed collaboratively with ICF International evaluators as part of the Robert Wood Johnson "Systematic Screening and Assessment of Workforce Innovations in the Provision of Preventive Oral Health Services"(Coelho and Jacobs 2013). The logic model illustrates the staged pattern of events whereby a dependent variable at an earlier stage (ie. number of participants receiving services) becomes an independent variable at the subsequent stage (increased number of children with regular access to comprehensive oral health services and/or to a dental home) (Coelho and Jacobs 2013). As suggested by Yin (2009), theoretically predicted events were

matched to empirical evidence. This form of pattern matching can be used for triangulation to establish internal validity (Yin 2009a).

Methodology

This case study used a quantitative method of inquiry allowing the investigator to examine the relationship among variables using parametric and nonparametric statistical procedures. In case study research operational measures must be identified to establish construct validity (Yin 2009b, a). “Quality of Care” was based on the IOM definition of quality; the degree to which oral health services for individuals increases the likelihood of desired oral health and overall health outcomes and are consistent with current standards of care and best practices (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001). The IOM further delineates quality of care as “the right care for every person, every time...being safe, timely, effective, efficient, equitable, and patient-centered” (Committee on Oral Health Access to Services Institutes of Medicine and National Research Council 2011). These definitions were in accord with DQA measurement concepts and provided the framework for measuring quality as a function of use of services, access, process, and health status (Dental Quality Alliance 2012c, a, b).

Central Hypothesis and Specific Aims

Central Hypothesis: ECP dental hygienists provide quality oral health care that improves the oral health of underserved children in a school-based setting.

Specific Aim #1: Evaluate the quality of oral health care provided in a school based setting by ECP dental hygienists as a function of use of services, access, and process.

Specific Aim #2: Evaluate the changes in oral health status of children who are provided care by ECP dental hygienists in a school based setting.

Dental providers in non-dental settings

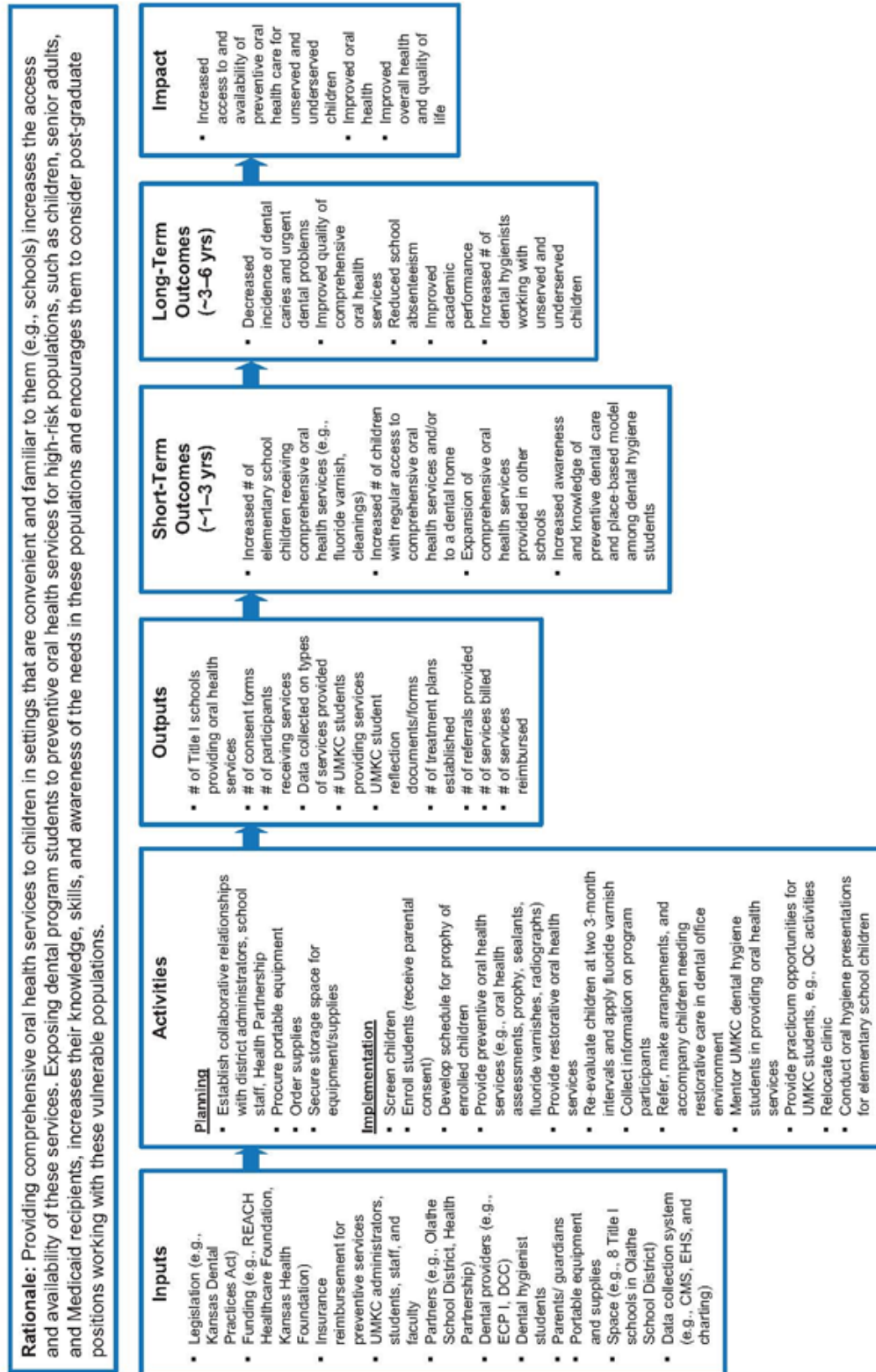


Figure 2. Intervention Logic Model

Data Collection

The setting for this study was a school-based oral health program which uses portable dental equipment. This program operates in seven Title I elementary schools located in a suburb of a Midwestern city and has been operating since 2008.

Sampling Strategies

A purposeful sampling strategy was utilized to target data sources. The target population of this study (n=986) was selected because they experienced the central phenomenon (comprehensive preventive dental services from the intervention) in some capacity. Two hundred ninety-five (n=295) subjects experienced the central phenomenon two or more times and formed the multi-encounter cohort. The EMRs of children who received oral health care in the school-based clinic from 2008-2012 were analyzed.

Target Population

The target population for this intervention was children eligible for the free or reduced lunch program. These children had either Medicaid insurance or were uninsured. The eligibility criteria was selected because of the ECP model criteria outlined in the Kansas Dental Practice Act (Kansas Dental Board 2009).

The target population was examined using two specific cohorts; all children who received the intervention (entire cohort) and children who received the intervention two or more times (multi-encounter cohort). Table 1 provides demographic data that span from the inception of the program in 2008 through spring 2012 for both cohorts. Gender and ethnicity for both cohorts was similar. The target population was almost evenly split between females and males. The target population was diverse with largest portion of the target population being of Hispanic descent. As of the 2010 U.S. census the racial makeup for the nation is

72.4% White, 16.3% Hispanic, 12.6% Black, 4.8% Asian, and 0.9% American Indian and Alaska Native (Humes K.R. et al. 2011). Examination of table 1 illustrates a disproportionate number of children served in the program were of Hispanic descent in comparison to U.S. census data. The age entering the program ranged from preschoolers who were 5 or younger up to 6th graders who were 12 and 13. The multi-encounter cohort had a larger number of children ages 6-7 and 8-9 entering the program.

TABLE 1

DEMOGRAPHICS OF CHILDREN SERVED FROM SEVEN TITLE I SCHOOLS

	Entire Cohort N = 986* N (%)	Multi-Encounter Cohort N=295 N(%)
Gender		
Female	478 (48.5%)	142 (48.1%)
Male	508 (51.5%)	153 (51.9%)
Racial/Ethnicity Background		
Hispanic	603 (61.1%)	205 (69.5%)
Caucasian	227 (23.0%)	51 (17.3%)
Black	102 (10.3%)	23 (7.8%)
Asian	28 (2.8%)	5 (1.7%)
Two or more reported	20 (2.1%)	8 (2.7%)
Native American	4 (0.4%)	1(0.3%)
Not identified	2 (0.2%)	2 (0.7%)
Age Entering Program		
≤5	234 (23.7%)	69 (23.4%)
6 – 7	330 (33.5%)	127 (43.1%)
8 – 9	242 (24.5%)	84 (28.5%)
10 – 11	160 (16.2%)	15 (5.1%)
12+	20 (2.0%)	0 (0.0%)

*May not add up to 100% due to rounding or non-responders

Table 2 describes the socioeconomic status of the schools who participated in the intervention during the 2011-2012 school year. These data illustrate what we know about disparity of care in relation to racial and ethnic background. Nearly 51% of the children

attending target schools were English Language Learners (ELL) with Spanish being the most common primary language. A significant portion (74%) of the target population qualified for free or reduced lunches further elucidating the disparities in the target population.

Examination of the socioeconomic status of the schools participating in the intervention during previous school years mirrored the 2011-2012 data.

TABLE 2
SOCIOECONOMIC STATUS OF SCHOOLS PARTICIPATING IN INTERVENTION
2011-2012

Elementary School	Total # of children	Free/Reduced lunch	# eligible for services	# of ELL	languages spoken
School 1	259	54%	140	23	2
School 2	490	83%	407	234	16
School 3	290	82%	238	159	4
School 4	331	76%	252	119	9
School 5	247	75%	185	112	3
School 6	267	87%	232	152	8
School 7	273	53%	145	21	4
Total	2157	74%	1599	820	n/a

Collectively, 63% of the children presented with decay when they entered the program, a disease indicator that automatically places a patient at elevated risk for decay unless the patient is practicing therapeutic interventions and arresting the disease process (Featherstone et al. 2003; Featherstone et al. 2007). The decay rate in the population targeted for this intervention is significantly higher than the decay rate reported in the state (16.2%), the county where the program is located (10.6%), and even the school district (13.9%) (Kansas Department of Health and Environment Bureau of Oral Health 2012-2013). The decay rate also exceeds the baseline national decay rate (23.8%) and target decay rate (21.4%) described in Healthy People (HP) 2020 (U.S. Department of Health and Human

Services 2013). This Hispanic origin socio-demographic factor is significant because this population's immigrant background has been shown to increase caries rates by three times (Nunn et al. 2009). The high percent of children qualifying for free or reduced lunches implies a low socioeconomic status which has also been shown to have an inverse relationship with caries (Vargas et al. 1998). Because of this, all children who participated in this program were considered elevated/high caries risk and were provided appropriate, evidence-based interventions (oral health education, nutritional counseling, sealants, and professional topical fluoride treatments every three months). This is consistent with guidelines set forth by the American Academy of Pediatrics in 2013 (American Academy of Pediatric Dentistry Council on Clinical Affairs 2013).

Procedures

In case study research, evidence should be well thought out and come from multiple sources that are complementary because the selection of evidence impacts the construct validity and reliability of the study (Yin 2009d). No single source of data has advantage over other sources (Yin 2009d). Often data will be pre-existing (Issel 2009). Multiple forms of data were extracted from the EMR, which also served as the case study database, allowing the investigator to draw on a full range of possibilities to answer the research questions and sub-questions.

Good measures must cover an important clinical area and be scientifically acceptable, useable, and feasible (Dental Quality Alliance 2012c). Tables 3 and 4 summarize the case study protocol used for this study. Research questions, sub-questions, units of analysis, measurements, analyses, and interpretations are included to allow replication of this study. A “balanced approach” based upon the purpose for measurement and selection of sub-measures

was implemented as recommended by DQA (Dental Quality Alliance 2012c, b). These measures provided the theoretical propositions that guided data collection and analysis (Yin 2009b). Data collection needs for this study were determined prior to beginning the intervention and de-identified data (demographics, encounters, disease status, treatment provided, and referral urgency), were extracted from the EMR bi-annually beginning in June 2008. These measures are consistent with the IOM's definition of quality and DQA measure concepts (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001; Committee on Oral Health Access to Services Institutes of Medicine and National Research Council 2011; Dental Quality Alliance 2012a, b).

Data were analyzed using descriptive statistics and ANOVA for Specific Aim #1, to describe the provision of oral health care services, access, and process. This included using numerators and denominators to determine percentages as described in the "Pediatric Oral Health Quality and Performance Measure Concept Set". MANOVA and Kruskal Wallace were used to answer Specific Aim #2. The independent variables were number encounters with the ECP dental hygienists (encounters), number of fluoride applications (fluoride), and number of sealants placed (sealants). The dependent variables were change in decay status, change in number of restorations, and change in treatment urgency.

TABLE 3

CASE STUDY PROTOCOL: SUMMARY OF RESEARCH QUESTIONS, SUB-
QUESTIONS, MEASUREMENTS, ANALYSES, AND
INTERPRETATIONS FOR SPECIFIC AIM 1

Specific Aim 1: Evaluate the quality of oral health care provided in a school based setting by ECP dental hygienists as a function of use of services, access and process.			
Research Question: Do ECP dental hygienists provide quality evidence based care for children?			
Unit of Analysis: Quality of oral health care			
Sub-Question	Measurement	Analysis	Interpretation
Did Children have access to timely and equitable care?	N: Number of children participating in program D: Number of children participating in free or reduced lunch program	Percentages calculated	HP 2020 Objective: OH-7 Target 49% of children will access the oral health care system DQA Objective: Higher the better
Did the number of encounters vary by race/ethnicity?	IV: Ethnicity DV: Encounters	ANOVA	Descriptive statistics: means and standard deviations Multivariate tests $p \leq 0.05$
Were children at elevated caries risk provided access to timely and appropriate preventive care?	N: Number of children who were provided fluoride applications and number of children who were provided sealants D: Number of children participating in program	Percentages calculated	HP 2020 Objective: OH-8 Target 29.4% of children will receive preventive dental care DQA Objective: Higher the better
Were children at elevated caries risk provided access to timely and appropriate topical fluoride applications?	N: Number of fluoride applications D: Number of children participating in program	Percentages calculated	DQA Objective: Higher the better
Were 6-14 year-old children at elevated caries risk provided timely and appropriate sealant applications?	N: Number of children who had at least one sealant placed and one sealant present D: Number of children ages 6-9 and 10-14 who participated in the program	Percentages calculated	HP 2020 Objective: OH-12 Target 28.1% of children will have at least 1 sealant on permanent 1 st molar DQA Objective: Higher the better

TABLE 4

CASE STUDY PROTOCOL: SUMMARY OF RESEARCH QUESTIONS, SUB-QUESTIONS, MEASUREMENTS, ANALYSES, AND INTERPRETATIONS FOR SPECIFIC AIM 2

Specific Aim 2: Evaluate the changes in oral health status of children who are provided care by ECP dental hygienists in a school based setting.			
Research Question: What is the oral health status of children who are provided care by ECP dental hygienists in a school based setting over multiple encounters?			
Unit of Analysis: Oral health status			
Sub-Question	Measurement	Analysis	Interpretation
How did the number of encounters affect the oral health status of children?	IV: Encounters DV: Change in decay and change in restorations	MANOVA	Descriptive statistics: means and standard deviations Multivariate tests $p \leq 0.05$, 95% CI, Hotelling Trace $p \leq 0.05$, partial μ^2 , post-hoc Bonferroni test $p \leq 0.05$
How did the number of encounters affect the oral health status of children?	IV: Encounters (2 encounters served as the control) DV: Change in treatment urgency	Kruskal Wallace	$p \leq 0.05$, mean rank, post hoc Mann-Whitney with Bonferroni correction $p \leq 0.007$
How did the number of fluoride applications affect the oral health status of children?	IV: Fluoride applications DV: Change in decay and change in restorations	MANOVA	Descriptive statistics: means and standard deviations Multivariate tests $p \leq 0.05$, 95% CI, partial μ^2 , post-hoc Bonferroni test $p \leq 0.05$, Bonferroni correction $p \leq 0.001$
How did the number of sealants placed affect the oral health status of children?	IV: Sealant applications DV: Change in decay and change in restorations	MANOVA	Descriptive statistics: means and standard deviations Multivariate tests $p \leq 0.05$, 95%CI, partial μ^2

Ethical Considerations

A common challenge and ethical consideration with community-based research is gaining access to the target population without exploitation. A strong mutually beneficial relationship between the target population, the school district, and the researcher was

established prior to beginning this study. Therefore the issues of power and risks to participants were minimized.

The University of Missouri Kansas City (UMKC) required Institutional Research Board (IRB) approval for all proposed research involving human subjects. The IRB was responsible to serve as an advocate for the research subject and assure ethical issues were completely addressed in the protection of human subjects who volunteer to participate in research studies. All protocols for research using human subjects were guided by three overriding principles: 1.) inform subjects about the nature of the study and ensure that their participation was voluntary, 2). ensure that the benefits of the research outweighed the risks, and 3.) ensure the risks and benefits of research were evenly distributed among the possible subject populations. The Social Science IRB was selected to review the proposed project. The aims of the Social Science IRB were to “ensure the ethical treatment of human participants in university research,” and review “studies that are considered medically noninvasive.” The protocol at UMKC mandated that all investigators, conducting human subject research fulfill “the requisite responsibilities to assure the safety and welfare of the participants”. Investigators must have “the qualifications and expertise to appreciate the complexities in the research and be able to ethically carry out the proposed activities.” In order to meet this mandate, investigators were required to complete a set of Collaborative Institutional Training Initiative (CITI) modules relevant to the type of research being conducted (University of Missouri-Kansas City 2011). This study was approved by the AHSIRB Protocol 13-420.

CHAPTER 3

RESULTS

Since its inception in 2008, 986 children have been provided comprehensive preventive oral health care by ECP dental hygienists in the school based oral health program (intervention). Two hundred ninety-five (n=295) children were provided the intervention two or more times (multi-encounter cohort) indicating the presence of a dental home (American Academy of Pediatric Dentistry Council on Clinical Affairs 2011). The following paragraphs will describe the initial oral health status of children entering the program. Utilization of services, the provision of preventive services, topical fluoride intensity, and sealant will be discussed to answer specific aim #1. Changes in the number of decayed teeth (caries), the number of restorations (restorations), and treatment urgency, using the number encounters with the ECP dental hygienists (encounters), number of fluoride applications (fluoride), and number of sealants placed (sealants) as independent (stratification) variables, will answer specific aim #2. The results section will conclude by matching patterns from the theoretically predicted events of the logic model to empirical data.

Initial Oral Health Status

Table 5 describes the initial oral health of children (n=986) prior to beginning the intervention. The amount of decay initially present across the sample ranged from 0 to 20 decayed teeth with the majority of children (63.4%) having caries. The number of direct (fillings) and indirect (crowns) restorations ranged from 0 to 11 and 0 to 15 respectively across the sample. Although a large group of children had carious lesions, the majority of children (68.7% and 79.7% respectively) did not have direct nor indirect restorations. Nearly 7% of the children presented with urgent needs that necessitated a phone call from the school

nurse or ECP dental hygienists to the child’s parents/guardians explaining care from a dentist was needed within 24 hours.

TABLE 5

INITIAL ORAL HEALTH STATUS OF ALL CHILDREN PRIOR TO INTERVENTION

Number of Teeth with Condition	Children with Decay Present (Caries)	Children with Direct Restorations Present (Fillings)	Children with Indirect Restorations Present (Crowns)
0	361 (36.6%)	677 (68.7%)	786 (79.7%)
1	133 (13.5%)	87 (8.8%)	70 (7.1%)
2	134 (13.6%)	66 (6.7%)	34 (3.4%)
3	74 (7.5%)	47 (4.8%)	29 (2.9%)
4	56 (5.7%)	40 (4.1%)	19 (1.9%)
5	46 (4.7%)	27 (2.7%)	10 (1.0%)
6	47 (4.8%)	21 (2.1%)	13 (1.3%)
7	41 (4.2%)	12 (1.2%)	9 (0.9%)
8	40 (4.1%)	4 (0.4%)	10 (1.0%)
9	28 (2.8%)	0 (0.0%)	0 (0.0%)
10 or more	26 (2.6%)	5 (0.5%)	6 (0.6%)

Table 6 describes the initial oral health of the multi-encounter cohort of children (n=295) prior to beginning the intervention. The amount of decay initially present across the sample ranged from 0 to 14 decayed teeth with the majority of children (64.1%) having caries. The number of direct (fillings) and indirect (crowns) restorations ranged from 0 to 8 and 0 to 15 respectively across the sample. The majority of children (70.5% and 79.7% respectively) did not have direct nor indirect restorations. The multi-encounter cohort also had nearly 7% of the children presenting with urgent needs that required immediate attention.

TABLE 6

INITIAL ORAL HEALTH STATUS OF MULTI-ENCOUNTER COHORT OF CHILDREN
PRIOR TO INTERVENTION

Number of Teeth With Condition	Children with Decay Present (Caries)	Children with Direct Restorations Present (Fillings)	Children with Indirect Restorations Present (Crowns)
0	106 (35.9%)	208 (70.5%)	235 (79.7%)
1	42 (14.2%)	26 (8.8%)	17 (5.8%)
2	38 (12.9%)	17 (5.8%)	10 (3.4%)
3	19 (6.4%)	12 (4.1%)	7 (2.4%)
4	11 (3.7%)	8 (2.7%)	8 (2.7%)
5	14 (4.7%)	13 (4.4%)	5 (1.7%)
6	20 (6.8%)	5 (1.7%)	4 (1.4%)
7	15 (5.1%)	4 (1.4%)	3 (1.0%)
8	12 (4.1%)	2 (0.7%)	5 (1.7%)
9	10 (3.4%)	0 (0.0%)	0 (0.0%)
10 or more	8 (2.7%)	0 (0.0%)	1 (0.3%)

Specific Aim #1

Specific Aim #1 seeks to “Evaluate the quality of oral health care provided in a school based setting by ECP dental hygienists as a function of use of services, access and process.” Sub-questions addressing 1.) Access to timely and equitable care overall (utilization of services); 2.) Access to timely and equitable preventive care for children at elevated caries risk (preventive services for children at elevated caries risk); 3.) Access to timely and appropriate fluoride applications for children at elevated risk (topical fluoride intensity); and 4.) The provision of timely and appropriate sealant applications for children at elevated caries risk (sealant use) were answered.

Utilization of Services

“Utilization of Services,” a clinical quality access to care measure, is one of the measures included in the DQA concept set that targets the IOM Aim of Equity. The measure

investigates the provision of “timely and appropriate” healthcare and is supported by evidence that an association exists between the measure and patient outcomes (Dental Quality Alliance 2012c, a, b). Table 7 summarizes the percent of unduplicated children per school who utilized the intervention during the defined time span. The number of children who participated in the intervention was selected as the numerator because it represents access for the target population. The number of children participating in free or reduced lunch program was selected for the denominator because it represents the number of children in a target population that potentially lack access to oral health care and were eligible to participate in the intervention. Utilization of services ranged from a low of 10.3% participation to a high of 50% participation. The mean overall participation was 26.3%. These results would suggest that the intervention provided access to timely and equitable care; however, not at the HP 2020 target of 49%.

Utilization of services by the multi-encounter cohort in relation to ethnicity was explored to see if ethnicity played a role in utilization. Table 8 summarizes the mean number of encounters for each ethnic group. The mean number of encounters ranged from a low of 3.3 encounters for children with Caucasian ethnicity to a high of 4.07 encounters for children with Hispanic ethnicity. A univariate ANOVA was conducted to determine the significance of encounters in relation to ethnicity. Results revealed ethnicity was not statistically significant and could not predict participation, $F(1.65)$, $p=0.134$.

TABLE 7

UTILIZATION OF SERVICES BY CHILDREN ELIGIBLE TO PARTICIPATE IN THE INTERVENTION

		School & Years of Participation (n=)							Overall 1
		1 (n=5)	2 (n=4)	3 (n=4)	4 (n=4)	5 (n=3)	6 (n=2)	7 (n=1)	
2007-2008	Intervention Enrollment	40							40
	Free/Reduced Lunch	121							121
	% F/R Lunch	33.1%							33.1%
2008-2009	Intervention Enrollment	36	80	83	111				310
	Free/Reduced Lunch	138	325	191	237				891
	% F/R Lunch	26.1%	24.6%	43.5%	46.8%				34.8%
2009-2010	Intervention Enrollment	40	138	82	53	86	44		443
	Free/Reduced Lunch	161	349	199	262	172	220		1363
	% F/R Lunch	24.8%	39.5%	41.2%	20.2%	*50.0%	20.0%		32.5%
2010-2011	Intervention Enrollment	25	76	48	53	61	43		306
	Free/Reduced Lunch	148	355	190	226	158	213		1290
	% F/R Lunch	16.9%	21.4%	25.3%	23.5%	38.6%	20.2%		23.7%
2011-2012	Intervention Enrollment	21	37	53	29	51	53	20	264
	Free/Reduced Lunch	146	359	225	238	178	226	144	1516
	% F/R Lunch	14.4%	10.3%	23.6%	12.2%	28.7%	23.5%	13.9%	17.4%
Overall	Intervention Enrollment	162	331	266	246	198	140	20	1364
	Free/Reduced Lunch	714	1388	805	963	508	659	144	5181
	% F/R Lunch	22.7%	23.8%	33.0%	25.5%	39.0%	21.2%	13.9%	26.3%

*Meets HP 2020 OH-7 Target 49% of children will access the oral health care system

TABLE 8

UTILIZATION OF SERVICES IN RELATION TO ETHNICITY

Ethnicity	Mean Number of Encounters	Std. Deviation	N
Hispanic	4.07	1.64	205
Caucasian	3.31	1.96	51
Black	3.83	1.75	23
Asian	3.4	0.55	5
Two+ reported	4.25	1.67	8
Native American	3.0	n/a	1
Not identified	3.0	0.00	2
Total	3.91	1.71	295

Preventive Services for Children at Elevated Caries Risk

The American Dental Association recommends placement of pit and fissure sealants in primary and permanent teeth and applying a topical fluoride, such as fluoride varnish, on teeth every three to six months for children who are at elevated caries risk (American Dental Association Council of Scientific Affairs 2006; Beauchamp et al. 2008). The provision of “preventive services for children at elevated caries risk,” a clinical quality access to care and a related health care delivery use of services measure, is included in the DQA concept set that targeting IOM Aims of equity and effectiveness. The measure investigates the provision of “timely and appropriate” healthcare and is supported by evidence that an association exists between the measure and patient outcomes and it investigates the “provision of a service” through use of clinical services (Dental Quality Alliance 2012c, a, b).

Table 9 summarizes the number of ECP dental hygienist encounters and the number and percent of unduplicated preventive interventions that were provided during the defined time span. Total encounters with the ECP dental hygienist ranged from 1 encounter to 9 encounters with an average of 2.2 encounters per child. The number of children who were provided at least one fluoride application and the number of children who had at least one

sealant placed were each selected as numerators. As described in the methods section, all children who participated in the intervention were high caries risk; therefore, the number of children who received prophylaxis (a consistent procedure for all children in the program) was selected as the denominator because this represents the total number of children at elevated risk. The percentage of children, by school year, who received at least one fluoride application ranged from a low of 89.1% to a high of 99.0% and averaged 96.6%. Children at elevated caries risk, who had fluoride applications applied, had single applications for the first three years of the intervention. In 2010 the intervention began providing additional fluoride applications spaced evenly throughout the year resulting in the average number of fluoride applications more than doubling during the final two years of the intervention. The percentage of children who had at least one sealant applied during the school year ranged from a low of 30% to a high of 52.6% and averaged 34.0%. Children who were candidates for sealants had an average of 2.9 sealants placed. These results exceed the HP target that 29.4% of children will receive preventive dental care and would suggest the intervention provided access to timely and appropriate preventive care.

TABLE 9

SUMMARY OF ENCOUNTERS AND PREVENTIVE SERVICES FOR CHILDREN AT ELEVATED CARIES RISK

	2007-2008 (pilot)	2008-2009	2009-2010	2010-2011	2011-2012	Total
Encounters with ECP dental hygienist	44	416	426	681	633	2200
Prophylaxis	40	307	424	307	293	1371
Number of children who had at least one topical fluoride application	37 *(92.5%)	304 *(99.0%)	419 *(98.8%)	304 *(99.0%)	261 *(89.1%)	1325 *(96.6%)
Total number of topical fluoride applications	37	304	419	660	619	2039
Average number of topical fluoride applications	1	1	1	2.2	2.4	1.5
Number of children who had at least one sealant placed	19 *(47.5%)	92 *(30.0%)	172 *(40.6%)	160 *(52.1%)	154 *(52.6%)	597 *(34.0%)
Total number of Sealants Placed	56	258	566	421	453	1754
Average number of sealants placed	2.9	2.8	3.3	2.6	2.9	2.9

*Meets HP 2020 OH-8 Target 29.2% of children will receive preventive dental care.

Topical Fluoride Intensity for Children at Elevated Risk

The application of topical fluoride (topical fluoride intensity), a clinical quality access and process measure, is a measure included in the DQA concept set that also targets the IOM Aims of equity and effectiveness. The measure investigates the provision of “timely and

appropriate” healthcare and is supported by evidence that “the clinical process had led to improved outcomes” (Dental Quality Alliance 2012c, a, b).

Table 10 summarizes the unduplicated number of fluoride applications provided during the defined time span for individual school years and overall. The specific number of fluoride applications (zero, one, two, etc.) was selected as the numerator. As described in the methods section, all children who participated in the intervention were at high caries risk; therefore, the number of children who received prophylaxis was selected as the denominator because this represents the total number of children at elevated risk who participated in the intervention. The majority of participants during the first three years of the intervention received one fluoride application. During the final two years of the intervention the number of topical fluoride applications increased and the majority of program participants received two or more topical fluoride applications.

Table 11 summarizes the cumulated unduplicated number of topical fluoride applications that were provided during the defined time span. Participants total number of topical fluoride applications was selected as the numerator and the total number of children who participated in the intervention was again selected as the denominator. Table 11 illustrates the total number of topical fluoride applications for individual participants ranged from 0-8 with nearly half (48.7%) of the program participants having two or more topical fluoride applications. It is important to note participants who had 4 or more topical fluoride applications had multiple applications concentrated during the 2010-2011 and/or 2011-2012 school years.

TABLE 10

TOPICAL FLUORIDE INTENSITY FOR CHILDREN AT ELEVATED CARIES RISK
PER SCHOOL YEAR

	2007-2008 (pilot)	2008-2009	2009-2010	2010-2011	2011-2012	Total
Numerator (zero topical fluoride application)	3	3	5	3	32	46
Percentage	7.5%	1.0%	1.2%	1.0%	10.9%	3.4%
Numerator (one topical fluoride application)	37	304	419	91	47	898
Percentage	92.5%	99.0%	98.8%	29.6%	16.0%	65.5%
Numerator (two topical fluoride applications)	n/a	n/a	n/a	73	97	170
Percentage	n/a	n/a	n/a	23.8%	33.1%	12.4%
Numerator (three topical fluoride applications)	n/a	n/a	n/a	137	91	228
Percentage	n/a	n/a	n/a	44.6%	31.1%	16.6%
Numerator (four topical fluoride applications)	n/a	n/a	n/a	3	26	29
Percentage	n/a	n/a	n/a	1.0%	8.9%	2.1%
Denominator (total number of children who were provided prophylaxis)	40	307	424	307	293	1371

TABLE 11

CUMULATED TOPICAL FLUORIDE INTENSITY FOR CHILDREN FOR DURATION
OF INTERVENTION

	Cumulated Number of Topical Fluoride Applications								
	0	1	2	3	4	5	6	7	8
Numerator (total number of topical fluoride applications)	10	496	200	132	77	27	17	18	9
Denominator (number of children who had intervention)	986	986	986	986	986	986	986	986	986
Percentage	1.0%	50.3%	20.3%	13.4%	7.8%	2.7%	1.7%	1.8%	1.0%

Collectively the results of the topical fluoride intensity and cumulated number of topical fluoride applications suggest the intervention provided access to timely and appropriate topical fluoride applications.

Sealant Use for 6-9 and 10-14 year-old Children at Elevated Risk

The application of “sealants for 6-9 year old children” and “sealants for 10-14 year-old children,” clinical quality access and process measures, are included in the DQA concept set and target the IOM Aims of equity and effectiveness. The measure investigates the provision of “timely and appropriate” healthcare and is supported by evidence that “the clinical process had led to improved outcomes” (Dental Quality Alliance 2012c, a, b). The ECP dental hygienists placed sealants in all permanent molars that were not decayed and did not already have a sealant present.

Table 12 summarizes the provision of sealants placed for enrolled children who were ages 6-14. The number of children who had at least one sealant placed was each selected as

the numerator. The number of children, ages 6-14, who had prophylaxis were selected at the denominator. Percentages of sealants placed on children in this age range ranged from a low of 36.8% to a high of 62.0%. To help put these numbers into perspective; table 13 outlines the percent of children ages 6-14 who had at least one sealant present prior to the prophylaxis. As you can see, the percent of children with at least one sealant present consistently increased throughout the duration of the intervention from a low of 12.9% to a high of 54.4%. These results exceed the HP 2020 target that 28.1% of children will have at least 1 sealant on permanent 1st molar. This suggests the intervention provided access to timely and appropriate sealant applications for 6-9 and 10-14 year old children.

TABLE 12

SEALANTS PLACED FOR 6-14 YEAR-OLD CHILDREN AT ELEVATED CARIES RISK

	2007-2008 (pilot)	2008-2009	2009-2010	2010-2011	2011-2012	Total
Numerator (number of children ages 6-14 who had at least one sealant placed)	19	92	172	160	154	597
Denominator (total number of children ages 6-14)	31	250	342	258	250	1131
Percentage	*62.3%	*36.8%	*50.3%	*62.0%	*61.6%	*52.8%

*Meets HP 2020 OH-12 Target 28.1% of children will have at least 1 sealant placed on a permanent 1st molar.

TABLE 13

SEALANTS PRESENT PRIOR TO TREATMENT FOR 6-14 YEAR-OLD CHILDREN AT ELEVATED CARIES RISK

	2007-2008 (pilot)	2008-2009	2009-2010	2010-2011	2011-2012	Total
Numerator (number of children ages 6-14 who had at least one sealant present)	4	63	126	112	136	441
Denominator (total number of children ages 6-14)	31	250	342	258	250	1131
Percentage	12.9%	25.2%	*36.8%	*43.4%	*54.4%	*39.0%

*Meets HP 2020 OH-12 Target 28.1% of children will have at least 1 sealant placed on a permanent 1st molar.

Collectively the data for Specific Aim #1 illustrate delivery of timely and appropriate evidence-based preventive healthcare suggesting that ECP dental hygienists provide quality evidence based care for children as a function of use of services, access and process.

Specific Aim #2

Specific Aim #2 seeks to “Evaluate the changes in oral health status of children who are provided care by ECP dental hygienists in a school based setting.” Sub-questions addressing 1.) The number of encounters in relation to the oral health status of children; 2.) The number of fluoride applications in relation to the oral health status of children; and 3.) The number of sealant applications in relation to the oral health status of children.

The oral health status of the multi-encounter cohort (n=295) was examined in depth to evaluate the outcomes on oral health status of children who were provided care by the ECP

dental hygienists in the intervention. The amount of decay decreased in 107 (36.3%) children, increased in 87 (29.5%) children, and remained the same in 36 (12.2%) children. Sixty-six (22.0%) children entered the program decay free and remained decay free.

Table 14 describes changes in the number of decayed teeth, and number of restorations present, in relation to the number of encounters that occurred. The total number of encounters for the multi-encounter cohort ranged from 2 encounters to 9 encounters. With the exception of having 2 or 9 encounters, an inverse relationship occurred between decay and restorations; as the number of teeth with decay decreased the number of teeth with restorations increased. This relationship is indicative of access to and utilization of dental services.

TABLE 14
CHANGES IN DECAY AND CHANGES IN RESTORATIONS IN RELATION TO THE NUMBER OF ENCOUNTERS

Number of Encounters	N	Mean (\pm SD) Change in Decayed Teeth	Mean (\pm SD) Change in Restored Teeth
2	73	0.51 (1.94)	0.30 (0.95)
3	64	-1.09 (2.92)	0.83 (1.86)
4	73	-0.66 (2.64)	1.10 (2.18)
5	32	-0.59 (3.78)	0.97 (1.73)
6	25	-1.16 (4.06)	2.00 (2.71)
7	16	-1.56 (3.54)	1.94 (2.24)
8	8	-1.25 (1.28)	1.50 (2.45)
9	4	1.50 (2.38)	0.00 (0.00)
Total	295	-0.54 (2.92)	0.95 (1.93)

A multivariate ANOVA was conducted to determine the significance of encounters in relation to decay and restorations. The results of this test are in table 15. There was a statistically significant effect of the number of encounters on decay ($p=0.014$), 95% CI (-1.06, -0.01) and restorations ($p=0.002$), 95% CI (0.74, 1.4). The Hotelling Trace multivariate

test was utilized to combine the dependent variables and examine the amount of variance in the data. This test revealed a statistically significant effect ($p=0.004$). The post hoc Bonferroni test was performed. Results revealed a statistically significant difference between 2 encounters and 3 encounters for decreasing the number of teeth with decay ($p=0.035$), 95% CI (-3.15, -0.05). Results revealed a statistically significant difference between 2 encounters and 6 encounters ($p=0.003$), 95% CI (0.33, 3.07) and between 2 encounters and 7 encounters ($p=0.049$), 95% CI (0.00, 3.27) for increases in the number of restorations.

TABLE 15

MANOVA SUMMARY TABLE CHANGES IN DECAY AND CHANGES IN RESTORATIONS IN RELATION TO THE NUMBER OF ENCOUNTERS

Dependent Variable	Sum of Squares	df	Mean Square	F	Sig.	η^2
Changes in Decay	147.74	7	21.11	2.56	.014	.059
Error	2365.64	287	8.24			
Changes in Restorations	82.42	7	11.77	3.34	.002	.075
Error	1010.71	287	3.52			

A Kruskal Wallis was conducted to determine the significance of the number of encounters in relation to changes in treatment urgency. The results of the mean ranks are in table 16. This test revealed a statistically significant difference between the number of encounters and treatment urgency ($H(2) = 16.34$, $p = 0.022$). The Mann-Whitney test was used to identify which pairs of encounters were significant in relation to changes in treatment urgency. Focused tests were conducted with 2 encounters serving as the control group. The Bonferroni correction ($.05/7$) was used to calculate a new statistical significance level ($p \leq 0.007$). The significant pairs were 2 encounters vs. 6 encounters ($p=0.003$) and 3 encounters vs. 6 encounters ($p=0.005$). As the number of encounters increased, the need for treatment referrals became less urgent.

TABLE 16
CHANGES IN TREATMENT URGENCY IN RELATION
TO THE NUMBER OF ENCOUNTERS

Number of Encounters	N	Mean Rank for Change in Treatment Urgency
2	73	131.69
3	64	131.91
4	73	159.14
5	32	157.42
6	25	183.58
7	16	138.66
8	8	187.38
9	4	160.75
Total	295	

The total number of fluoride applications per child ranged from 1 to 9 with a mean of 3.66 ± 1.69 applications. A multivariate ANOVA was conducted to determine the significance of fluoride applications in relation to decay and restorations. The results of this test are in table 17. There was not a statistically significant effect of fluoride application on decay. There was a statistically significant effect of the fluoride applications on restorations ($p= 0.031$), 95% CI (0.46, 1.58). As the number of fluoride applications increased so did the number of restorations. The Bonferroni correction ($.05/36$) was used to calculate a new statistical significance level ($p \leq 0.001$). The post hoc Bonferroni test was performed and revealed no significant pairings.

TABLE 17

MANOVA SUMMARY TABLE CHANGES IN DECAY AND CHANGES IN RESTORATIONS IN RELATION TO THE NUMBER OF TOPICAL FLUORIDE APPLICATIONS

Dependent Variable	Sum of Squares	df	Mean Square	F	Sig.	η^2
Changes in Decay	51.971	8	6.496	.755	.643	.021
Error	2461.405	286	8.606			
Changes in Restorations	62.015	8	7.752	2.150	.031	.057
Error	1031.117	286	3.605			

The total number of sealants placed per child ranged from 0 to 16 with a mean of 2.79 \pm 2.65 sealants placed. A multivariate ANOVA was conducted to determine the significance of sealants in relation to decay and restorations. The results of this test are in table 18. There was not a statistically significant effect of sealants in relation to decay or restorations.

TABLE 18

MANOVA SUMMARY TABLE CHANGES IN DECAY AND CHANGES IN RESTORATIONS IN RELATION TO THE NUMBER OF SEALANTS PLACED

Dependent Variable	Sum of Squares	df	Mean Square	F	Sig.	η^2
Changes in Decay	133.229	13	10.248	1.210	.271	.053
Error	2380.147	281	8.470			
Changes in Restorations	55.381	13	4.260	1.154	.314	.051
Error	1037.751	281	3.693			

Interpretation of Logic Model

Interpretation of a logic model by matching theoretically predicted events to empirical events is a recognized analytic technique for case study research (Yin 2009a). Figure 3 illustrates the analysis of the intervention logic model. Multiple pattern matches for outputs, short-term outcomes, long-term outcomes, and impact were observed. These matches are identified in bold red font. The researchers substituted referrals complete in

place of treatment plans established and they substituted dollar values in place of specific numbers for restorative dental care provided, dental hygiene services billed, and dental hygiene services reimbursed. The logic model was 100% successful at predicting outputs and short-term outcomes. The logic model predicted 2 out of 5 long-term outcomes and 2 out of 3 impacts. Data was not available for the long-term outcomes and impacts that were not matched.

Central Hypothesis

Collectively, the results of this study support the central hypothesis that ECP dental hygienists provide quality oral health care leading to improved oral health of underserved children in a school-based setting.

Dental providers in non-dental settings

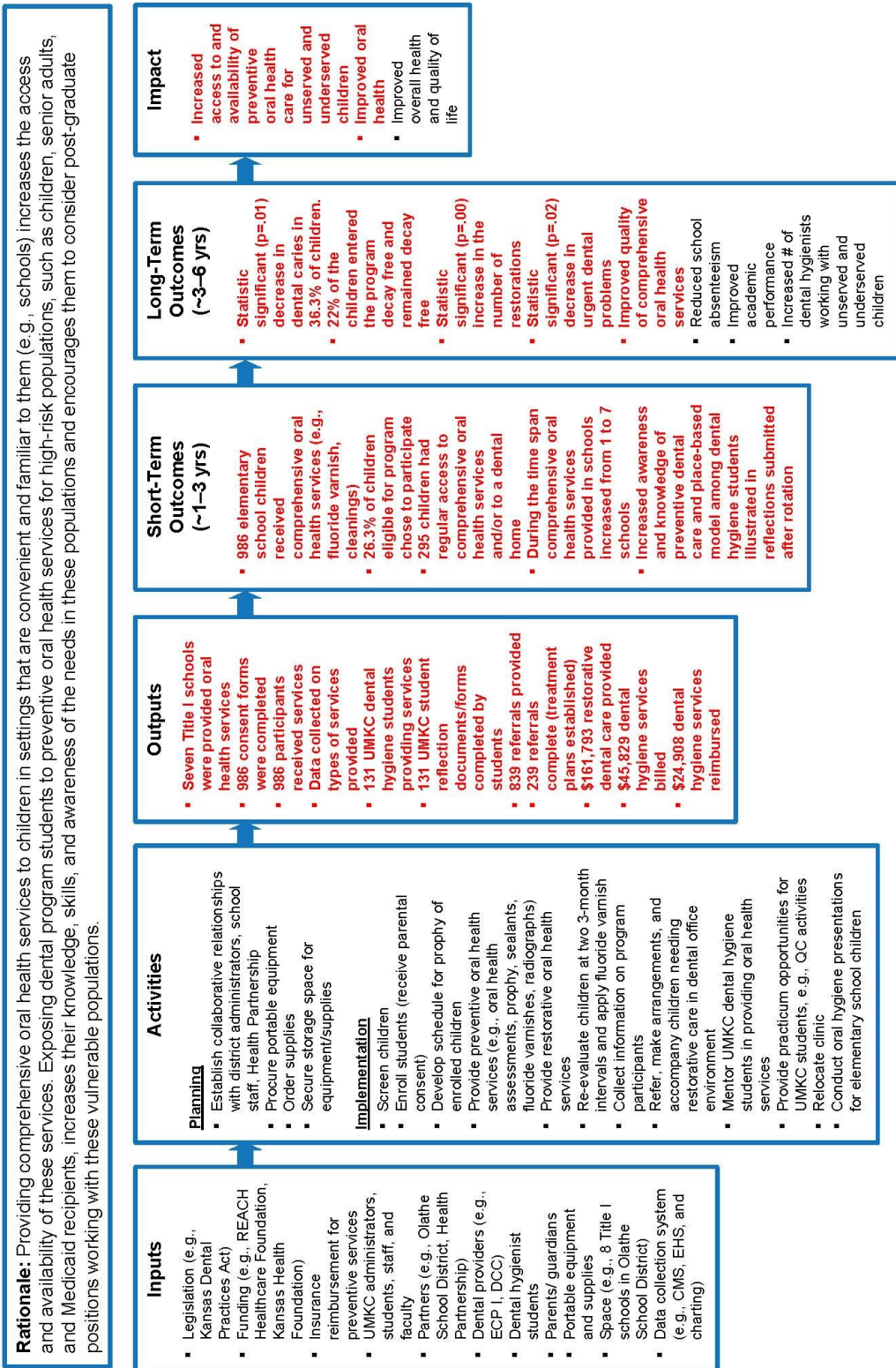


Figure 3. Analysis of Intervention Logic Model

CHAPTER 4

DISCUSSION

This study provides a foundation for examining the quality of care provided by dental hygienists with expanded scope of practice, in non-traditional settings, by which the results of subsequent research can be compared. This is the first study that used the Pediatric DQA Concept Set to examine the quality of care provided by ECP dental hygienists and can also be utilized to refine these measures. The DQA Concept Set measures quality by use of services, access, process, and cost. This study examined the first three measures, but, did not examine cost. Future research would benefit by examining costs associated with the provision of care and determining whether or not models such as these are a cost effective way to provide high quality care.

The amount of care delivered may have been influenced by the dental hygiene student rotations. The dental hygiene student workforce added additional providers to deliver care which potentially increased productivity. However, the dental hygiene student workforce functioned at a much slower pace than experienced dental hygienists which most likely offset any increased productivity that may have occurred. Dental hygiene student providers delivered care on average to 3 or 4 children daily depending on the child's age, complexity of oral health findings, and number of sealants that were placed. The dental hygiene student workforce was supervised by and delivered care under the license of the ECP dental hygienist. The quality of care was consistently maintained.

It is also important to consider the availability of resources from the School of Dentistry influenced the program. The Maintenance Department and the Bio-Medical Communications (BMC) Department assisted with setting up the clinic, moving the clinic,

utilization of technology (including the EMR and digital radiographs), and maintaining equipment. Additionally infrastructure is in place to assist with purchasing. Adjustments may be necessary to replicate this model in a non-university setting.

The results of this study revealed the intervention provided access to timely and equitable healthcare in 10-50% of the target population. The intervention; however, did not routinely meet the HP 2020 objective of 49% of persons 2 and older accessing the oral health system at least one time in the past year. It is important to consider that this model was just one option for accessing the oral health system and other opportunities for access were also present. Additionally, this program only had access to school age children. Therefore the numbers reported in this study merely contribute to the target of 49% and do not represent all persons who accessed the system.

Utilization of services remained relatively constant for the first three years of the intervention and then began to steadily decrease after collaboration with a dentist in the community began providing restorative care one day a month. While this could be viewed as a negative aspect of the model, the authors do not feel that is the case. Interviews with the ECP dental hygienists hypothesize utilization of services decreased because children became patients of record at the referring dentist after being provided care in the practice. The intervention helped facilitate this establishment of a dental home for the children. Future studies should examine the frequency of this occurrence and the behavioral changes in the target population that occurred.

The DQA Concept Set uses the provision of “preventive services for children at elevated caries risk” to measure quality. This measure represents access to timely, equitable, appropriate, and effective healthcare. The results of this study revealed 96.6% of the target

population was provided at least one fluoride application and 34% of the target population was provided at least one sealant. These results significantly exceed the HP 2020 objective that 29.4% of children will receive preventive dental care. These outcomes overwhelmingly demonstrate the provision of quality oral health care. The topical fluoride intensity outcomes and sealant use outcomes further substantiate this.

The number of topical fluoride applications had a statistically significant effect on increases in the number of restorations. It is important to note the application of topical fluoride does not directly affect the number of restorations and the findings in this study are not implying that. There is clinical significance in this finding in terms of triangulation. An increase in the number of topical fluoride applications would also result in an increase in ECP dental hygienists encounters; therefore, this finding could infer that fluoride applications increase access and utilization of dental services.

In contrast, the number of sealants placed was not statistically significant in relation to changes in decay and changes in restorations. This was not an expected finding. The researchers hypothesize this is because the number of sealants placed is not reflective of the number of ECP dental hygienists encounters. Participants could have numerous sealants placed during one single encounter. These findings further illustrate improved oral health is related to the number of ECP dental hygienists encounters and not merely the provision of evidence-based services.

Quality assessment has been criticized for not evaluating the effectiveness of care and patient-oriented outcomes (Bader 2009; U.S. Institute of Medicine Committee on Quality of Health Care in America 2009; Dental Quality Alliance 2012b). Changes in program participant's oral health status are ultimately the preeminent measure of quality. This study

addressed these deficiencies by examining the changes in oral health status in a cohort of children who adopted the intervention as their dental home. The results of this study clearly illustrate the number of encounters with ECP dental hygienists yielded a decrease in decay, an increase in restorations, and a decrease in the level of treatment urgency all at statistically significant levels. This study did not capture how the inter-professional relationships between the ECP dental hygienists, dental hygiene students, school nurses, speech pathologists, occupational therapists, teachers, and translators impacted the quality of care. Future research should examine the effect of these relationships.

Effectiveness research assesses the degree of beneficial effect of a real-world intervention on a target population (Dental Quality Alliance 2012c). The pragmatic nature of these sorts of trials does not allow for tight controls. There was tremendous diversity in the target population that could not be measured or controlled for in this case study. Parental knowledge and support of oral health varied tremendously, children had different levels of ability for their personal oral self-care, diets were wide-ranging, and home environments were unpredictable. The target population tended to be transient and it was not unusual for children to attend more than one school during the school year. There was also diversity within the data set. The multi-encounter cohort did not necessarily have consecutive visits from year to year. Some of the children had two or three years between visits. Also, children that attended School 5 had two preventive visits during the 2011-2012 school year. The number of subjects in each group was not equal which further complicated the data set. Data sets with more variables of interest than data points are undesirable for clinical trials; however, they are widely accepted (and expected) for case study research methods when multiple sources of data are used for triangulation (Yin 2009b).

Extreme measures were taken by ECP dental hygienists and school nurses to coordinate collaboration with the local dentist and utilize the dentist's time efficiently. Health histories and informed consent were collected by the school nurse in advance of the appointment and the school nurse coordinated transportation which was provided by the school district. The ECP dental hygienist communicated initial findings and shared charting and radiographs with the dentist so the appropriate amount of time was set aside to complete restorative procedures. The ECP dental hygienist was present at the restorative appointment to answer questions and served as the district representative. The DQA concept set does not measure care coordination and care continuity which are "important aspects of high quality, patient-centered care" (Dental Quality Alliance 2012b). Future research should collect data about these aspects of quality in relation to patient-oriented outcomes. Future research should also explore why children did not continue with the intervention from one year to the next. Did the children find a dental home at a dental office in the community? Did they move to a different elementary school? Did they move out of the school district? Did they graduate to middle school?

Four conditions are necessary to produce high quality case study research; construct validity, internal validity, external validity, and reliability (Yin 2009b). Construct validity is frequently criticized with case study research methods because investigators fail to establish an operational set of measures (Yin 2009c). The investigators in the present study were cognizant of this. The definition of quality was established using specific concepts of quality that were identified in the literature and the operational measures were objective and developed by a third party (DQA) not associated with this study.

Internal validity seeks to examine a causal relationship where certain conditions lead to others (Yin 2009c). To ascertain internal validity, the investigators analyzed the intervention logic model that was developed by ICF International as part of an evaluative assessment. The investigators applied pattern matching techniques, as suggested by Yin (2009) and found the logic model to be predictive of the intervention outcomes (Yin 2009c). This provided triangulation. Additionally, data for this case study were obtained using objective measures removing the need for inference. This case study did not examine or make inferences about the effect of the intervention on participants' school attendance, school performance, overall health, nor quality of life. Future studies should examine these items to gain a better picture how school-based oral health interventions impact children.

External validity is the condition that allows a study to get generalized beyond the case study. Case study research relies on “analytic generalization” where investigators generalize results “to a broader theory” (Yin 2009c). The researchers analyzed a tremendous amount of data for this study. Additionally, data for this study was collected over a five year time period in seven different schools. The investigators feel confident that the results of this study can be generalized to other school based oral health interventions where care is provided by ECP dental hygienists.

Reliability demonstrates a study's methods and procedures can be repeated and yield the same results. It is an important aspect of minimizing errors and biases (Yin 2009c). Documentation in the present case study was extensive. A case study protocol was designed and can be observed in tables 3 and 4. This protocol could be easily replicated by other researchers. Additionally all of the data came from the EMR which also served as the case study database.

Limitations

One of the problems encountered with this study was modifying the EMR to capture data essential for this project. In 2009 the EMR at the SOD was updated and patient files were merged. Several of the patient files did not merge properly; therefore, a record audit was conducted and data during this time span were re-entered by hand. To ascertain data extracted from the EMR was accurate, a third party audited the data. Minimal errors were found and corrected.

Quantitative research methods include numerical values and measurement allowing the investigator to identify patterns using deductive logic (Salehi and Golafshani 2010). Quantitative researchers must identify potential threats to validity and control for these threats through the design of the research (Maxwell J. 2005; Creswell 2009). This study had no internal threats to validity. A potential threat to external validity was the interaction of setting and treatment. Generalizing the findings of this study to individuals in settings other than schools may be problematic. Future research, using the same model of oral health care delivery, should be conducted in other settings such as long term care facilities (Creswell 2009).

Delimitations

This study sought to examine the quality of care and effectiveness of care provided by dental hygienists with expanded scope of practice in a school based setting. In Kansas ECP dental hygienists can provide preventive care without the direct supervision of a dentist (Kansas Dental Board 2009). Therefore, this study examined the quality of care and effectiveness of “preventive” care, not “restorative” care. This study did not examine the quality of care and effectiveness of care provided by an advanced dental hygiene practitioner

or any other expanded scope of practice dental hygienist. In the future, should the scope of dental hygiene practice broaden, this study could be replicated to examine quality of care and effectiveness of care, provided by the expanded scope of practice dental hygienist, after making modifications related to best practices for associated restorative care.

The study did not control for the variability of competency between providers. The competency of the dental hygienist clearly impacts the quality and effectiveness of care. The dental hygienist with expanded scope of practice providing care for this study had 19 years of experience working with children and 6 years' experience treating patients under an expanded scope of practice in a school based setting. The experience of other dental hygienists may impact the quality of care delivered.

CHAPTER 5

CONCLUSION

Within the limitations of this single program multisite case study the following conclusions can be rendered:

1. ECP dental hygienists can provide access to and the provision of timely and appropriate quality oral health care for low income children in a school-based setting.
2. Oral health care provided by ECP dental hygienists can improve the oral health status of low income children who lack access to oral health care.

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APPENDIX 1
GLOSSARY OF TERMS

Access (Clinical Quality Measure): Access to care is the attainment of timely and appropriate health care by patients or enrollees of a health care organization or clinician.

Access measures are supported by evidence that an association exists between the measure and the outcomes of or satisfaction with care (National Quality Measures Clearinghouse 2013).

Cost (Related Healthcare Delivery Measure): Costs of care are the monetary or resource units expended by a health care organization or clinician to deliver health care to individuals or populations. Cost measures are computed from data in monetary or resource units. Costs may be reported directly (i.e., actual costs) or estimated based on the volume of resource units provided and the charges for those units (National Quality Measures Clearinghouse 2013).

Dental Home: An ongoing source of quality dental care delivered in a comprehensive, continuously accessible, family-centered way under the supervision of a licensed dentist (American Academy of Pediatric Dentistry 2010).

Effective: Providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (avoiding underuse and overuse) (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001).

Efficient: Avoiding waste in equipment, supplies, ideas, and energy (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001).

Equitable: Providing care that does not fluctuate in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001).

Quality of Care: The degree to which healthcare services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001).

Quality Measures: The mechanisms that enable the user to quantify the quality of a selected aspect of care by comparing it to an evidence-based criterion that specified what better quality is (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001).

Patient-centered: Providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001).

Process (Clinical Quality Measure): A process of care is a health care-related activity performed for, on behalf of, or by a patient. Process measures are supported by evidence that the clinical process-that is the focus of the measure-has led to improved outcomes (National Quality Measures Clearinghouse 2013).

Safe: Avoiding injuries to patients from the care that is intended to help them (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001).

Timely: Reducing waits and sometimes harmful delays for both those who receive and those who provide care (U.S. Institute of Medicine Committee on Quality of Health Care in America 2001).

Title I Schools: Supplemental funding provided by the U.S. Department of Education to schools with 40% of children exceeding poverty, with poverty being based upon the number of students that qualify for free or reduced lunches, to meet the needs of at-risk and low-

income students. Title 1 funds aim to bridge the gap between low-income students and other students (Kansas State Department of Education 2013).

Use of Services (Related Healthcare Delivery Measure): Use of services is the provision of a service to, on behalf of, or by a group of persons identified by enrollment in a health plan or through use of clinical services. Use of service measures can assess encounters, tests, or interventions that are not supported by evidence for the appropriateness of the service for the specified individuals (National Quality Measures Clearinghouse 2013).

APPENDIX 2

DENTAL QUALITY ALLIANCE STARTER SET OF MEASURES

FINAL July 19, 2013



Dental Quality Alliance Measures User Guide

Preface

This user guide was developed by the Dental Quality Alliance (DQA) to assist in implementing DQA Measures. These measures are based on administrative (enrollment, claims and encounters) data and are applicable for health plan/program assessment. All users should read this document carefully prior to implementing the measures.

Although it would be ideal for measurement agencies to measure all aspects of care, this may not be cost-effective and may result in undue burden to reporting agencies. Thus, organizations engaged in measurement must first define the purpose for measurement and select an appropriate subset of measures for implementation. DQA measure specifications are designed such that each measure can be used independently.

A balanced approach that evaluates multiple aspects of care is essential in understanding disparities and adequately planning for improved performance. In order to implement standardized measurement, it is imperative that along with measure concepts, a **uniform set of feasible, valid and reliable measure specifications are used** across measurement agencies using similar data sources in order to develop benchmarks and compare results towards identifying improvement opportunities.^{1,2}

¹ Damiano P, Momany ET, Crall JJ. Determining dental utilization rates for children: an analysis of data from the Iowa Medicaid and SCHIP programs. *J Public Health Dent.* 2006 Spring; 66(2):97-103.

² Department of Health and Human Services, Children's Health Insurance Program Reauthorization Act 2011 Annual Report on the Quality of Care for Children in Medicaid and CHIP. <http://www.medicaid.gov/> Accessed February 2012

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Background

The DQA developed measures that are standardized and can be applied across both public and private sectors. DQA Measures can be used to:

1. uniformly assess quality of care across private/public sectors³ and across state/community and national levels;
2. uniformly assess utilization of certain services that are not supported by evidence that they indicate better or worse care, but which may be important in the context of providing a standard of care;
3. inform performance improvement projects longitudinally and monitor improvements in care;
4. identify variations in care; and
5. develop benchmarks for comparison.

These measures can be used by health plans as well as state programs such as Medicaid or CHIP.

Paid and Unpaid claims

All non-cost DQA measures should include both paid and unpaid claims (including pending, suspended, and denied claims) since the intent is to capture whether the enrollee received **the service** during the reporting year. This approach is consistent with commonly used measures of access and effectiveness of health care services. DQA cost measures should include only paid claims. Only the most recent disposition of adjudicated claims should be used, and implementers should allow for at least three months of claims run-out before calculating the measures for the reporting year. For example, if the reporting year is calendar year 2013, then the measures should not be run before April 1, 2014 to allow sufficient time for claims processing. Implementers may want to check with program administrators for any additional requirements related to claims run-out. The claims run-out period should be reported with the measurement score.

³ Comparisons between different programs, plans and product lines within a plan should be interpreted in context of the populations served and benefit designs.

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Defining Reporting Year: CY versus FFY

The definition of “reporting year” can be either *calendar* or *federal fiscal* year. In testing the DQA measures, the results were similar between these methods of defining the “reporting year.” Agencies requesting measurement scores should specify the reporting year. The reporting year should be reported with the measurement score. Because nationally-reported measures sets are most frequently reported using the calendar year or the federal fiscal year, state fiscal year was not additionally tested. Programs that elect to report on the state fiscal year may want to conduct their own sensitivity testing.

Age Requirements

DQA measures are designed broadly to allow for use across public and private sectors. When used for comparison across Medicaid/ CHIP programs, all programs should include children younger than age 21 years (<21 years). However, if a particular Medicaid or CHIP program has a more restrictive age range, the state should include only the ages eligible for the program in the denominator.

When used for quality reporting within a health Insurance Marketplace under the ACA, competing plans should include individuals younger than age 19 years (<19 years) following the age requirements for Essential Dental Benefit coverage.

Reporting entities reporting for other programs or purposes should check with the appropriate program officials. The age criterion used should be reported with the measurement score.

Calculating Continuous Enrollment: “Same” Plan versus “Any” Plan

Continuous enrollment for measures with 90-day (3 month) or 180-day (6-month) enrollment criteria requires that there be no gap in coverage. Continuous enrollment for measures with full-year enrollment criteria allows for a single one-month gap in coverage (or 31 days). At the state program level (e.g., Medicaid/ CHIP) a criterion of “any” plan applies when assessing continuous enrollment, whereas at the health plan (e.g., MCO) level a criterion of “same” plan applies. That is, at the program level, all enrollment months are counted regardless of whether the enrollee switched plans during the reporting period; at the plan level, only enrollment months in the particular plan are counted. The criterion of “any” plan versus “same” plan should

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be reported with the measurement rate. While this prevents direct aggregation of results from plan to program, each entity is given due credit for the population it serves. Thus programs with multiple MCOs should not merely “add up” the plan level rates but should calculate the overall program rate (i.e., using the “any” plan criterion) from their database to allow inclusion of individuals who were continuously enrolled but switched plans during the reporting year. Users are encouraged to report the average enrollment duration of all members included in the denominator with the measurement score (total number of months enrolled/total unduplicated members).

Provider Type

Delineating “Dental” vs. “Oral Health” Services

Most measure specifications include the option to report separate rates for “dental” services and for “oral health” services. The Code of Federal Regulations⁴ defines “dental” services as follows:

§ 440.100 Dental services.
(a) “Dental services” means diagnostic, preventive, or corrective procedures provided by or under the supervision of a dentist in the practice of his profession, including treatment of —
(1) The teeth and associated structures of the oral cavity; and
(2) Disease, injury, or impairment that may affect the oral or general health of the recipient.
(b) “Dentist” means an individual licensed to practice dentistry or dental surgery.

Thus “dental” services refers to services provided by or under the supervision of a dentist, and “oral health” services refers to services not provided by or under the supervision of a dentist.

When CDT codes are used, provider taxonomy codes should be used to delineate provider type. Handling of provider taxonomy varies between states. When available, the Health Care Provider Taxonomy code set maintained by the National Uniform Claim Committee (hereafter referred to as NUCC maintained provider taxonomy codes) can be used to delineate “dental” and “oral health” services. The NUCC maintained provider taxonomy codes in the table below should be categorized as “dental” services. **Note that services provided by a dental hygienist would only be counted as a “dental” service if those services are provided under the supervision of a dentist. Services provided by independently practicing dental hygienists and other such**

⁴ Accessed at <http://www.gpo.gov/fdsys/pkg/CFR-2006-title42-vol4/xml/CFR-2006-title42-vol4-sec440-100.xml>

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providers would be classified as "oral health" services.⁵ In cases where the provider is listed as a Federally Qualified Health Center (FQHC) (NUCC Code: 261QF0400X), Rural Health Center (RHC) (NUCC Code: 261QR1300X), or County Health Department the services would be included in the measure numerators as "dental" services. Some states may use custom codes instead of NUCC maintained provider taxonomy codes. The custom codes should align as closely as possible to the NUCC maintained provider taxonomy code assignment of "dental" versus "oral health" providers.

Similarly, services related to the oral cavity that are billed using CPT codes should be identified as "oral health" services when billed by non-dental providers.

<http://www2.aap.org/compeds/dochs/oralhealth/docs/OHR reimbursementChart.pdf>.

Table 1: NUCC maintained Provider Taxonomy Codes

Code	Classification	Specialization	Definition
122300000X	Dentist		A dentist is a person qualified by a doctorate in dental surgery (D.D.S.) or dental medicine (D.M.D.), licensed by the state to practice dentistry, and practicing within the scope of that license. There is no difference between the two degrees: dentists who have a DMD or DDS have the same education. Universities have the prerogative to determine what degree is awarded. Both degrees use the same curriculum requirements set by the American Dental Association's Commission on Dental Accreditation. Generally, three or more years of undergraduate education plus four years of dental school is required to graduate and become a general dentist. State licensing boards accept either degree as equivalent, and both degrees allow licensed individuals to practice the same scope of general dentistry. Additional post-graduate training is required to become a dental specialist.
1223D0001X	Dentist	Dental Public Health	The science and art of preventing and controlling dental diseases and promoting dental health through organized community efforts. It is that form of dental practice that serves the community as a patient rather than the individual. It is concerned with the dental health education of the public, with applied dental research, and with the administration of group dental care programs as well as the prevention and control of dental diseases on a community basis.
1223D0004X	Dentist	Dentist Anesthesiologist	A dentist who has successfully completed an accredited postdoctoral anesthesiology residency training program for dentists of two or more years duration, in accord with Commission on Dental Accreditation's Standards for Dental Anesthesiology Residency Programs, and/or meets the eligibility requirements for examination by the American Dental Board of Anesthesiology.

⁵ Without taxonomy codes that distinguish allied dental professionals practicing independently versus under the supervision of a dentist, administrative claims data may not distinguish whether services are provided under the supervision of a dentist.

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1223E0200X	Dentist	Endodontics	The branch of dentistry that is concerned with the morphology, physiology and pathology of the human dental pulp and periradicular tissues. Its study and practice encompass the basic and clinical sciences including biology of the normal pulp, the etiology, diagnosis, prevention and treatment of diseases and injuries of the pulp and associated periradicular conditions.
1223G0001X	Dentist	General Practice	A general dentist is the primary dental care provider for patients of all ages. The general dentist is responsible for the diagnosis, treatment, management and overall coordination of services related to patients' oral health needs.
1223P0106X	Dentist	Oral and Maxillofacial Pathology	The specialty of dentistry and discipline of pathology that deals with the nature, identification, and management of diseases affecting the oral and maxillofacial regions. It is a science that investigates the causes, processes, and effects of these diseases. The practice of oral and maxillofacial pathology includes research and diagnosis of diseases using clinical, radiographic, microscopic, biochemical, or other examinations.
1223P0221X	Dentist	Pediatric Dentistry	An age-defined specialty that provides both primary and comprehensive preventive and therapeutic oral health care for infants and children through adolescence, including those with special health care needs.
1223P0300X	Dentist	Periodontics	That specialty of dentistry which encompasses the prevention, diagnosis and treatment of diseases of the supporting and surrounding tissues of the teeth or their substitutes and the maintenance of the health, function and esthetics of these structures and tissues.
1223P0700X	Dentist	Prosthodontics	That branch of dentistry pertaining to the restoration and maintenance of oral functions, comfort, appearance and health of the patient by the restoration of natural teeth and/or the replacement of missing teeth and contiguous oral and maxillofacial tissues with artificial substitutes.
1223S0112X	Dentist	Oral and Maxillofacial Surgery	The specialty of dentistry which includes the diagnosis, surgical and adjunctive treatment of diseases, injuries and defects involving both the functional and esthetic aspects of the hard and soft tissues of the oral and maxillofacial region.
1223X0008X	Dentist	Oral and Maxillofacial Radiology	The specialty of dentistry and discipline of radiology concerned with the production and interpretation of images and data produced by all modalities of radiant energy that are used for the diagnosis and management of diseases, disorders and conditions of the oral and maxillofacial region.
1223X0400X	Dentist	Orthodontics and Dentofacial Orthopedics	That area of dentistry concerned with the supervision, guidance and correction of the growing or mature dentofacial structures, including those conditions that require movement of teeth or correction of malrelationships and malformations of their related structures and the adjustment of relationships between and among teeth and facial bones by the application of forces and/or the stimulation and redirection of functional forces within the craniofacial complex. Major responsibilities of orthodontic practice include the diagnosis, prevention, interception and treatment of all forms of malocclusion of the teeth and associated alterations in their surrounding structures; the design, application and control of functional and corrective appliances; and the guidance of the dentition and its supporting structures to attain and maintain optimum occlusal relations in physiologic and esthetic harmony among facial and cranial structures.
124Q00000X	Dental Hygienist		An individual who has completed an accredited dental hygiene education program, and an individual who has been licensed by a state board of dental examiners to provide preventive care services under the supervision of a dentist.

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			Functions that may be legally delegated to the dental hygienist vary based on the needs of the dentist, the educational preparation of the dental hygienist and state dental practice acts and regulations, but always include, at a minimum, scaling and polishing the teeth. To avoid misleading the public, no occupational title other than dental hygienist should be used to describe this dental auxiliary.
125J0000X	Dental Providers	Dental Therapist	A Dental Therapist is an individual who has completed an accredited or non-accredited dental therapy program and who has been authorized by the relevant state board or a tribal entity to provide services within the scope of their practice under the supervision of a dentist. Functions that may be delegated to the dental therapist vary based on the needs of the dentist, the educational preparation of the dental therapist and state dental practice acts and regulations.
125K0000X	Dental Providers	Advanced Practice Dental Therapist	An Advanced Practice Dental Therapist is: (1) A dental therapist who has completed additional training beyond basic dental therapy education and provides dental services in accordance with state advanced practice dental therapist laws or statutes; or (2) A dental hygienist with a graduate degree in advanced dental therapy prepared for independent and interdependent decision making and direct accountability for clinical judgment across the dental health care continuum. The individual has been authorized by the relevant state board or a tribal entity to provide services under the remote supervision of a dentist. The functions of the advanced practice dental therapist vary based on the needs of the dentist, the educational preparation of the advanced practice dental therapist and state dental practice acts and regulations.
261QF0400X	Clinic/Center	Federally Qualified Health Center (FQHC)	
261QR1300X	Clinic/Center	Rural Health	

“Billing” vs. “Rendering” Provider

Provider type should be based on rendering provider (not billing provider) unless otherwise noted. Rendering provider is more likely to capture the individual actually performing the service.

Typically the claims/encounter database includes both the provider ID (tax ID, NPI, or program assigned ID) as well as the provider type (based on NUCC maintained provider taxonomy or program/plan defined specialty or type). In cases where the provider type is not available in the claims/encounter database, users should link the provider ID in the claims database to the provider type in the provider database. When linking to the provider database: if an individual provider ID maps to more than one taxonomy/specialty, the service should be counted as a dental service if any of the taxonomies/specialties that the provider maps to is within the list presented above with the exception of dental hygienist if the dental hygienist is not under the supervision of a dentist.

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As mentioned above, in cases where rendering provider is listed as a Federally Qualified Health Center (FQHC) (NUCC Code: 261QF0400X), Rural Health Center (RHC) (NUCC Code: 261QR1300X), or County Health Department the services would be included in the measure numerators as "dental" services. As a last resort, when "rendering" provider information is not available, the billing provider's taxonomy may be used. This should be noted in the performance report.

Stand-alone commercial dental plans that reconcile claims only for dental providers can skip the steps required to check for "dental" services.

Bundled Services Reported Using CDT Code

Some state programs may reimburse a single amount for a bundled set of services – e.g., oral evaluation, topical fluoride, and prophylaxis. In such instances providers should be encouraged to record all the services rendered on the claim form even if they may be billing against only one of the services.

For computing the measure, the code should be interpreted in line with the descriptions in the CDT manual (e.g., D0145 should only be included in the Utilization of Services and Oral Evaluation measures).

FQHC Encounter Billing

Some FQHCs may be reimbursed based on an encounter - i.e., they are reimbursed based on each visit and not on the individual services provided during that visit. In such instances, that encounter may be captured in the claims system as a designated procedure/encounter code. Information on what services were provided during that encounter is not captured. In such cases, that encounter would be captured only in the Utilization of Services measure.

A note should be included in any performance reports from programs and plans noting such reimbursement policies and acknowledging the policy's limitation for accurately capturing service provision.

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Non-FFS Reimbursement

Providers who are reimbursed using payment methods other than fee-for-service (e.g., capitation, salary, and hybrid payment methodologies) should be required to submit information on all rendered services on the encounter form to enable appropriate quality measurement.

Criteria for “Elevated” Risk

Risk status is valuable for identifying individuals who are more likely to experience disease. Many evidence-based guidelines⁶ suggest a risk-based approach for prevention.^{7,8} Some measures are limited to populations at “elevated-risk” using the following approach:

- a. If subject meets any of the following then include in **denominators restricted to individuals with elevated risk**:
 - i. the subject has a visit with a CDT code indicating elevated risk (Dxxxx or Dxxxx) in the reporting year⁹, OR
 - ii. the subject has a SERVICE Code among those in Table 1 in the reporting year, OR
 - iii. the subject has a SERVICE Code among those in Table 1 below in any of the three years prior to the measurement year (**NOTE:** The subject does not need to be enrolled in any of the prior three years in order to meet the denominator enrollment criteria for these measures; this is a “look back” for enrollees who do have claims experience in any of the prior three years.)
- b. If the subject does not meet any of the above criteria for elevated risk, then these enrollees will not be included in the elevated risk measure denominators.

Table 1: CDT Codes to identify “elevated risk”

D2140	D2394	D2630	D2720	D2791	D3120
D2150	D2410	D2642	D2721	D2792	D3220
D2160	D2420	D2643	D2722	D2794	D3221
D2161	D2430	D2644	D2740	D2799	D3222

⁶ Beauchamp J, Caufield PW, Crall JJ, Donly K, Feigal R, Gooch B, et al. Evidence-based clinical recommendations for the use of pit-and-fissure sealants: a report of the American Dental Association Council on Scientific Affairs. *J Am Dent Assoc* 2008; 139(3):257-268.

⁷ National Institute for Health and Clinical Excellence Guideline accessed at <http://guidance.nice.org.uk/CG19/Guidance/pdf/English>

⁸ American Dental Association. Report of the Council on Scientific Affairs. *Evidence-based Clinical Recommendations: Professionally Applied Topical Fluoride*. May 2006.

⁹ **CDT Codes:** Specific codes will be available January 2014

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D2330	D2510	D2650	D2750	D2930	D3230
D2331	D2520	D2651	D2751	D2931	D3240
D2332	D2530	D2652	D2752	D2932	D3310
D2335	D2542	D2662	D2780	D2933	D3320
D2390	D2543	D2663	D2781	D2934	D3330
D2391	D2544	D2664	D2782	D2940	
D2392	D2610	D2710	D2783	D2950	
D2393	D2620	D2712	D2790	D3110	

This method has limitations in that it will not identify every child who may be truly at elevated risk. Given that past history of caries is the most well-established predictor of risk for future disease;^{10,11,12} this method is the strongest evidence-based approach to identify children who are most susceptible to new carious lesions using administrative data.

A number of efforts are underway to develop predictive tools to assess caries risk (validated risk assessment tools) and capture this assessment as structured data within the claims process (procedure and diagnostic codes). These changes will be assessed in future updates to the DQA measures. ***It is important to note that this proposed methodology is not intended as a "risk assessment tool" to be used at the level of the individual patient either to assess risk or to define dental benefits.*** It is only a population-based model for the purpose of identifying populations at "elevated risk" for caries using claims data.

Stratification

The DQA encourages the measure results to be stratified by age, race, ethnicity, geographic location, socioeconomic status, payer type, and program/plan type. Such stratifications will enable implementers to identify variations in care by child and program characteristics, which can be used to inform quality improvement initiatives.

¹⁰ National Institute for Health and Clinical Excellence Guideline accessed at <http://guidance.nice.org.uk/CG19/Guidance/pdf/English>

¹¹ American Academy of Pediatric Dentistry Guidelines accessed at http://www.aapd.org/media/Polices_Guidelines/G_CariesRiskAssessment.pdf

¹² American Dental Association Caries Risk Assessment Forms accessed at <http://www.ada.org/5157.aspx?currentTab=2>

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To stratify the measure results, the denominator population is divided into different subsets based on different characteristics of interest (e.g., age, race/ethnicity, geographic location, etc.) and the rates are reported for each sub-population.

Contextual Information

There may be other aspects of care that would inform quality improvement initiatives, such as identifying **where** services were received – for example, what percentage of children who received an oral evaluation received that service at a private practice, federally qualified health center, and so forth.

Data Quality

Critical data elements are those without which the measure cannot be calculated (e.g., date of service, CDT codes, etc.). Stratification data elements are those data elements used for stratification of the measure score (e.g., race/ethnicity, geographic location, etc.). The tables below provide examples of the critical data elements and those needed for stratification of several DQA measures. These tables will be useful for implementers to ensure completeness of their databases when they consider using the DQA measures. In addition to completeness, users should assure accuracy and quality of the data before calculating and reporting measure scores. **Although reliability of the DQA measures has been established, ultimately reliability of the measure score depends on the quality of the data that are used to calculate the measures. Flow rates (% of missing or invalid data) for these data elements must be investigated prior to measurement.** Particularly for critical data elements, programs and plans should prospectively identify error thresholds – the maximum percentage of missing or invalid values that will be accepted. Following guidance from the Centers for Medicare and Medicaid services, it is recommended that data element error thresholds be set below 5%.¹³ Plans and programs should have detailed protocols in place for assessing data completeness, accuracy, and quality.

¹³ Centers for Medicare and Medicaid Services. Medicaid and CHIP Statistical Information System (MSIS) File Specifications and Data Dictionary. August 2010; accessed at: <http://www.cms.gov/Research-Statistics-Data-and-Systems/Computer-Data-and-Systems/MSIS/downloads/msisd2010.pdf>.

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Below is a sample report of missing and invalid rates for critical and stratification data elements.

Critical Elements

Variable Name	Source	# of Total Counts	# of Missing or Invalid	% of Missing or Invalid	Note	
Member ID	Enrollment Database	332,290	896	0.27%		
Member ID	Encounter Database	2,668,868	5,333	0.20%		
Date of Birth	Enrollment Database	332,290	0	0.00%		
Monthly enrollment indicator	Enrollment Database	332,290	0	0.00%		
Dental Procedure Codes - CDT	Encounter Database	2,668,868	7,597	0.28%		
Date of Service	Encounter Database	2,668,868	0	0.00%		
Tooth Number	Encounter Database	248,821	454	0.18%		
Amount Paid	Encounter Database	2,668,868	0	0.00%		
Different Fields Used to Capture Provider ID (Only 1 Needed) - Need 1 for Usual Source of Services Measure; May Be Needed for Identifying Provider Type (Dentist/Oral Health) if Taxonomy/Provider Type not filled in claims data.	Rendering Provider TAXID (TIN)	Encounter Database	2,668,868	25,235	0.95%	
	Billing Provider TAXID (TIN)	Encounter Database	2,668,868	182,463	6.84%	
	Rendering Provider NPI	Encounter Database	2,668,868	28,944	1.08%	
	Billing Provider NPI	Encounter Database	2,668,868	146,769	5.50%	
	Rendering Provider Program Assigned ID	Encounter Database				Not Available
	Billing Provider Program Assigned ID	Encounter Database				Not Available
Different Fields Used to Capture Provider Type (Only 1 Needed) - Dental v. Oral Health	Rendering Provider Taxonomy (NUCC)	Encounter Database	2,668,868	4,932	0.18%	
	Billing Provider Taxonomy (NUCC)	Encounter Database	2,668,868	4,973	0.19%	
	Rendering Provider Specialty (Program/Plan defined)	Encounter Database				Not Available
	Rendering Provider Type (Program/Plan defined)	Encounter Database				Not Available
	Billing Provider Specialty (Program/Plan defined)	Encounter Database				Not Available
	Billing Provider Type (Program/Plan defined)	Encounter Database				Not Available

Stratification Elements

Variable Name	Source	# of Total Counts	# of Missing or Invalid	% of Missing or Invalid	Note	
Race/Ethnicity Combined Field	Enrollment Database				Not Available	
Race Separate Field	Enrollment Database	332,290	164,258	49.43%		
Ethnicity Separate Field	Enrollment Database	332,290	174,446	52.50%		
Gender	Enrollment Database	332,290	4	0.00%		
Geographic Fields - Potential SES Indicator	Street Address	Enrollment Database	332,290	3,465	1.04%	
	City	Enrollment Database	332,290	3,465	1.04%	
	County	Enrollment Database	332,290	4,282	1.29%	
	State	Enrollment Database	332,290	3,465	1.04%	
	Zip	Enrollment Database	332,290	3,465	1.04%	
	Income Related Fields	Income	Enrollment Database	332,290	10	0.00%
FPL Percentage		Enrollment Database	332,290	10	0.00%	
Premium Category		Enrollment Database	332,290	0	0.00%	
Place of service (private office, school, CHC, etc.)	Encounter Database	2,668,868	87	0.00%		
Funding source (private insurance, Medicaid, CHIP)	Enrollment Database				Not Applicable (database represents only one funding source)	
Provider payment mechanism (FFS, Capitation, etc.)	Encounter Database	2,668,868	925,644	34.68%		

****Please read the DQA Measures User Guide prior to implementing this measure****

DQA Measure Specification Sheet: Utilization of Services

a. "Dental services"

Description: Percentage of all enrolled children who received at least one dental service within the reporting year

Numerator a: Unduplicated number of children who received at least one dental service

Denominator: Unduplicated number of all enrolled children

Rate: NUM a/DEN

b. "Oral health services"

Description: Percentage of all enrolled children who received at least one oral health service within the reporting year

Numerator b: Unduplicated number of children who received at least one oral health service

Denominator: Unduplicated number of all enrolled children

Rate: NUM b/DEN

c. "Dental" OR "Oral health services"

Description: Percentage of all enrolled children who received at least one dental OR oral health service within the reporting year

Numerator c: Unduplicated number of children who received at least one dental OR oral health service

Denominator: Unduplicated number of all enrolled children

Rate: NUM c/DEN

Rationale: Dental caries is the most common chronic disease in children in the United States (1). In 2009–2010, 14% of children aged 3–5 years had untreated dental caries. Among children aged 6–9 years, 17% had untreated dental caries, and among adolescents aged 13–15, 11% had untreated dental caries. (2) Identifying caries early is important to reverse the disease process, prevent progression of caries, and reduce incidence of future lesions. Approximately three quarters of children younger than age 6 years did not have at least one visit to a dentist in the previous year (3).

(1) National Center for Health Statistics. Healthy People 2010 Final Review. Hyattsville, MD: National Center for Health Statistics; 2012. Accessed at http://www.cdc.gov/nchs/healthy_people/hp2010/hp2010_final_review.htm on July 10 2013.

(2) Dye BA, Li X, Thornton-Evans G. Oral health disparities as determined by selected Healthy People 2020 oral health objectives for the United States, 2009–2010. NCHS data brief, no 104. Hyattsville, MD: National Center for Health Statistics; 2012.

(3) Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. Acad Pediatr. 2009;9(6):415-9. PMID: 19945076

AHRQ Domain: Use of Services¹

IOM Aim: Equity

Level of Aggregation: Health Plan/Program

¹ **Use of Services (Related Healthcare Delivery Measure):** Use of services is the provision of a service to, on behalf of, or by a group of persons identified by enrollment in a health plan or through use of clinical services. Use of service measures can assess encounters, tests, or interventions that are not supported by evidence for the appropriateness of the service for the specified individuals. National Quality Measures Clearinghouse: <http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx>. Accessed April 2013.

Improvement Noted As: This is a related health care delivery measure that provides context for other measures. Because specific services are not delineated for this measure, higher or lower rates are not necessarily indicative of better or worse performance.

Data Required: Single year

Measure purpose: Examples of questions that can be answered through this measure at each level of aggregation

1. What percentage of children received at least one service during the reporting period?
2. What percentage of children received at least one oral health service from a non-dentist provider?
3. Does receipt of at least one service vary by any of the stratification variables?
4. Are there disparities in receipt of at least one service among different groups based on the stratification variables?
5. Over time, does the percentage of children who receive at least one service stay stable, increase or decrease?
6. How many patients receive at least one service in a public health setting (e.g., in school-based programs, community centers)?

Applicable Stratification Variables (Optional: Contact Program Official to determine reporting requirements)

1. Age (e.g., <1; 1-2; 3-5; 6-7; 8-9; 10-11; 12-14; 15-18; 19-20)
2. Payer Type (e.g., Medicaid; CHIP programs; private commercial benefit programs)
3. Program/Plan Type (e.g., traditional FFS; PPO; prepaid dental/DHMO)
4. Geographic Location (e.g., rural; suburban; urban)
5. Race/Ethnicity
6. Socioeconomic Status (e.g., premium or income category)

Utilization of Services Calculation

1. Run records for one reporting year for paid and unpaid claims.²
2. Check if the enrollee meets age criteria³ at the last day of the reporting year
 - a. If age criterion is met, then proceed to next step.
 - b. If age criterion is not met or there are missing or invalid field codes (e.g., date of birth), then STOP processing. This enrollee does not get counted in the denominator.
3. Check if subject is continuously enrolled (calculate for at least 90 days AND at least 180 days)^{4,5}
 - a. If subject meets continuous enrollment criterion, then include in **denominator**; proceed to next step.
 - b. If subject does not meet enrollment criterion, then STOP processing. This enrollee does not get counted in the denominator.

YOU NOW HAVE THE DENOMINATOR (DEN) COUNT: All enrollees who meet the age and enrollment criteria

4. Check if subject received any dental or oral health service from any provider
 - a. If [SERVICE-CODE] = D0100 – D9999%, then proceed to next step.
 - b. If not, then service was not provided; STOP processing. This enrollee is already included in the denominator but will not be included in the numerators.
5. Check for valid provider taxonomy
 - a. If [RENDERING PROVIDER TAXONOMY] is valid, then include in **numerator C**.
 - b. If [RENDERING PROVIDER TAXONOMY] code is missing or invalid, then exclude. This enrollee is included in the denominator but will not be included in the numerators delineated by provider type.

YOU NOW HAVE NUMERATOR C (Num c) COUNT: Enrollees who received a dental or an oral health service

6. Check if subject received a dental service and/or an oral health service ⁷ (**NOTE:** Children who received BOTH dental and oral health services will be included in both numerators a and b.)
 - a. Check if subject received a dental service

² Medicaid/ CHIP programs may want to apply these overall exclusions before the case finding process (check with program official):

- Undocumented aliens who are eligible only for emergency Medicaid services;
- Other groups of individuals under age 21 who are eligible only for limited services as part of their Medicaid eligibility (e.g., pregnancy-related services)

If exclusions are applied, the exclusion criteria should be reported along with the number and percentage of members excluded.

³ **Age:** Medicaid/ CHIP programs use under age 21 (<21); Exchange quality reporting use under age 19 (<19); other programs check with program officials. This criterion should be reported with the measurement score.

⁴ **Length of Enrollment:** It is important to standardize length of enrollment when comparing entities. Two different lengths of enrollment should be applied. **90 days:** Captures the maximum number of children while also provides for some continuity of enrollment, which is important from a program perspective. This also provides historical comparison to current CMS 416 data. **6 months:** Allows sufficient time to seek, schedule, and follow through on an appointment; provides a consistent approach for comparison with other DQA measures (except the topical fluoride measure).

⁵ **Enrollment in "same" plan vs. "any" plan:** At the state program level (e.g., Medicaid/ CHIP) a criterion of "any" plan applies versus at the health plan (e.g., MCO) level a criterion of "same" plan applies. The criterion used should be reported with the measurement score. While this prevents direct aggregation of results from plan to program, each entity is given due credit for the population it serves. Thus, States with multiple MCOs should not merely "add up" the plan level scores but should calculate the State score from their database to allow inclusion of individuals who may be continuously enrolled but might have switched plans in the interim.

⁶ **Services provided by medical providers:** In some instances, CPT codes are used for reimbursement of oral health services e.g., medical primary care providers providing oral evaluation, risk assessment, anticipatory guidance or fluoride varnish. Details available at [AAFP Table](#). For such states, these additional codes must be considered.

⁷ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

- i. If [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes or their equivalent in Table 1 below, then include in **numerator a** of those who received a dental service; STOP processing
- b. Check if subject received an oral health service
 - i. If [RENDERING PROVIDER TAXONOMY] code is a valid NUCC maintained Provider Taxonomy code but NOT included in the NUCC maintained Provider Taxonomy Codes in Table 1 below, then include in **numerator b** of those who received an oral health service; STOP processing

YOU NOW HAVE NUMERATOR a (Num a) & b (Num b) COUNTS: Enrollees who received a dental (a) and an oral health (b) service, respectively

- 7. Report
 - a. Unduplicated count of enrollees in numerator(s)
 - b. Unduplicated count of enrollees in denominator
 - c. Rates of measures a (NUM a/DEN), b (NUM b/DEN), c (NUM c/DEN) for 90-day enrollment and 180-day enrollment

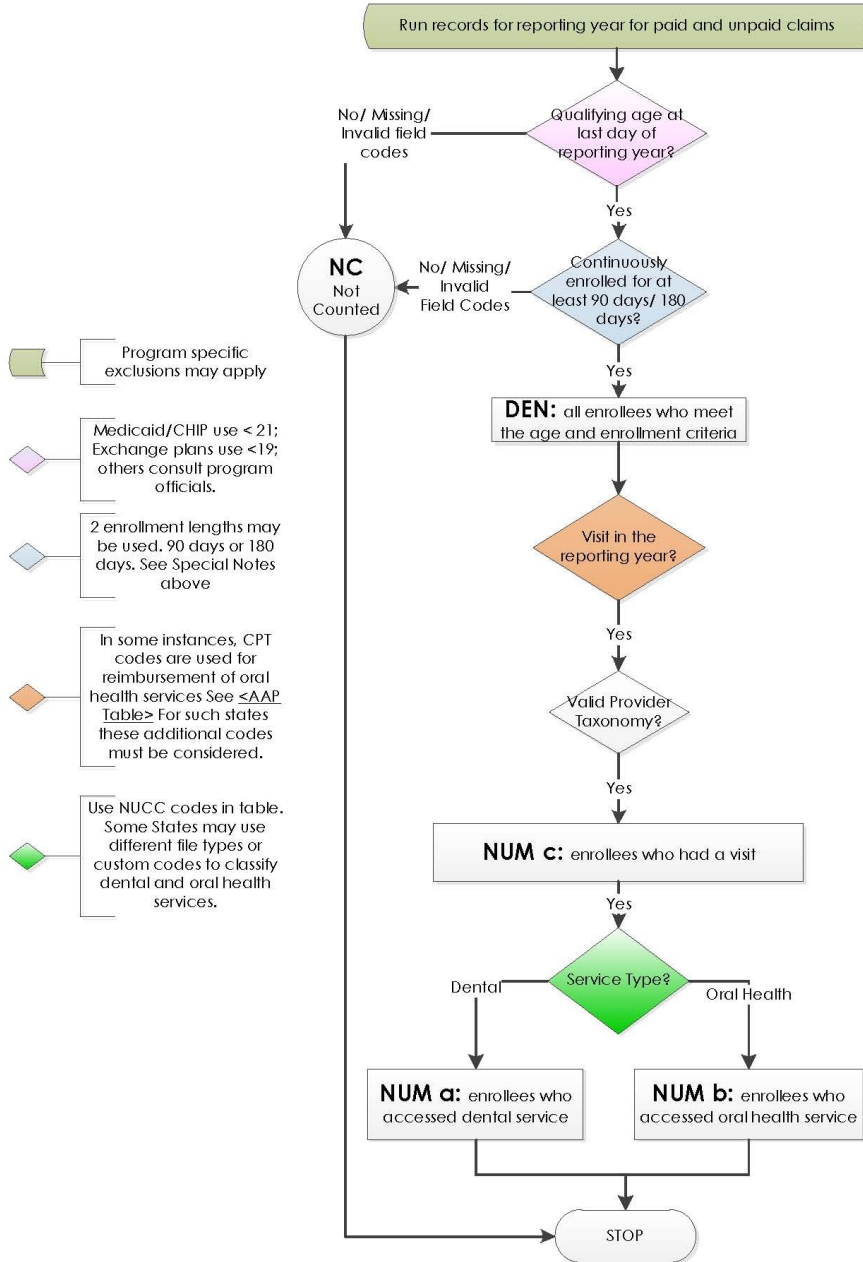
Table 1: NUCC maintained Provider Taxonomy Codes classified as "Dental Service"*

122300000X	1223P0106X	1223X0008X	261 QF0400X
1223D0001X	1223P0221X	1223X0400X	261 QR1300X
1223D0004X	1223P0300X	124Q00000X+	
1223E0200X	1223P0700X	125J00000X	
1223G0001X	1223S0112X	125K00000X	

*Services provided by County Health Department dental clinics may also be included as "dental" services.

*Only dental hygienists who provide services under the supervision of a dentist should be classified as "dental" services. Services provided by independently practicing dental hygienists should be classified as "oral health" services.

*** Note: Reliability of the measure score depends on the quality of the data that are used to calculate the measures. Flow rates (% of missing or invalid data) for these data elements must be investigated prior to measurement. Data elements with high rates of missing or invalid data will adversely affect the subsequent counts that are recorded. For example, records with missing or invalid SERVICE-CODE will be counted in the "all enrollees" denominator but not in "all enrollees who received service" numerator. These records are assumed to not have had a visit. In this case, a low quality data set will result in a low utilization score and will not be reliable.***





DENTAL QUALITY ALLIANCE™

Improving Oral Health Through Measurement

FINAL July 19, 2013

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****Please read the DQA Measures User Guide prior to implementing this measure****

DQA Measure Specification Sheet: Preventive Services for Children at Elevated Caries Risk

"Dental Services"

Description: Percentage of a. all enrolled children b. enrolled children who received at least one dental service who are at "elevated" risk (i.e., "moderate" or "high") who received a topical fluoride application and/or sealants within the reporting year.

Numerator: Unduplicated number of children at "elevated" risk (i.e., "moderate" or "high") who received a topical fluoride application and/or sealants as a dental service

Denominator:

DEN 1: Unduplicated number of all enrolled children at "elevated" risk (i.e., "moderate" or "high")

DEN 2: Unduplicated number of all enrolled children at "elevated" risk (i.e., "moderate" or "high") who received at least one dental service

Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)

Rationale: Dental caries is the most common chronic disease in children in the United States (1). In 2009–2010, 14% of children aged 3–5 years had untreated dental caries. Among children aged 6–9 years, 17% had untreated dental caries, and among adolescents aged 13–15, 11% had untreated dental caries. (2) Identifying caries early is important to reverse the disease process, prevent progression of caries, and reduce incidence of future lesions. Approximately three quarters of children younger than age 6 years did not have at least one visit to a dentist in the previous year (3). Evidence-based Clinical Recommendations recommend that sealants should be placed on pits and fissures of children's primary and permanent teeth when it is determined that the tooth, or the patient, is at risk of experiencing caries. (4) Evidence-based Clinical Recommendations suggest that topical fluoride should be applied at least every three to six months in children at elevated risk for caries. (5)

(1) National Center for Health Statistics. Healthy People 2010 Final Review. Hyattsville, MD: National Center for Health Statistics; 2012. Accessed at http://www.cdc.gov/nchs/healthy_people/hp2010/hp2010_final_review.htm on July 10 2013.

(2) Dye BA, Li X, Thornton-Evans G. Oral health disparities as determined by selected Healthy People 2020 oral health objectives for the United States, 2009–2010. NCHS data brief, no 104. Hyattsville, MD: National Center for Health Statistics; 2012.

(3) Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. *Acad Pediatr*. 2009;9(6):415-9. PMID: 19945076

(4) Beauchamp J, Caufield PW, Crall JJ, Donly K, Feigal R, Gooch B, et al. Evidence-based clinical recommendations for the use of pit-and-fissure sealants: a report of the American Dental Association Council on Scientific Affairs. *J Am Dent Assoc* 2008;139(3):257-268.

(5) American Dental Association. Report of the Council on Scientific Affairs. Evidence-based Clinical Recommendations: Professionally Applied Topical Fluoride, May 2006.

AHRQ Domain: Use of Services (DEN 2)¹

IOM Aim: Equity, Effectiveness

Level of Aggregation: Health Plan/Program

¹ **Use of Services (Related Healthcare Delivery Measure):** Use of services is the provision of a service to, on behalf of, or by a group of persons identified by enrollment in a health plan or through use of clinical services. Use of service measures can assess encounters, tests, or interventions that are not supported by evidence for the appropriateness of the service for the specified individuals. National Quality Measures Clearinghouse: <http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx>. Accessed April 2013.

Improvement Noted As: Higher the better

Data Required: Single year for measurement (prior 3 years may be needed for risk determination)

Measure purpose: Examples of questions that can be answered through this measure at each level of aggregation:

1. What percentage of children at elevated risk who receive any topical fluoride or sealants?
2. Does the percentage of children at elevated risk who receive any topical fluoride or sealants vary by any of the stratification variables?
3. Are there disparities in the receipt of topical fluoride or sealants among different groups based on the stratification variables?
4. Over time, does the percentage of children who receive topical fluoride or sealants stay stable, increase or decrease?
5. How many patients receive topical fluoride or sealants in a public health setting (e.g., in school-based programs, community centers)?

Applicable Stratification Variables (Optional: Contact Program Official to determine reporting requirement)

1. Age (e.g., <1; 1-2; 3-5; 6-7; 8-9; 10-11; 12-14; 15-18; 19-20)
2. Payer Type (e.g., Medicaid; CHIP programs; private commercial benefit programs)
3. Program/Plan Type (e.g., traditional FFS; PPO; prepaid dental/DHMO)
4. Geographic Location (e.g., rural; suburban; urban)
5. Race/Ethnicity
6. Socioeconomic Status (e.g., premium or income category)

Measure Limitations:

- CDT codes do not distinguish between fluoride gel and fluoride foam. This measure assumes that all modes of topical fluoride application are equally effective
- This measure does not take into account alternate home-use fluoride products including supplements.
- This measure will not delineate those whose teeth have not erupted, those who already received sealants in prior years, and those with decayed/filled teeth not candidates for sealants.
- Some codes (i.e., a few endodontic codes) are included to identify children at elevated risk. In some cases, these codes are reported for instances such as trauma and may contribute to some overestimation of children at "elevated risk".
- Since the "elevated risk" determination requires an evaluation (to record CDT risk code) or treatment visit (to record a treatment code), children who are enrolled but do not have a visit in the reporting year or a treatment visit in any of the prior three years will not have sufficient information to be included in the measure. While this is a limitation, the intent of this PROCESS measure is to seek to understand whether children who can be positively identified as being at elevated risk receive the recommended preventive services.

Preventive Services Calculation for Children at Elevated Caries Risk

1. Run records for one reporting year for paid and unpaid claims.²
2. Check if the enrollee meets age criteria³ at the last day of the reporting year
 - a. If age criterion is met, then proceed to next step.
 - b. If age criterion is not met or there are missing or invalid field codes (e.g., birth date), then STOP processing. This enrollee does not get counted.
3. Check if subject is continuously enrolled for at least 180 days⁴
 - a. If subject meets continuous enrollment criterion, then proceed to next step.
 - b. If subject does not meet enrollment criterion, then STOP processing. This enrollee does not get counted.

YOU NOW HAVE THE COUNT OF THOSE WHO MEET THE AGE AND ENROLLMENT CRITERIA

4. Check if subject is at "elevated risk"
 - a. If subject meets any of the following then include in **denominator 1**.
 - i. the subject has a visit with a CDT code = (Dxxxx or Dxxxx) in the reporting year,⁵ OR
 - ii. the subject has a SERVICE Code among those in Table 1 in the reporting year, OR
 - iii. the subject has a SERVICE Code among those in Table 1 in any of the three years prior to the measurement year (**NOTE:** The subject does not need to be enrolled in any of the prior three years for the denominator enrollment criteria; this is a "look back" for enrollees who do have claims experience in any of the prior three years.)
 - b. If the subject does not meet any of the above criteria for elevated risk, then STOP processing. This enrollee will not be included in the measure denominators.

YOU NOW HAVE THE DENOMINATOR 1 (DEN 1): Enrollees who are at "elevated risk"

5. Check if subject received any dental service
 - a. If [SERVICE CODE] = D0100 – D9999, and;
 - b. If [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes in Table 2 below,⁶ then include in **denominator 2**; proceed to next step.
 - c. If both a AND b are not met, then the service was not a "dental" service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

Note: In this step, all **claims** with missing or invalid SERVICE CODE, missing or invalid NUCC maintained Provider Taxonomy Codes, or NUCC maintained Provider Taxonomy Codes that do not appear in Table 2 should be excluded

² Medicaid/ CHIP programs may want to apply these overall exclusions before the case finding process (check with program official):

- Undocumented aliens who are eligible only for emergency Medicaid services;
- Other groups of individuals under age 21 who are eligible only for limited services as part of their Medicaid eligibility (e.g., pregnancy-related services)

If exclusions are applied, the exclusion criteria should be reported along with the number and percentage of members excluded.

³ **Age:** Medicaid/ CHIP programs use under age 21 (<21); Exchange quality reporting use under age 19 (<19); other programs check with program officials. This criterion should be reported with the measurement score.

⁴ **Enrollment in "same" plan vs. "any" plan:** At the state program level (e.g., Medicaid/ CHIP) a criterion of "any" plan applies versus at the health plan (e.g., MCO) level a criterion of "same" plan applies. The criterion used should be reported with the measurement score. While this prevents direct aggregation of results from plan to program, each entity is given due credit for the population it serves. Thus, States with multiple MCOs should not merely "add up" the plan level scores but should calculate the State score from their database to allow inclusion of individuals who may be continuously enrolled but might have switched plans in the interim.

⁵ **CDT Codes:** Specific codes will be available January 2014

⁶ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

YOU NOW HAVE THE DENOMINATOR 2 (DEN 2): Enrollees who are at “elevated risk” and accessed dental service (had a visit)

6. Check if subject received topical fluoride or a sealant as dental service
 - a. If [SERVICE CODE] = D1206 or D1208⁷ or D1351 then include in **numerator**; STOP processing. (Note: At least one **claim** for preventive services in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes in Table 2.)
 - b. If not, then service was not provided; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

YOU NOW HAVE NUMERATOR (NUM) COUNT: Enrollees at “elevated risk” who received preventive services as dental service

7. Report
 - a. Unduplicated count of enrollees in numerator
 - b. Unduplicated count of enrollees in each denominator
 - c. Rates of measures (NUM/DEN1) and (NUM/DEN2)

Table 1: CDT Codes to identify “elevated risk”

D2140	D2394	D2630	D2720	D2791	D3120
D2150	D2410	D2642	D2721	D2792	D3220
D2160	D2420	D2643	D2722	D2794	D3221
D2161	D2430	D2644	D2740	D2799	D3222
D2330	D2510	D2650	D2750	D2930	D3230
D2331	D2520	D2651	D2751	D2931	D3240
D2332	D2530	D2652	D2752	D2932	D3310
D2335	D2542	D2662	D2780	D2933	D3320
D2390	D2543	D2663	D2781	D2934	D3330
D2391	D2544	D2664	D2782	D2940	
D2392	D2610	D2710	D2783	D2950	
D2393	D2620	D2712	D2790	D3110	

Table 2: NUCC maintained Provider Taxonomy Codes classified as “Dental Service”*

122300000X	1223P0106X	1223X0008X	261QF0400X
1223D0001X	1223P0221X	1223X0400X	261QR1300X

⁷ **Topical Fluoride codes:** For reporting years prior to 2013 use D1203 or D1204 or D1206. Some States may require medical providers to submit different codes. See AAP table.

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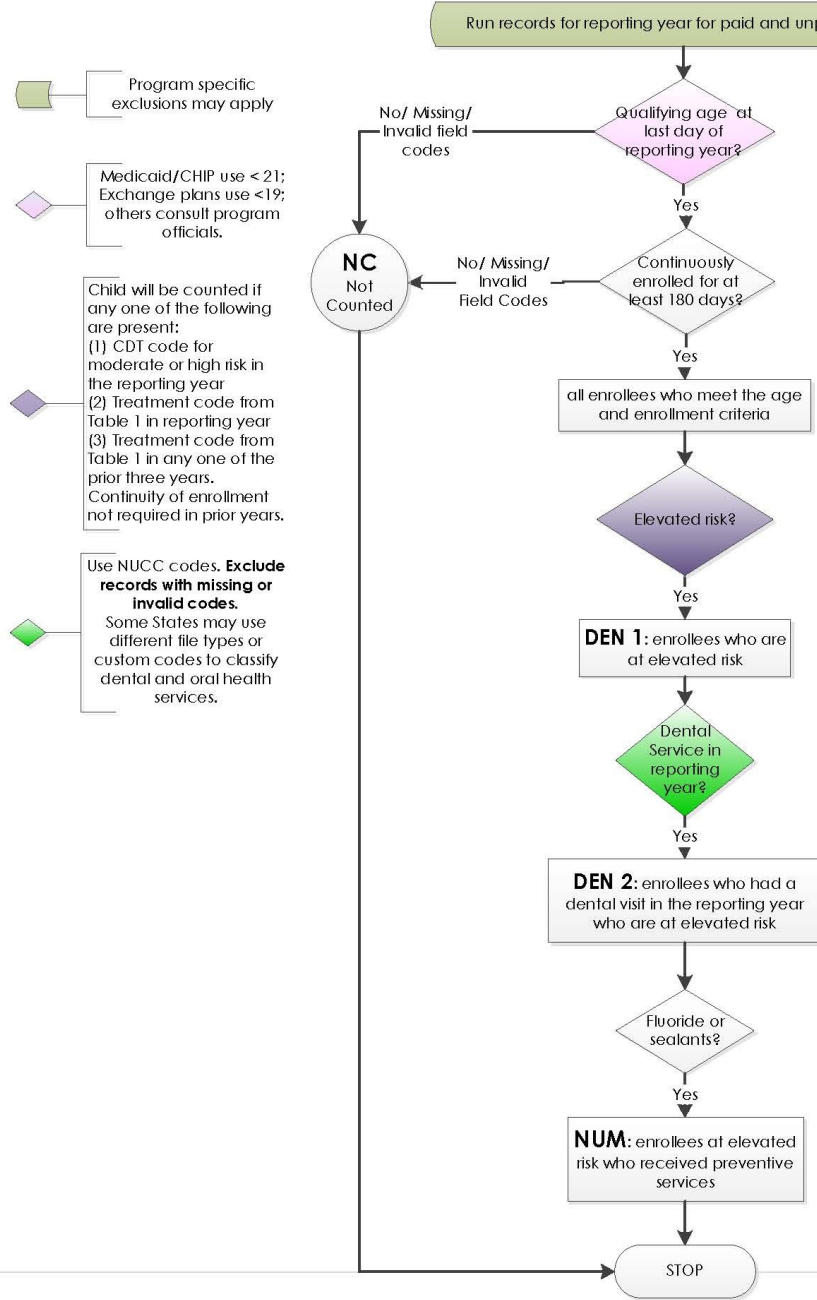


1223D0004X	1223P0300X	124Q00000X+	
1223E0200X	1223P0700X	125J00000X	
1223G0001X	1223S0112X	125K00000X	

*Services provided by County Health Department dental clinics may also be included as "dental" services.

*Only dental hygienists who provide services under the supervision of a dentist should be classified as "dental" services. Services provided by independently practicing dental hygienists should be classified as "oral health" services.

*** Note: Reliability of the measure score depends on the quality of the data that are used to calculate the measures. Flow rates (% of missing or invalid data) for these data elements must be investigated prior to measurement. Data elements with high rates of missing or invalid data will adversely affect the subsequent counts that are recorded. For example, records with missing or invalid SERVICE CODE will be counted in the "all enrollees" but not in "all enrollees who received service." These records are assumed to not have had a visit. In this case, a low quality data set will result in a low utilization score and will not be reliable.***



Program specific exclusions may apply

Medicaid/CHIP use < 21; Exchange plans use < 19; others consult program officials.

Child will be counted if any one of the following are present:
 (1) CDT code for moderate or high risk in the reporting year
 (2) Treatment code from Table 1 in reporting year
 (3) Treatment code from Table 1 in any one of the prior three years.
 Continuity of enrollment not required in prior years.

Use NUCC codes. Exclude records with missing or invalid codes.
 Some States may use different file types or custom codes to classify dental and oral health services.

Additional Specifications for “oral health services”: Preventive Services for Children at Elevated Caries Risk

Apart from routine quality reporting, researchers and policy makers may wish to seek additional information regarding services provided by or under the supervision of a dentist versus otherwise.

For example, some policy questions that may need to be answered include:

- Among those enrolled, how many received preventive services as an oral health service (e.g., from a medical primary care provider)?
- Among those who had a visit, how many received preventive services as an oral health service (e.g., from a medical primary care provider)?

Note: Not all State Medicaid programs reimburse for “oral health” services up to age 21. Stratifications may be used when interpreting this measure.

The DQA User Guide provides additional information on categorization of “dental” and “oral health” services.

“Oral health services”

Description: Percentage of a. all enrolled children b. enrolled children who received at least one oral health service at “elevated” risk (i.e. “moderate” or “high”) who received a topical fluoride application and/or sealants within the reporting year.

Numerator: Unduplicated number of children at “elevated” risk (i.e. “moderate” or “high”) who received a topical fluoride application and/or sealants as an oral health service

Denominator:

DEN 1: Unduplicated number of all enrolled children at “elevated” risk (i.e. “moderate” or “high”)

DEN 2: Unduplicated number of all enrolled children at “elevated” risk (i.e. “moderate” or “high”) who received at least one oral health service

Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)

Calculation of “oral health services” – modify the calculation for “dental services” as follows:

STEP 5: In the calculation above, use the decision box in Step 5 as follows.

- If [SERVICE CODE] = D0100 – D9999⁸ and;
- If [RENDERING PROVIDER TAXONOMY] code is valid NUCC maintained Provider Taxonomy Code but *not* any of the NUCC maintained Provider Taxonomy Codes in Table 2 above,⁹ then include in count of enrollees who received oral health service; proceed to next step.
- If both a AND b are not met, then the service was not an “oral health” service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

⁸ **Services provided by medical providers:** In some instances, CPT codes are used for reimbursement of oral health services e.g., medical primary care providers providing oral evaluation, risk assessment, anticipatory guidance or fluoride varnish. Details available at [SAAP Table>](#). For such states these additional codes must be considered.

⁹ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

Note: In this step, all **claims** with missing or invalid SERVICE CODE or with missing or invalid NUCC maintained Provider Taxonomy Codes should be excluded.

STEP 6: In the calculation above, use the decision box in Step 6 as follows. Some states may use codes other than CDT codes to reimburse for fluoride.¹⁰ These codes should be included in the [SERVICE CODE] codes in addition to D1206, D1208 and D1351.

- a. If [SERVICE CODE] = D1206 or D1208 or D1351, then include in **numerator**; STOP processing. (Note: At least one **claim** for preventive services in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = valid NUCC maintained Provider Taxonomy Code but *not* any of the NUCC maintained Provider Taxonomy Codes in Table 2.)
- b. If not, then service was not provided or service was not an "oral health" service; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

Additional Specifications for "dental OR oral health services": Preventive Services for Children at Elevated Caries Risk

Researchers and policy makers may wish to seek additional information regarding whether certain services were provided to a population. In such cases a "dental OR oral health" measure may be applicable.

The "dental OR oral health" measure is **NOT** a sum of the "dental" and "oral health" services but represents the unduplicated count of children who received a service.

"Dental OR Oral health services"

Description: Percentage of a. all enrolled children b. enrolled children who received at least one dental OR oral health service at "elevated" risk (i.e. "moderate" or "high") who received a topical fluoride application and/or sealants within the reporting year.

Numerator: Unduplicated number of children at "elevated" risk (i.e. "moderate" or "high") who received a topical fluoride application and/or sealants as a dental OR oral health service

Denominator:

DEN 1: Unduplicated number of all enrolled children at "elevated" risk (i.e. "moderate" or "high")

DEN 2: Unduplicated number of all enrolled children at "elevated" risk (i.e. "moderate" or "high") who received at least one dental OR oral health service

Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)

Calculation of "dental OR oral health services" – modify the calculation for "dental services" as follows:

STEP 5: In the calculation above, use the decision box in Step 5 as follows.

- a. If [SERVICE CODE] = D0100 – D9999¹¹ and;
- b. If [RENDERING PROVIDER TAXONOMY] code is *any* valid of the NUCC maintained Provider Taxonomy Code,¹² then include in **count of enrollees who received dental OR oral health service**; proceed to next step.

¹⁰ **Services provided by medical providers:** In some instances, CPT codes are used for reimbursement of oral health services e.g., medical primary care providers providing oral evaluation, risk assessment, anticipatory guidance or fluoride varnish. Details available at [<AAP Table>](#). For such states these additional codes must be considered.

¹¹ **Services provided by medical providers:** In some instances, CPT codes are used for reimbursement of oral health services e.g., medical primary care providers providing oral evaluation, risk assessment, anticipatory guidance or fluoride varnish. Details available at [<AAP Table>](#). For such states these additional codes must be considered.

- c. If both a AND b are not met, then the service was not a “dental or oral health” service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

Note: In this step, all **claims** with missing or invalid SERVICE CODE or with missing or invalid NUCC maintained Provider Taxonomy Codes should be excluded.

STEP 6: In the calculation above, use the decision box in Step 6 as follows. Some states may use codes other than CDT codes to reimburse for fluoride.¹³ These codes should be included in the [SERVICE CODE] codes in addition to D1206, D1208 and D1351.

- a. If [SERVICE CODE] = D1206 or D1208 or D1351, then include in **numerator**; STOP processing. (Note: At least one **claim** for preventive services in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = *any* valid NUCC maintained Provider Taxonomy code)
- b. If not, then service was not provided or service was not a “dental OR oral health” service; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

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¹² **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

¹³ **Services provided by medical providers:** In some instances, CPT codes are used for reimbursement of oral health services e.g., medical primary care providers providing oral evaluation, risk assessment, anticipatory guidance or fluoride varnish. Details available at [AAP Table>](#). For such states these additional codes must be considered.

****Please read the DQA Measures User Guide prior to implementing this measure****

DQA Measure Specification Sheet: Prevention: Topical Fluoride Intensity for Children at Elevated Caries Risk

"Dental Services"

Description: Percentage of a. all enrolled children b. enrolled children who received at least one dental service who are at "elevated" risk (i.e. "moderate" or "high") who received (1, 2, 3, ≥4) topical fluoride applications within the reporting year.

Numerator: Unduplicated number of children at "elevated" risk (i.e. "moderate" or "high") who received (1, 2, 3, ≥4) topical fluoride applications as a dental service

Denominator:

DEN 1: Unduplicated number of all enrolled children at "elevated" risk (i.e. "moderate" or "high")

DEN 2: Unduplicated number of all enrolled children at "elevated" risk (i.e. "moderate" or "high") who received at least one dental service

Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)

Rationale: Dental caries is the most common chronic disease in children in the United States (1). In 2009–2010, 14% of children aged 3–5 years had untreated dental caries. Among children aged 6–9 years, 17% had untreated dental caries, and among adolescents aged 13–15, 11% had untreated dental caries. (2) Identifying caries early is important to reverse the disease process, prevent progression of caries, and reduce incidence of future lesions. Approximately three quarters of children younger than age 6 years did not have at least one visit to a dentist in the previous year (3). Evidence-based Clinical Recommendations suggest that topical fluoride should be applied at least every three to six months in children at elevated risk for caries (4).

(1) National Center for Health Statistics. Healthy People 2010 Final Review. Hyattsville, MD: National Center for Health Statistics; 2012. Accessed at http://www.cdc.gov/nchs/healthy_people/hp2010/hp2010_final_review.htm on July 10 2013.

(2) Dye BA, Li X, Thornton-Evans G. Oral health disparities as determined by selected Healthy People 2020 oral health objectives for the United States, 2009–2010. NCHS data brief, no 104. Hyattsville, MD: National Center for Health Statistics; 2012.

(3) Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. *Acad Pediatr*. 2009;9(6):415-9. PMID: 19945076

(4) American Dental Association. Report of the Council on Scientific Affairs. Evidence-based Clinical Recommendations: Professionally Applied Topical Fluoride, May 2006.

AHRQ Domain: ACCESS (DEN 1)¹; PROCESS (DEN 2)²

IOM Aim: Equity, Effectiveness

Level of Aggregation: Health Plan/Program

Improvement Noted As: Higher the better³

¹ **Access (Clinical Quality Measure):** Access to care is the attainment of timely and appropriate health care by patients or enrollees of a health care organization or clinician. Access measures are supported by evidence that an association exists between the measure and the outcomes of or satisfaction with care. National Quality Measures Clearinghouse: <http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx>. Accessed April 2013.

² **Process (Clinical Quality Measure):** A process of care is a health care-related activity performed for, on behalf of, or by a patient. Process measures are supported by evidence that the clinical process—that is the focus of the measure—has led to improved outcomes. National Quality Measures Clearinghouse: <http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx>. Accessed April 2013.

³ Evidence Based Guidelines suggest that at-risk children benefit from topical fluoride applications applied at least every 3–6 months.

Data Required: Single year for measurement (prior 3 years may be needed for risk determination)

Measure purpose: Examples of questions that can be answered through this measure at each level of aggregation

1. What percentage of children at elevated risk receive professionally applied topical fluoride at least once in a year? How many receive it 1, 2, 3, 4 or more times?
2. Does the receipt of professionally applied topical fluoride for children at elevated risk vary by any of the stratification variables?
3. Are there disparities in receipt of professionally applied topical fluoride among different groups based on the stratification variables?
4. Over time, is the percentage of children receiving professionally applied topical fluoride 1, 2, 3, 4 or more times stable, increasing or decreasing?
5. How many patients receive professionally applied topical fluoride in a public health setting (e.g. in school-based programs, community centers)?

Applicable Stratification Variables (Optional: Contact Program Official to determine reporting requirement)

1. Age (e.g., <1; 1-2; 3-5; 6-7; 8-9; 10-11; 12-14; 15-18; 19-20)
2. Payer Type (e.g., Medicaid; CHIP programs; private commercial benefit programs)
3. Program/Plan Type (e.g., traditional FFS; PPO; prepaid dental/DHMO)
4. Geographic Location (e.g., rural; suburban; urban)
5. Race/Ethnicity
6. Socioeconomic Status (e.g., premium or income category)

Measure Limitations:

- CDT codes do not distinguish between fluoride gel and fluoride foam. This measure assumes that all modes of topical fluoride application are equally effective.
- This measure does not take into account alternate home-use fluoride products including supplements.
- Some codes (i.e., a few endodontic codes) included to identify children at elevated risk may also be reported for instances such as trauma and may contribute to some overestimation of children at "elevated risk."
- Since the "elevated risk" determination requires an evaluation (to record CDT risk code) or a treatment visit (to record a treatment code), children who are enrolled but do not have a visit in the reporting year or a treatment visit in any of the prior three years will not have sufficient information to be included in the measure. While this is a limitation, the intent of this PROCESS measure is to seek to understand whether children who can be positively identified as being at elevated risk receive the recommended preventive services.

Topical Fluoride Intensity Calculation for Children at Elevated Caries Risk

1. Run records for one reporting year for paid and unpaid claims.⁴
2. Check if the enrollee meets age criteria⁵ at the last day of the reporting year
 - a. If age criterion is met, then proceed to next step.
 - b. If age criterion is not met or there are missing or invalid field codes (e.g., date of birth), then STOP processing. This enrollee does not get counted.
3. Check if subject is continuously enrolled for the reporting year (12 months) with a gap of no more than 31 days (one month gap for programs that determine eligibility on a monthly basis).⁶
 - a. If subject meets continuous enrollment criterion, then proceed to next step.
 - b. If subject does not meet enrollment criterion, then STOP processing. This enrollee does not get counted.

YOU NOW HAVE THE COUNT OF THOSE WHO MEET THE AGE AND ENROLLMENT CRITERIA

4. Check if subject is at "elevated risk"
 - a. If subject meets any of the following then include in **denominator 1**.
 - i. the subject has a visit with a CDT code = (Dxxx or Dxxx) in the reporting year,⁷ OR
 - ii. the subject has a SERVICE Code among those in Table 1 in the reporting year, OR
 - iii. the subject has a SERVICE Code among those in Table 1 in any of the three years prior to the measurement year (**NOTE:** The subject does not need to be enrolled in any of the prior three years for the denominator enrollment criteria; this is a "look back" for enrollees who do have claims experience in any of the prior three years.)
 - b. If the subject does not meet any of the above criteria for elevated risk, then STOP processing. This enrollee will not be included in the measure denominators.

YOU NOW HAVE THE DENOMINATOR 1 (DEN 1): Enrollees who are at "elevated risk"

5. Check if subject received any dental service
 - a. If [SERVICE CODE] = D0100 – D9999 and;
 - b. If [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes in Table 2 below,⁸ then include in **denominator 2**; proceed to next step.
 - c. If both a AND b are not met, then the service was not a "dental" service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

⁴ Medicaid/ CHIP programs may want to apply these overall exclusions before the case finding process (check with program official):

- Undocumented aliens who are eligible only for emergency Medicaid services;
- Other groups of individuals under age 21 who are eligible only for limited services as part of their Medicaid eligibility (e.g., pregnancy-related services)

If exclusions are applied, the exclusion criteria should be reported along with the number and percentage of members excluded.

⁵ **Age:** Medicaid/ CHIP programs use under age 21 (<21); Exchange quality reporting use under age 19 (<19); other programs check with program officials. This criterion should be reported with the measurement score.

⁶ **Enrollment in "same" plan vs. "any" plan:** At the state program level (e.g., Medicaid/ CHIP) a criterion of "any" plan applies versus at the health plan (e.g., MCO) level a criterion of "same" plan applies. The criterion used should be reported with the measurement score. While this prevents direct aggregation of results from plan to program, each entity is given due credit for the population it serves. Thus, States with multiple MCOs should not merely "add up" the plan level scores but should calculate the State score from their database to allow inclusion of individuals who may be continuously enrolled but might have switched plans in the interim.

⁷ **CDT Codes:** Specific codes will be available January 2014

⁸ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

Note: In this step, all **claims** with missing or invalid SERVICE-CODE, missing or invalid NUCC maintained Provider Taxonomy Codes, or NUCC maintained Provider Taxonomy Codes that do not appear in Table 2 should be excluded

YOU NOW HAVE THE DENOMINATOR 2 (DEN 2): Enrollees who are at “elevated risk” and accessed a dental service (had a visit)

6. Check if subject received fluoride as dental service
 - a. If [SERVICE CODE] = D1206 or D1208⁹ then include in **numerator**; STOP processing. (**NOTE 1:** No more than one fluoride application can be counted for the same member on the same date of service.) (**Note 2:** At least one **claim** for topical fluoride in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes in Table 2)
 - b. If not, then service was not provided, STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

YOU NOW HAVE NUMERATOR (NUM) COUNT: Enrollees at “elevated risk” who received fluoride as a dental service

7. Stratify the numerator by the number of fluoride applications as 1, 2, 3, ≥4

YOU NOW HAVE THE INTENSITY OF FLUORIDE APPLICATIONS

8. Report
 - a. Unduplicated count of enrollees in numerator
 - b. Unduplicated count of enrollees in each denominator
 - c. Rates of measures (NUM/DEN1) and (NUM/DEN2)
 - d. Rates for 1, 2, 3, ≥4 fluoride applications for Den 1 and Den 2 measures

Table 1: CDT Codes to identify “elevated risk”

D2140	D2394	D2630	D2720	D2791	D3120
D2150	D2410	D2642	D2721	D2792	D3220
D2160	D2420	D2643	D2722	D2794	D3221
D2161	D2430	D2644	D2740	D2799	D3222
D2330	D2510	D2650	D2750	D2930	D3230
D2331	D2520	D2651	D2751	D2931	D3240
D2332	D2530	D2652	D2752	D2932	D3310
D2335	D2542	D2662	D2780	D2933	D3320
D2390	D2543	D2663	D2781	D2934	D3330
D2391	D2544	D2664	D2782	D2940	
D2392	D2610	D2710	D2783	D2950	

⁹Topical Fluoride codes: For reporting years prior to 2013 use D1203 or D1204 or D1206.

D2393	D2620	D2712	D2790	D3110
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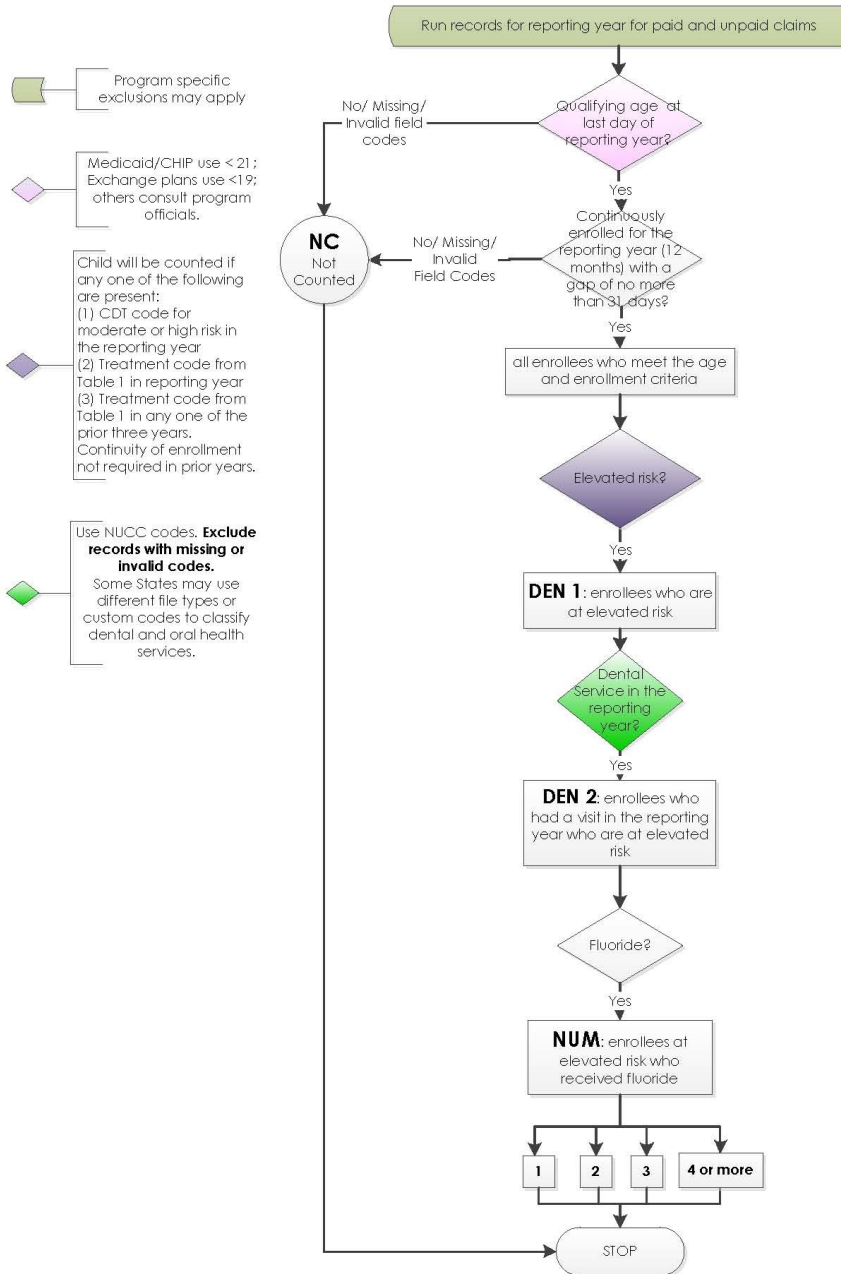
Table 2: NUCC maintained Provider Taxonomy Codes classified as "Dental Service"*

122300000X	1223P0106X	1223X0008X	261QF0400X
1223D0001X	1223P0221X	1223X0400X	261QR1300X
1223D0004X	1223P0300X	124Q00000X+	
1223E0200X	1223P0700X	125J00000X	
1223G0001X	1223S0112X	125K00000X	

*Services provided by County Health Department dental clinics may also be included as "dental" services.

+Only dental hygienists who provide services under the supervision of a dentist should be classified as "dental" services. Services provided by independently practicing dental hygienists should be classified as "oral health" services.

*** Note: Reliability of the measure score depends on the quality of the data that are used to calculate the measures. Flow rates (% of missing or invalid data) for these data elements must be investigated prior to measurement. Data elements with high rates of missing or invalid data will adversely affect the subsequent counts that are recorded. For example, records with missing or invalid SERVICE CODE will be counted in the "all enrollees" but not in "all enrollees who received service." These records are assumed to not have had a visit. In this case, a low quality data set will result in a low utilization score and will not be reliable.***



Program specific exclusions may apply

Medicaid/CHIP use <21; Exchange plans use <19; others consult program officials.

Child will be counted if any one of the following are present:
(1) CDT code for moderate or high risk in the reporting year
(2) Treatment code from Table 1 in reporting year
(3) Treatment code from Table 1 in any one of the prior three years.
Continuity of enrollment not required in prior years.

Use NUCC codes. Exclude records with missing or invalid codes.
Some States may use different file types or custom codes to classify dental and oral health services.

Additional Specifications for “oral health services”: Topical Fluoride Intensity for Children at Elevated Caries Risk

Apart from routine quality reporting, researchers and policy makers may wish to seek additional information regarding services provided by or under the supervision of a dentist versus otherwise.

For example, some policy questions that may need to be answered include:

- Among those enrolled, how many received topical fluoride as an oral health service (e.g., from a medical primary care provider)?
- Among those who had a visit, how many received topical fluoride as an oral health service (e.g., from a medical primary care provider)?

The DQA User Guide provides additional information on categorization of “dental” and “oral health” services.

“Oral health services”

Description: Percentage of a. all enrolled children b. enrolled children who received at least one oral health service at “elevated” risk (i.e. “moderate” or “high”) who received (1, 2, 3, ≥4) topical fluoride applications within the reporting year.

Numerator: Unduplicated number of children at “elevated” risk (i.e. “moderate” or “high”) who received (1, 2, 3, ≥4) topical fluoride applications as an oral health service

Denominator:

DEN 1: Unduplicated number of all enrolled children at “elevated” risk (i.e. “moderate” or “high”)

DEN 2: Unduplicated number of all enrolled children at “elevated” risk (i.e. “moderate” or “high”) who received at least one oral health service

Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)

Calculation of “oral health services” – modify the calculation for “dental services” as follows:

STEP 5: In the calculation above, use the decision box in Step 5 as follows.

- If [SERVICE CODE] = D0100 – D9999¹⁰ and;
- If [RENDERING PROVIDER TAXONOMY] code is valid NUCC maintained Provider Taxonomy Code but *not* any of the NUCC maintained Provider Taxonomy Codes in Table 2 above¹¹, then include in count of enrollees who received oral health service; proceed to next step.
- If both a AND b are not met, then the service was not an “oral health” service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

Note: In this step, all **claims** with missing or invalid SERVICE CODE or with missing or invalid NUCC maintained Provider Taxonomy Codes should be excluded.

STEP 6: In the calculation above, use the decision box in Step 6 as follows. Some states may use codes other than CDT codes to reimburse for fluoride from non-dental providers. These codes should be included in the [SERVICE CODE] codes in addition to D1206 and D1208.

¹⁰ **Services provided by medical providers:** In some instances, CPT codes are used for reimbursement of oral health services e.g. medical primary care providers providing oral evaluation, risk assessment, anticipatory guidance or fluoride varnish. Details available at [SAAP Table](#). For such states these additional codes must be considered.

¹¹ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

- a. If [SERVICE CODE] = D1206 or D1208, then include in **numerator**; STOP processing. (Note: At least one **claim** for topical fluoride in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = valid NUCC maintained Provider Taxonomy Code but *not* any of the NUCC maintained Provider Taxonomy Codes in Table 2.)
- b. If not, then service was not provided or service was not an "oral health" service; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

Additional Specifications for "dental OR oral health services": Topical fluoride Intensity for Children at Elevated Caries Risk

Researchers and policy makers may wish to seek additional information regarding whether certain services were provided to a population. In such cases a "dental OR oral health" measure may be applicable. The "dental OR oral health" measure is **NOT** a sum of the "dental" and "oral health" services but represents the unduplicated count of children who received a service.

<p>"Dental OR Oral health services"</p> <p>Description: Percentage of a. <u>all enrolled children</u> b. <u>enrolled children who received at least one dental OR oral health service</u> at "elevated" risk (i.e. "moderate" or "high") who received (1, 2, 3, ≥4) topical fluoride applications within the reporting year.</p> <p>Numerator: Unduplicated number of children at "elevated" risk (i.e. "moderate" or "high") who received (1, 2, 3, ≥4) topical fluoride applications as a dental OR oral health service</p> <p>Denominator:</p> <p>DEN 1: Unduplicated number of all enrolled children at "elevated" risk (i.e. "moderate" or "high")</p> <p>DEN 2: Unduplicated number of all enrolled children at "elevated" risk (i.e. "moderate" or "high") who received at least one dental OR oral health service</p> <p>Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)</p>

Calculation of "dental OR oral health services" – modify the calculation for "dental services" as follows:

STEP 5: In the calculation above, use the decision box in Step 5 as follows.

- a. If [SERVICE CODE] = D0100 – D9999¹² and;
- b. If [RENDERING PROVIDER TAXONOMY] code is *any*valid NUCC maintained Provider Taxonomy Code¹³, then include in **count of enrollees who received dental OR oral health service**; proceed to next step.
- c. If both a AND b are not met, then the service was not a "dental or oral health" service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

Note: In this step, all **claims** with missing or invalid SERVICE-CODE or with missing or invalid NUCC maintained Provider Taxonomy Codes should be excluded.

¹² **Services provided by medical providers:** In some instances, CPT codes are used for reimbursement of oral health services e.g. medical primary care providers providing oral evaluation, risk assessment, anticipatory guidance or fluoride varnish. Details available at [sAAP Table>](#). For such states these additional codes must be considered.

¹³ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

STEP 6: In the calculation above, use the decision box in Step 6 as follows. Some states may use codes other than CDT codes to reimburse for fluoride from non-dental providers. These codes should be included in the [SERVICE CODE] codes in addition to D1206 and D1208.

- a. If [SERVICE CODE] = D1206 or D1208, then include in **numerator**; STOP processing. (Note: At least one **claim** for topical fluoride in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = *any* valid NUCC maintained Provider Taxonomy Code.)
- b. If not, then service was not provided or service was not a "dental OR oral health" service; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

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****Please read the DQA Measures User Guide prior to implementing this measure****

DQA Measure Specification Sheet: Prevention: Sealants for 6-9 year-old Children at Elevated Risk

"Dental" services

Description: Percentage of a. enrolled children b. enrolled children who accessed a dental service (received at least one service) in the age category of **6-9** years at "elevated" risk (i.e., "moderate" or "high") who received a sealant on a permanent **first** molar tooth within the reporting year.

Numerator: Unduplicated number of all enrolled children age **6-9** years at "elevated" risk (i.e., "moderate" or "high") who received a sealant on a permanent **first** molar tooth as a dental service

Denominator:

DEN 1: Unduplicated number of all enrolled children age 6 - 9 years at "elevated" risk (i.e., "moderate" or "high")

DEN 2: Unduplicated number of all enrolled children age 6 - 9 years at "elevated" risk (i.e., "moderate" or "high") who received at least one dental service

Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)

Rationale: Dental caries is the most common chronic disease in children in the United States (1). In 2009–2010, 14% of children aged 3–5 years had untreated dental caries. Among children aged 6–9 years, 17% had untreated dental caries, and among adolescents aged 13–15, 11% had untreated dental caries. (2) Identifying caries early is important to reverse the disease process, prevent progression of caries, and reduce incidence of future lesions. Approximately three quarters of children younger than age 6 years did not have at least one visit to a dentist in the previous year (3). Evidence-based Clinical Recommendations recommend that sealants should be placed on pits and fissures of children's primary and permanent teeth when it is determined that the tooth, or the patient, is at risk of experiencing caries. The evidence for sealant effectiveness in permanent molars is stronger than evidence for primary molars (4).

(1) National Center for Health Statistics. Healthy People 2010 Final Review. Hyattsville, MD: National Center for Health Statistics; 2012. Accessed at http://www.cdc.gov/nchs/healthy_people/hp2010/hp2010_final_review.htm on July 10 2013.

(2) Dye BA, Li X, Thornton-Evans G. Oral health disparities as determined by selected Healthy People 2020 oral health objectives for the United States, 2009–2010. NCHS data brief, no 104. Hyattsville, MD: National Center for Health Statistics; 2012.

(3) Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. Acad Pediatr. 2009;9(6):415-9. PMID: 19945076

(4) Beauchamp J, Caufield PW, Crall JJ, Donly K, Feigal R, Gooch B, et al. Evidence-based clinical recommendations for the use of pit-and-fissure sealants: a report of the American Dental Association Council on Scientific Affairs. J Am Dent Assoc 2008;139(3):257-268.

AHRQ Domain: Access (DEN 1)¹; Process (DEN 2)²

IOM Aim: Equity, Effectiveness

Level of Aggregation: Health Plan/Program

¹ **Access (Clinical Quality Measure):** Access to care is the attainment of timely and appropriate health care by patients or enrollees of a health care organization or clinician. Access measures are supported by evidence that an association exists between the measure and the outcomes of or satisfaction with care. National Quality Measures Clearinghouse: <http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx>. Accessed April 2013.

² **Process (Clinical Quality Measure):** A process of care is a health care-related activity performed for, on behalf of, or by a patient. Process measures are supported by evidence that the clinical process—that is the focus of the measure—has led to improved outcomes. National Quality Measures Clearinghouse: <http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx>. Accessed April 2013.

Improvement Noted As: Higher the better; interpreted in the context of relative scores (e.g., over time and between reporting entities)

Data Required: Single year for measurement (prior 3 years may be needed for risk determination)

Measure purpose: Examples of questions that can be answered through this measure at each level of aggregation

1. What is the **relative percentage** of children receiving sealants when compared to another plan? (Note: This measure CANNOT be used to determine the absolute percentage of children ages 6-9 years who have sealants on their permanent first molars due to limitations of the administrative data in capturing prior sealant placement that are noted below. Rather, this measure indicates the prevalence of sealant placement during the reporting period.)
2. Does the percentage of children who receive sealants vary by any of the stratification variables?
3. Are there disparities in use of sealants among different groups based on the stratification variables?
4. Over time, is the level of sealant use stable, increasing or decreasing?

Applicable Stratification Variables (Optional: Contact Program Official to determine reporting requirement)

1. Payer Type (e.g., Medicaid; CHIP programs; private commercial benefit programs)
2. Program/Plan Type (e.g., traditional FFS; PPO; prepaid dental/DHMO)
3. Geographic Location (e.g., rural; suburban; urban)
4. Race/Ethnicity
5. Socioeconomic Status (e.g., premium or income category)

Measure Limitations due to Limitations of Administrative Data

- *This measure will not delineate those whose teeth have not erupted, those who have already received sealants in prior years, and those with decayed/filled teeth not candidates for sealants. However, this measure is designed to identify the prevalence of sealant placement on a permanent first molar tooth during the reporting year for children ages 6-9 years at elevated risk for caries; this measure is not designed to provide the absolute percentage of children who have ever had a sealant on a permanent first molar. As such, this prevalence-based measure is intended to be used for monitoring trends in sealant placement over time, variations in sealant placement between reporting entities, and disparities in sealant placement*
- *This measure will not capture children younger than 6 years of age whose teeth have erupted and have received sealants.*
- *Some codes (i.e., a few endodontic codes) included to identify children at elevated risk may also be reported for instances such as trauma and may contribute to some overestimation of children at "elevated risk".*
- *Since "elevated risk" determination requires an evaluation (to record CDT risk code) or a treatment visit (to record a treatment code), children who are enrolled but do not have a visit in the reporting year or a treatment visit in any of the prior three years will not have sufficient information to be included in the measure. While this is a limitation, the intent of this PROCESS measure is to seek to understand whether children who can be positively identified as being at elevated risk receive the recommended preventive services.*

Sealants for 6 – 9 year olds - Calculation for Children at Elevated Caries Risk

1. Run records for one reporting year for paid and unpaid claims.³
2. Check if the enrollee meets age criteria at the last day of the reporting year
 - a. If child is ≥ 6 and ≤ 9 , then proceed to next step.
 - b. If age criterion is not met or there are missing or invalid field codes (e.g., date of birth), then STOP processing. This enrollee does not get counted.
3. Check if subject is continuously enrolled for at least 180 days⁴
 - a. If subject meets continuous enrollment criterion, then proceed to next step.
 - b. If subject does not meet enrollment criterion, then STOP processing. This enrollee does not get counted.

YOU NOW HAVE THE COUNT OF THOSE WHO MEET THE AGE AND ENROLLMENT CRITERIA

4. Check if subject is at "elevated risk"
 - a. If subject meets any of the following then include in **denominator 1**.
 - i. the subject has a visit with a CDT code = (Dxxxx or Dxxxx) in the reporting year,⁵ OR
 - ii. the subject has a SERVICE Code among those in Table 1 in the reporting year, OR
 - iii. the subject has a SERVICE Code among those in Table 1 in any of the three years prior to the reporting year (**NOTE:** The subject does not need to be enrolled in any of the prior three years for the denominator enrollment criteria; this is a "look back" for enrollees who do have claims experience in any of the prior three years.)
 - b. If the subject does not meet any of the above criteria for elevated risk, then STOP processing. This enrollee will not be included in the measure denominators.

YOU NOW HAVE THE DENOMINATOR 1 (DEN 1): Enrollees who are at "elevated risk"

5. Check if subject received any dental service
 - a. If [SERVICE CODE] = D0100 – D9999 and;
 - b. If [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes in Table 2 below,⁶ then include in **denominator 2**; proceed to next step.
 - c. If both a AND b are not met, then the service was not a "dental" service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

Note: In this step, all **claims** with missing or invalid SERVICE CODE, missing or invalid NUCC maintained Provider Taxonomy Codes, or NUCC maintained Provider Taxonomy Codes that do not appear in Table 2 should be excluded

³ Medicaid/ CHIP programs may want to apply these overall exclusions before the case finding process (check with program official):

- Undocumented aliens who are eligible only for emergency Medicaid services;
- Other groups of individuals under age 21 who are eligible only for limited services as part of their Medicaid eligibility (e.g., pregnancy-related services)

If exclusions are applied, the exclusion criteria should be reported along with the number and percentage of members excluded.

⁴ **Enrollment in "same" plan vs. "any" plan:** At the state program level (e.g., Medicaid/ CHIP) a criterion of "any" plan applies versus at the health plan (e.g., MCO) level a criterion of "same" plan applies. The criterion used should be reported with the measurement score. While this prevents direct aggregation of results from plan to program, each entity is given due credit for the population it serves. Thus, States with multiple MCOs should not merely "add up" the plan level scores but should calculate the State score from their database to allow inclusion of individuals who may be continuously enrolled but might have switched plans in the interim.

⁵ **CDT Codes:** Specific codes will be available January 2014.

⁶ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

YOU NOW HAVE THE DENOMINATOR 2 (DEN 2): Enrollees who are at “elevated risk” and accessed a dental service (had a visit)

6. Check if subject received a sealant as a dental service
 - a. If [SERVICE CODE] = D1351 then proceed to next step. (Note: At least one **claim** for a sealant in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes in Table 2.)
 - b. If not, then service was not provided; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

7. Check if sealant was placed on permanent first molar
 - c. If [TOOTH-NUMBER] = 3, 14, 19 or 30 then include in **numerator**; STOP processing.
 - d. If not, then service was not provided for the first permanent molar; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

YOU NOW HAVE NUMERATOR (NUM) COUNT: Enrollees at “elevated risk” who received sealants on a permanent first molar as a dental service

8. Report
 - a. Unduplicated count of enrollees in numerator
 - b. Unduplicated count of enrollees in each denominator
 - c. Rates of measures (NUM/DEN1) and (NUM/DEN2)

Table 1: CDT Codes to identify “elevated risk”

D2140	D2394	D2630	D2720	D2791	D3120
D2150	D2410	D2642	D2721	D2792	D3220
D2160	D2420	D2643	D2722	D2794	D3221
D2161	D2430	D2644	D2740	D2799	D3222
D2330	D2510	D2650	D2750	D2930	D3230
D2331	D2520	D2651	D2751	D2931	D3240
D2332	D2530	D2652	D2752	D2932	D3310
D2335	D2542	D2662	D2780	D2933	D3320
D2390	D2543	D2663	D2781	D2934	D3330
D2391	D2544	D2664	D2782	D2940	
D2392	D2610	D2710	D2783	D2950	
D2393	D2620	D2712	D2790	D3110	

Table 2: NUCC maintained Provider Taxonomy Codes classified as “Dental Service”*

12230000X	1223P0106X	1223X0008X	261QF0400X
1223D0001X	1223P0221X	1223X0400X	261QR1300X

FINAL July 19, 2013

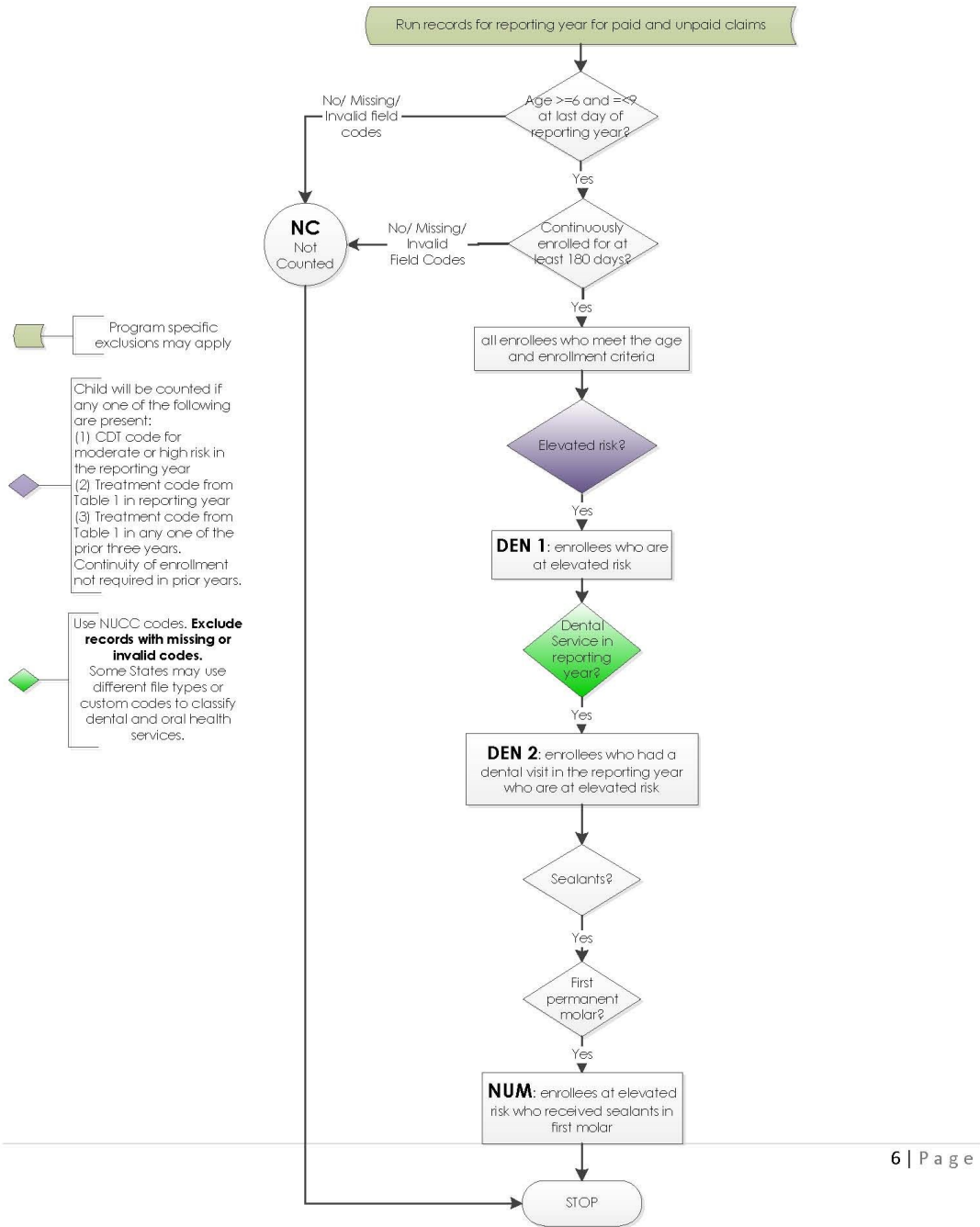


1223D0004X	1223P0300X	124Q00000X+	
1223E0200X	1223P0700X	125J00000X	
1223G0001X	1223S0112X	125K00000X	

*Services provided by County Health Department dental clinics may also be included as "dental" services.

*Only dental hygienists who provide services under the supervision of a dentist should be classified as "dental" services. Services provided by independently practicing dental hygienists should be classified as "oral health" services.

*** Note: Reliability of the measure score depends on the quality of the data that are used to calculate the measures. Flow rates (% of missing or invalid data) for these data elements must be investigated prior to measurement. Data elements with high rates of missing or invalid data will adversely affect the subsequent counts that are recorded. For example, records with missing or invalid SERVICE CODE will be counted in the "all enrollees" but not in "all enrollees who received service." These records are assumed to not have had a visit. In this case, a low quality data set will result in a low utilization score and will not be reliable.***



Additional Specifications for “oral health services”: Sealants for 6-9 year-old Children at Elevated Risk

Apart from routine quality reporting, researchers and policy makers may wish to seek additional information regarding services provided by or under the supervision of a dentist versus otherwise.

For example, some policy questions that may need to be answered include:

- Among those enrolled, how many children aged 6 – 9 years received sealants as an oral health service (e.g., from an independently practicing dental hygienist)?
- Among those who had a visit, how many children aged 6 – 9 years received sealants as an oral health service (e.g., from an independently practicing dental hygienist)?

Note: DQA User Guide provides additional information on categorization of “dental” and “oral health” services.

“Oral health” services

Description: Percentage of a. enrolled children b. enrolled children who accessed oral health services (received at least one service) in the age categories of **6-9** years at “elevated” risk (i.e., “moderate” or “high”) who received a sealant on a permanent **first** molar tooth within the reporting year.

Numerator: Unduplicated number of all enrolled children age **6-9 years** at “elevated” risk (i.e., “moderate” or “high”) who received a sealant on a permanent **first** molar tooth as an oral health service

Denominator:

DEN 1: Unduplicated number of all enrolled children age 6 - 9 years at “elevated” risk (i.e., “moderate” or “high”)

DEN 2: Unduplicated number of all enrolled children age 6 - 9 years at “elevated” risk (i.e., “moderate” or “high”) who received at least one oral health service

Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)

Calculation of “oral health services” – modify the calculation for “dental services” as follows:

STEP 5: In the calculation above, use the decision box in Step 5 as follows.

- If [SERVICE CODE] = D0100 – D9999 and;
- If [RENDERING PROVIDER TAXONOMY] code is valid NUCC maintained Provider Taxonomy Code but *not* any of the NUCC maintained Provider Taxonomy Codes in Table 2 above⁷, then include in count of enrollees who received oral health service; proceed to next step.
- If both a AND b are not met, then the service was not an “oral health” service; STOP processing. This enrollee is already included in the denominator 1 but will not be included in the subsequent counts.

Note: In this step, all **claims** with missing or invalid SERVICE CODE or with missing or invalid NUCC maintained Provider Taxonomy Codes should be excluded.

STEP 6: In the calculation above, use the decision box in Step 6 as follows.

⁷ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

- a. If [SERVICE CODE] = D1351 then proceed to next step. (Note: At least one **claim** for sealant in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = is valid NUCC maintained Provider Taxonomy Code but *not* any of the NUCC maintained Provider Taxonomy Codes in Table 2 above⁸)
- b. If not, then service was not provided or service was not an “oral health” service; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

Additional Specifications for “dental OR oral health services”: Sealants for 6-9 year-old Children at Elevated Risk

Researchers and policy makers may wish to seek additional information regarding whether certain services were provided to a population. In such cases a “dental OR oral health” measure may be applicable.

The “dental OR oral health” measure is **NOT** a sum of the “dental” and “oral health” services but represents the unduplicated count of children who received a service.

“Dental” or “Oral health” services
<p>Description: Percentage of a. <u>enrolled children</u> b. <u>enrolled children who accessed dental OR oral health services (received at least one service)</u> in the age categories of 6-9 years at “elevated” risk (i.e., “moderate” or “high”) who received a sealant on a permanent first molar tooth within the reporting year.</p> <p>Numerator: Unduplicated number of all enrolled children age 6-9 years at “elevated” risk (i.e., “moderate” or “high”) who received a sealant on a permanent first molar tooth as a dental OR oral health service</p> <p>Denominator:</p> <p>DEN 1: Unduplicated number of all enrolled children age 6 - 9 years at “elevated” risk (i.e., “moderate” or “high”)</p> <p>DEN 2: Unduplicated number of all enrolled children age 6 - 9 years at “elevated” risk (i.e., “moderate” or “high”) who received at least one dental OR oral health service</p> <p>Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)</p>

Calculation of “dental OR oral health services” – modify the calculation for “dental services” as follows:

STEP 5: In the calculation above, use the decision box in Step 5 as follows:

- a. If [SERVICE CODE] = D0100 – D9999 and;
- b. If [RENDERING PROVIDER TAXONOMY] code is *any* valid NUCC maintained Provider Taxonomy Code,⁹ then include in **count of enrollees who received dental OR oral health service**; proceed to the next step.
- c. If both a AND b are not met, then the service was not a “dental or oral health” service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

Note: In this step, all **claims** with missing or invalid SERVICE-CODE or with missing or invalid NUCC maintained Provider Taxonomy Codes should be excluded.

⁸ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

⁹ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

July 19, 2013



STEP 6: In the calculation above, use the decision box in Step 6 as follows.

- a. If [SERVICE CODE] = D1351 then proceed to next step. (Note: At least one **claim** for sealant in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = *any* valid NUCC maintained Provider Taxonomy Code)
- b. If not, then service was not provided or service was not a "dental OR oral health" service, STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

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These Measures are intended to assist stakeholders in enhancing quality of care. These performance Measures are not clinical guidelines and do not establish a standard of care. The DQA has not tested its Measures for all potential applications. Measures are subject to review and may be revised or rescinded at any time by the DQA. The Measures may not be altered without the prior written approval of the DQA. Measures developed by the DQA, while copyrighted, can be reproduced and distributed, without modification, for noncommercial purposes. Commercial use is defined as the sale, license, or distribution of the Measures for commercial gain, or incorporation of the Measures into a product or service that is sold, licensed or distributed for commercial gain. Commercial uses of the Measures require a license agreement between the user and DQA. Neither the DQA nor its members shall be responsible for any use of these Measures.

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****Please read the DQA Measures User Guide prior to implementing this measure****

DQA Measure Specification Sheet: Prevention: Sealants for 10-14 year-old Children at Elevated Risk

"Dental" services

Description: Percentage of a. enrolled children b. enrolled children who accessed a dental service (received at least one service) in the age category of **10-14** years at "elevated" risk (i.e., "moderate" or "high") who received a sealant on a permanent **second** molar tooth within the reporting year.

Numerator: Unduplicated number of all enrolled children age **10-14** years at "elevated" risk (i.e., "moderate" or "high") who received a sealant on a permanent **second** molar tooth as a dental service

Denominator:

DEN 1: Unduplicated number of all enrolled children age **10-14** years at "elevated" risk (i.e., "moderate" or "high")

DEN 2: Unduplicated number of all enrolled children age **10-14** years at "elevated" risk (i.e., "moderate" or "high") who received at least one dental service

Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)

Rationale: Dental caries is the most common chronic disease in children in the United States (1). In 2009–2010, 14% of children aged 3–5 years had untreated dental caries. Among children aged 6–9 years, 17% had untreated dental caries, and among adolescents aged 13–15, 11% had untreated dental caries. (2) Identifying caries early is important to reverse the disease process, prevent progression of caries, and reduce incidence of future lesions. Approximately three quarters of children younger than age 6 years did not have at least one visit to a dentist in the previous year (3). Evidence-based Clinical Recommendations recommend that sealants should be placed on pits and fissures of children's primary and permanent teeth when it is determined that the tooth, or the patient, is at risk of experiencing caries. The evidence for sealant effectiveness in permanent molars is stronger than evidence for primary molars (4).

(1) National Center for Health Statistics. Healthy People 2010 Final Review. Hyattsville, MD: National Center for Health Statistics; 2012. Accessed at http://www.cdc.gov/nchs/healthy_people/hp2010/hp2010_final_review.htm on July 10 2013.

(2) Dye BA, Li X, Thornton-Evans G. Oral health disparities as determined by selected Healthy People 2020 oral health objectives for the United States, 2009–2010. NCHS data brief, no 104. Hyattsville, MD: National Center for Health Statistics; 2012.

(3) Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. *Acad Pediatr*. 2009;9(6):415-9. PMID: 19945076

(4) Beauchamp J, Caufield PW, Crall JJ, Donly K, Feigal R, Gooch B, et al. Evidence-based clinical recommendations for the use of pit-and-fissure sealants: a report of the American Dental Association Council on Scientific Affairs. *J Am Dent Assoc* 2008;139(3):257-268.

AHRQ Domain: Access (DEN 1)¹; Process (DEN 2)²

IOM Aim: Equity, Effectiveness

Level of Aggregation: Health Plan/Program

¹ **Access (Clinical Quality Measure):** Access to care is the attainment of timely and appropriate health care by patients or enrollees of a health care organization or clinician. Access measures are supported by evidence that an association exists between the measure and the outcomes of or satisfaction with care. National Quality Measures Clearinghouse: <http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx>. Accessed April 2013.

² **Process (Clinical Quality Measure):** A process of care is a health care-related activity performed for, on behalf of, or by a patient. Process measures are supported by evidence that the clinical process—that is the focus of the measure—has led to improved outcomes. National Quality Measures Clearinghouse: <http://www.qualitymeasures.ahrq.gov/about/domain-definitions.aspx>. Accessed April 2013.

Improvement Noted As: Higher the better; interpreted in the context of relative scores (e.g., over time and between reporting entities)

Data Required: Single year for measurement (prior 3 years may be needed for risk determination)

Measure purpose: Examples of questions that can be answered through this measure at each level of aggregation

1. What is the **relative percentage** of children receiving sealants when compared to another plan? (Note: This measure CANNOT be used to determine the absolute percentage of children ages 10-14 years who have sealants on their permanent second molars due to limitations of the administrative data in capturing prior sealant placement that are noted below. Rather, this measure indicates the prevalence of sealant placement during the reporting period.)
2. Does the percentage of children who receive sealants vary by any of the stratification variables?
3. Are there disparities in use of sealants among different groups based on the stratification variables?
4. Over time, is the level of sealant use stable, increasing or decreasing?

Applicable Stratification Variables (Optional: Contact Program Official to determine reporting requirement)

1. Payer Type (e.g., Medicaid; CHIP programs; private commercial benefit programs)
2. Program/Plan Type (e.g., traditional FFS; PPO; prepaid dental/DHMO)
3. Geographic Location (e.g., rural; suburban; urban)
4. Race/Ethnicity
5. Socioeconomic Status (e.g., premium or income category)

Measure Limitations due to Limitations of Administrative Data

- *This measure will not delineate those whose teeth have not erupted, those who have already received sealants in prior years, and those with decayed/filled teeth not candidates for sealants. However, this measure is designed to identify the prevalence of sealant placement on a permanent second molar tooth during the reporting year for children ages 10-14 years at elevated risk for caries; this measure is not designed to provide the absolute percentage of children who have ever had a sealant on a permanent second molar. As such, this prevalence-based measure is intended to be used for monitoring trends in sealant placement over time, variations in sealant placement between reporting entities, and disparities in sealant placement. This measure will not capture children younger than 10 years of age whose second molars have already erupted and received sealants.*
- *Some codes (i.e., a few endodontic codes) included to identify children at elevated risk may also be reported for instances such as trauma and may contribute to some overestimation of children at "elevated risk".*
- *Since "elevated risk" determination requires an evaluation (to record CDT risk code) or a treatment visit (to record a treatment code), children who are enrolled but do not have a visit in the reporting year or a treatment visit in any of the prior three years will not have sufficient information to be included in the measure. While this is a limitation, the intent of this PROCESS measure is to seek to understand whether children who can be positively identified as being at elevated risk receive the recommended preventive services.*

Sealants for 10-14 year olds - Calculation for Children at Elevated Caries Risk

1. Run records for one reporting year for paid and unpaid claims.³
2. Check if the enrollee meets age criteria at the last day of the reporting year
 - a. If child is ≥ 10 and ≤ 14 , then proceed to next step.
 - b. If age criterion is not met or there are missing or invalid field codes (e.g., date of birth), then STOP processing. This enrollee does not get counted.
3. Check if subject is continuously enrolled for at least 180 days⁴
 - a. If subject meets continuous enrollment criterion, then proceed to next step.
 - b. If subject does not meet enrollment criterion, then STOP processing. This enrollee does not get counted.

YOU NOW HAVE THE COUNT OF THOSE WHO MEET THE AGE AND ENROLLMENT CRITERIA

4. Check if subject is at "elevated risk"
 - a. If subject meets any of the following then include in **denominator 1**.
 - i. the subject has a visit with a CDT code = (Dxxxx or Dxxxx) in the reporting year,⁵ OR
 - ii. the subject has a SERVICE Code among those in Table 1 in the reporting year, OR
 - iii. the subject has a SERVICE Code among those in Table 1 in any of the three years prior to the measurement year (**NOTE:** The subject does not need to be enrolled in any of the prior three years for the denominator enrollment criteria; this is a "look back" for enrollees who do have claims experience in any of the prior three years.)
 - b. If the subject does not meet any of the above criteria for elevated risk, then STOP processing. This enrollee will not be included in the measure denominators.

YOU NOW HAVE DENOMINATOR 1 (DEN 1): Enrollees who are at "elevated risk"

5. Check if subject received any dental service
 - a. If [SERVICE CODE] = D0100 – D9999 and;
 - a. If [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes in Table 2 below,⁶ then include in **denominator 2**; proceed to next step.
 - b. If both a AND b are not met, then the service was not a "dental" service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

Note: In this step, all **claims** with missing or invalid SERVICE-CODE, missing or invalid NUCC maintained Provider Taxonomy Codes, or NUCC maintained Provider Taxonomy Codes that do not appear in Table 2 should be excluded

³ Medicaid/ CHIP programs may want to apply these overall exclusions before the case finding process (check with program official):

- Undocumented aliens who are eligible only for emergency Medicaid services;
- Other groups of individuals under age 21 who are eligible only for limited services as part of their Medicaid eligibility (e.g., pregnancy-related services)

If exclusions are applied, the exclusion criteria should be reported along with the number and percentage of members excluded.

⁴ **Enrollment in "same" plan vs. "any" plan:** At the state program level (e.g., Medicaid/ CHIP) a criterion of "any" plan applies versus at the health plan (e.g., MCO) level a criterion of "same" plan applies. The criterion used should be reported with the measurement score. While this prevents direct aggregation of results from plan to program, each entity is given due credit for the population it serves. Thus, States with multiple MCOs should not merely "add up" the plan level scores but should calculate the State score from their database to allow inclusion of individuals who may be continuously enrolled but might have switched plans in the interim.

⁵ **CDT Codes:** Specific codes will be available January 2014.

⁶ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

YOU NOW HAVE DENOMINATOR 2 (DEN 2): Enrollees who are at "elevated risk" and accessed a dental service (had a visit)

6. Check if subject received a sealant as a dental service
 - a. If [SERVICE CODE] = D1351, then proceed to next step. (Note: At least one **claim** for sealant in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = any of the NUCC maintained Provider Taxonomy Codes in Table 2.)
 - b. If not, then service was not provided; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

7. Check if sealant was placed on the permanent second molar
 - c. If [TOOTH-NUMBER] = 2, 15, 18, 31 then include in **numerator**; STOP processing.
 - d. If not, then service was not provided for the second permanent molar; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

YOU NOW HAVE NUMERATOR (NUM) COUNT: Enrollees at "elevated risk" who received sealants on a permanent second molar as a dental service

8. Report
 - a. Unduplicated count of enrollees in numerator
 - b. Unduplicated count of enrollees in each denominator
 - c. Rates of measures (NUM/DEN1) and (NUM/DEN2)

Table 1: CDT Codes to identify "elevated risk"

D2140	D2394	D2630	D2720	D2791	D3120
D2150	D2410	D2642	D2721	D2792	D3220
D2160	D2420	D2643	D2722	D2794	D3221
D2161	D2430	D2644	D2740	D2799	D3222
D2330	D2510	D2650	D2750	D2930	D3230
D2331	D2520	D2651	D2751	D2931	D3240
D2332	D2530	D2652	D2752	D2932	D3310
D2335	D2542	D2662	D2780	D2933	D3320
D2390	D2543	D2663	D2781	D2934	D3330
D2391	D2544	D2664	D2782	D2940	
D2392	D2610	D2710	D2783	D2950	
D2393	D2620	D2712	D2790	D3110	

Table 2: NUCC maintained Provider Taxonomy Codes classified as "Dental Service"*

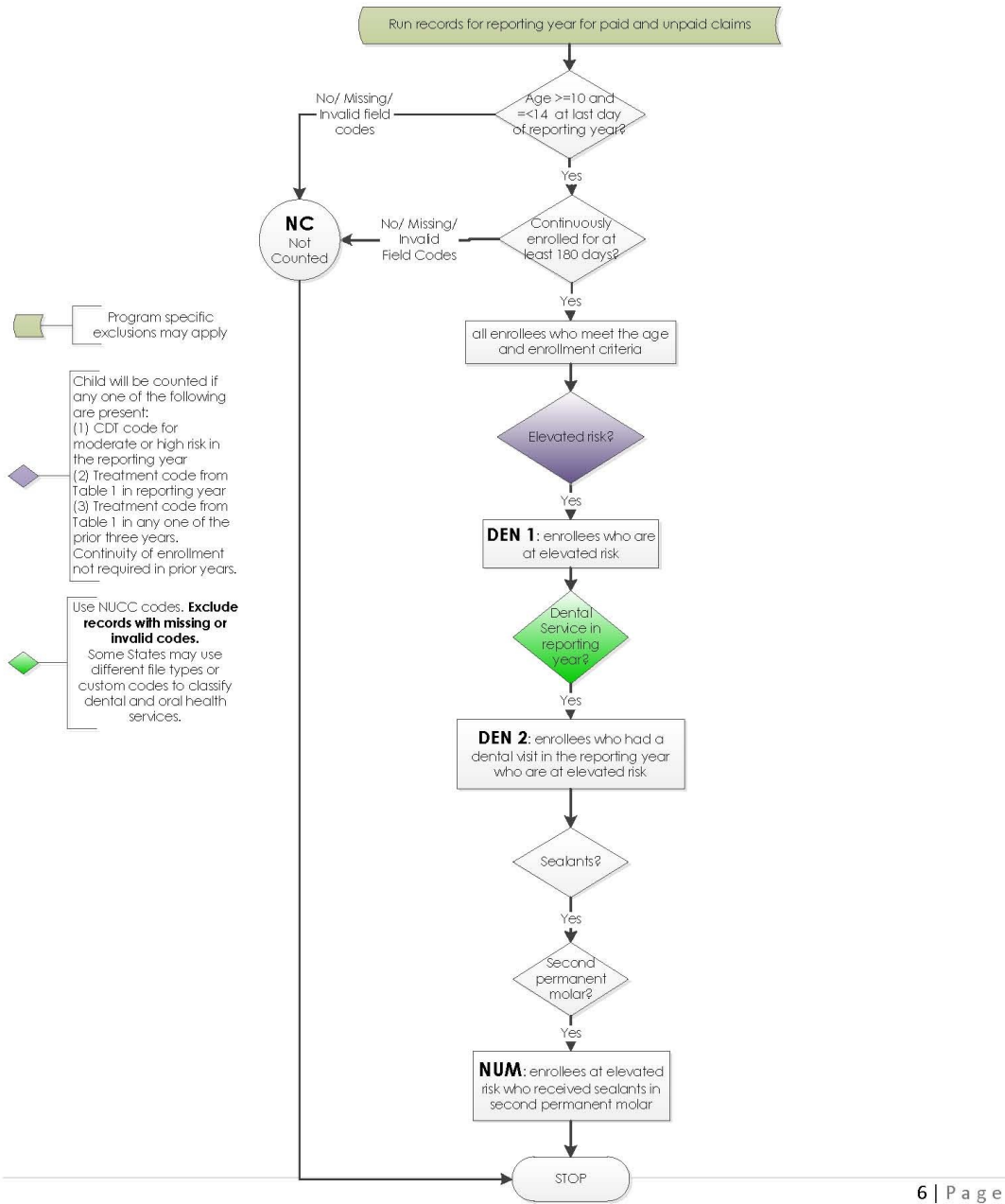
12230000X	1223P0106X	1223X0008X	261 QF0400X
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1223D0001X	1223P0221X	1223X0400X	261QR1300X
1223D0004X	1223P0300X	124Q00000X+	
1223E0200X	1223P0700X	125J00000X	
1223G0001X	1223S0112X	125K00000X	

*Services provided by County Health Department dental clinics may also be included as "dental" services.

*Only dental hygienists who provide services under the supervision of a dentist should be classified as "dental" services. Services provided by independently practicing dental hygienists should be classified as "oral health" services.

*** Note: Reliability of the measure score depends on the quality of the data that are used to calculate the measures. Flow rates (% of missing or invalid data) for these data elements must be investigated prior to measurement. Data elements with high rates of missing or invalid data will adversely affect the subsequent counts that are recorded. For example, records with missing or invalid SERVICE CODE will be counted in the "all enrollees" but not in "all enrollees who received service." These records are assumed to not have had a visit. In this case, a low quality data set will result in a low utilization score and will not be reliable.***



Additional Specifications for “oral health services”: Sealants for 10 -14 year-old Children at Elevated Risk

Apart from routine quality reporting, researchers and policy makers may wish to seek additional information regarding services provided by or under the supervision of a dentist versus otherwise.

For example, some policy questions that may need to be answered include:

- Among those enrolled, how many children aged 10-14 years received sealants as an oral health service (e.g., from an independently practicing dental hygienist)?
- Among those who had a visit, how many children aged 10-14 years received sealants as an oral health service (e.g., from an independently practicing dental hygienist)?

Note: The DQA User Guide provides additional information on categorization of “dental” and “oral health” services.

“Oral health” services

Description: Percentage of a. enrolled children b. enrolled children who accessed oral health services (received at least one service) in the age categories of **10-14** years at “elevated” risk (i.e., “moderate” or “high”) who received a sealant on a permanent **second** molar tooth within the reporting year.

Numerator: Unduplicated number of all enrolled children age **10-14 years** at “elevated” risk (i.e., “moderate” or “high”) who received a sealant on a permanent **second** molar tooth as an oral health service

Denominator:

DEN 1: Unduplicated number of all enrolled children age 10-14 years at “elevated” risk (i.e., “moderate” or “high”)

DEN 2: Unduplicated number of all enrolled children age 10-14 years at “elevated” risk (i.e., “moderate” or “high”) who received at least one oral health service

Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)

Calculation of “oral health services” – modify the calculation for “dental services” as follows:

STEP 5: In the calculation above, use the decision box in Step 5 as follows.

- If [SERVICE CODE] = D0100 – D9999 and;
- If [RENDERING PROVIDER TAXONOMY] code is valid NUCC maintained Provider Taxonomy Code but *not* any of the NUCC maintained Provider Taxonomy Codes in Table 2 above,⁷ then include in count of enrollees who received oral health service; proceed to next step.
- If both a AND b are not met, then the service was not an “oral health” service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

Note: In this step, all **claims** with missing or invalid SERVICE CODE or with missing or invalid NUCC maintained Provider Taxonomy Codes should be excluded.

STEP 6: In the calculation above, use the decision box in Step 6 as follows.

⁷ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

- a. If [SERVICE CODE] = D1351, then proceed to next step. (Note: At least one **claim** for sealant in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = is valid NUCC maintained Provider Taxonomy Code but *not* any of the NUCC maintained Provider Taxonomy Codes in Table 2 above.⁸)
- b. If not, then service was not provided or service was not an "oral health" service; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

Additional Specifications for "dental OR oral health services": Sealants for 10-14 year old Children at Elevated Risk

Researchers and policy makers may wish to seek additional information regarding whether certain services were provided to a population. In such cases a "dental OR oral health" measure may be applicable.

The "dental OR oral health" measure is **NOT** a sum of the "dental" and "oral health" services but represents the unduplicated count of children who received a service.

"Dental" or "Oral health" services

Description: Percentage of a. enrolled children b. enrolled children who accessed dental OR oral health services (received at least one service) in the age categories of **10-14** years at "elevated" risk (i.e., "moderate" or "high") who received a sealant on a permanent **second** molar tooth within the reporting year.

Numerator: Unduplicated number of all enrolled children age **10-14 years** at "elevated" risk (i.e., "moderate" or "high") who received a sealant on a permanent **second** molar tooth as a dental OR oral health service

Denominator:

DEN 1: Unduplicated number of all enrolled children age 10-14 years at "elevated" risk (i.e., "moderate" or "high")

DEN 2: Unduplicated number of all enrolled children age 10-14 years at "elevated" risk (i.e., "moderate" or "high") who received at least one dental OR oral health service

Rates: NUM/DEN 1; NUM/DEN 2 (Note: These are two different rates based on the two different denominators)

Calculation of "dental OR oral health services" – modify the calculation for "dental services" as follows:

STEP 5: In the calculation above, use the decision box in Step 5 as follows:

- a. If [SERVICE CODE] = D0100 – D9999, and;
- b. If [RENDERING PROVIDER TAXONOMY] code is *any* valid NUCC maintained Provider Taxonomy Code,⁹ then include in count of enrollees who received dental OR oral health service; proceed to the next step.
- c. If both a AND b are not met, then the service was not a "dental or oral health" service; STOP processing. This enrollee is already included in denominator 1 but will not be included in the subsequent counts.

Note: In this step, all **claims** with missing or invalid SERVICE-CODE or with missing or invalid NUCC maintained Provider Taxonomy Codes should be excluded.

⁸ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

⁹ **Provider taxonomy:** Some States may use different file types or custom codes to classify dental and oral health services.

STEP 6: In the calculation above, use the decision box in Step 6 as follows.

- a. If [SERVICE CODE] = D1351, then proceed to next step. (Note: At least one **claim** for sealant in the reporting year must be with a provider whose [RENDERING PROVIDER TAXONOMY] code = *any* valid NUCC maintained Provider Taxonomy Code)
- b. If not, then service was not provided or service was not a “dental OR oral health” service; STOP processing. This enrollee is already included in the denominators but will not be included in the numerator.

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1994-Present	Certified to administer local anesthesia
1994-Present	Certified to administer Nitrous Oxide
1993-Present	Certified in Cardiopulmonary Resuscitation

CURRENT POSITION:

2010-Present	Associate Professor (tenured) University of Missouri-Kansas City School of Dentistry
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ACADEMIC EXPERIENCE:

2007-2010	Assistant Professor & Senior Clinic Coordinator University of Missouri-Kansas City School of Dentistry
2007-Present	Graduate Faculty, University of Missouri-Kansas City
2004 – 2007	Assistant Professor, Division of Dental Hygiene University of Missouri-Kansas City School of Dentistry
2002 – 2004	Clinical Instructor, Division of Dental Hygiene University of Missouri-Kansas City School of Dentistry

OTHER EXPERIENCE:

2004-Present University of Missouri-Kansas City Dental Hygienists' Alumni Association Board of Directors
2012-2013 Immediate Past-President, UMKC Dental Hygienists' Alumni Association
2011-2012 President, UMKC Dental Hygienists' Alumni Association
2010-2011 President Elect, UMKC Dental Hygienists' Alumni Association

CONSULTING ACTIVITIES:

2011 Textbook Reviewer, CENGAGE LEARNING publishing company, *Emergency Guide for Dental Auxiliaries*
2010-Present Thought Leader, Hu-Friedy Corporation
2010-Present Reviewer, *Journal of Dental Education*
2010-2012 Cabinet Member, Kansas Dental Workforce Cabinet
2010 Grant Reviewer, Kansas Department of Health & Environment, Bureau of Oral Health, *Extended Care Permit Grant*
2005-Present Reviewer, *Dimensions of Dental Hygiene*
2006 Textbook Reviewer, Prentice Hall Publishing Company, "Dental Medical Emergencies," Nov. 5th 2005 version

PUBLICATIONS (Peer Reviewed):

Hardgraves VM, Villalpando-Mitchell T, Carter-Hanson C, **Simmer-Beck M**. Oral healthcare status, needs, and barriers in Arkansas nursing facilities. Manuscript submitted to *Journal of Dental Hygiene* Aug. 2013. (submitted)

Hoffman, AM, Branson, BG, Keselyak, NK, **Simmer-Beck, M**. Preventive services program (PSP): Application of a framework for sustaining improvement in the oral health of Missouri's children. Manuscript in-press *Journal of Dental Hygiene*.

Siruta KJ, Gadbury-Amyot CC, **Simmer-Beck M**, Ahmed A, Holt LA, Mitchell TV. Extending Oral Health Care Services to Underserved Children Through a School-based Collaboration: Part #-3 Cost Analysis. Manuscript in-press *Journal of Dental Hygiene*.

Branson BB, **Simmer-Beck M**. Addressing the Long-Term Needs of Long Term Care Facility Residents. *Dimensions of Dental Hygiene* 11(8): 31-35, August 2013.

Simmer-Beck M, Gadbury-Amyot CC, Williams KB, Keselyak NT, Branson BB, Villalpando TM. Measuring the Short Term Effects of Incorporating Academic Service Learning throughout a Dental Hygiene Curriculum. *International Journal of Dental Hygiene*, doi: 10.1111/idh, February 2013.

- Voelker MA, **Simmer-Beck M**, Bauer M, Keeven E, Tira D. Preliminary Findings on the Comparison of Saliva pH, Buffering Capacity, Flow, Consistency, and *Streptococcus mutans* in Relation to Cigarette Smoking. *Journal of Dental Hygiene* 87(1):27-34, February 2013.
- Keselyak NT, Michaelsen LK, Gadbury-Amyot CC, **Simmer-Beck M**. Peer Evaluation in a Didactic Team-Based Learning™ Dental Hygiene Course. MedEdPORTAL; 2012. Available from: www.mededportal.org/publication/9079.
- Keselyak N, **Simmer-Beck M**, Gadbury-Amyot CC. Extending Oral Healthcare Services to Unserved and Underserved Children through a School Based Collaboration between a Dental Hygiene Program and a School District: Part 2 – The Student Experience. *Journal of Dental Hygiene* 85(3):193-203, Summer 2011.
- Simmer-Beck M**, Gadbury-Amyot CC, Ferris H, et al. Extending Oral Healthcare Services to Unserved and Underserved Children through a School Based Collaboration between a Dental Hygiene Program and a School District: Part 1 - A Descriptive Overview. *Journal of Dental Hygiene* 85(3):181-192, Summer 2011.
- Saylor CD, Keselyak NT, **Simmer-Beck M**, Tira D. Evaluation of Social Interaction, Task Management and Trust among Dental Hygiene Students in a Collaborative Learning Environment. *Journal of Dental Education* 75(2):180-189, Feb 2011.
- Simmer-Beck M**. Providing Care to Individuals with Special Healthcare Needs. *Dimensions of Dental Hygiene* 8(5): 64-67, May 2010.
- Simmer-Beck M**, Branson BB. An Evidence-Based Review of Ergonomic Features of Dental Hygiene Instruments. *WORK: A Journal of Prevention, Assessment, & Rehabilitation* –35 (2010) 477-485, 2010.
- Branson BB, **Simmer-Beck M**. Changes in Posture: A Case Study of a Dental Hygienist Use of Magnification Loupes. *WORK: A Journal of Prevention, Assessment, & Rehabilitation* 35(2010) 467-476, 2010.
- James D, Branson BB, **Simmer-Beck M**. Examining the Effect of the Flextend Orthotic Device® on Grip Strength: A Pilot Study. *WORK: A Journal of Prevention, Assessment, & Rehabilitation* 35 (2010) 487-494, 2010.
- Branson BB, **Simmer-Beck M**. Visual Acuity Without Injury. *Dimensions of Dental Hygiene* 7(9):46-49, Sept. 2009.
- Keselyak N, **Simmer-Beck M**, Bray KK. Examining the Role of Collaborative Assessment in a Didactic Dental Hygiene Course. *Journal of Dental Education* 73(8):980-990, Aug. 2009.

- Branson BB, **Simmer-Beck M**. Personal Assessment. *Dimensions of Dental Hygiene* 7(4): 20-23, April 2009.
- Simmer-Beck M**, Branson BB. Minimizing Work-Related Injuries in the Dental Office. *Dimensions of Dental Hygiene*. (Special 4 CR CE) 6v(6) supplement June 2008.
- Simmer-Beck M**, Branson BB, Villalpando TM, Holt LA. Comparison of Tactile Discrimination Associated with Varying Weights of Explorers. *Journal of Dental Education* 71 (5) 687-693, May 2007.
- Keselyak N, **Simmer-Beck M**, Bray KK, Gadbury-Amyot CC. Evaluation of an Academic Service Learning Course on Special Needs Patients for Dental Hygiene Students: A Qualitative Study. *Journal of Dental Education* 70 (3) 378-392, March 2007.
- Villalpando TM, Gadbury-Amyot CC, Bray KK, **Simmer-Beck M**. Advanced degree seeking students' satisfaction with online courses at UMKC--an early investigation. *Journal of Dental Hygiene* 81 (3) 62, 2007.
- Gadbury-Amyot CC, **Simmer-Beck M**, McCunniff M, Williams KB. Using a multifaceted approach including community-based service-learning to enrich formal ethics instruction in a dental school setting. *Journal of Dental Education* 70 (6) 652-61, June 2006.
- Simmer-Beck M**, Bray KK, Branson BB, Glaros A, Weeks J. Comparison of muscle activity associated with structural differences in dental hygiene mirrors. *Journal of Dental Hygiene* 80 (1) 8, 2006.
- Simmer-Beck M**, Branson BB. Ergonomic instrument design. *Journal of Practical Hygiene* 14 (6) 25-6, July/Aug. 2005.
- Simmer-Beck M**, Branson BB. Posture perfect. *Dimensions of Dental Hygiene* 3 (5) 16-19, May 2005.

OTHER PUBLICATIONS AND CREATIVE WORKS:

Tables from An Evidence-Based Review of Ergonomic Features of Dental Hygiene Instruments, published in *WORK: A Journal of Prevention, Assessment, & Rehabilitation* are being used in the 7th edition of the textbook *Fundamentals of Periodontal Instrumentation & Advanced Root Instrumentation* published by Lippincott Williams & Wilkins:

- Hong L, **Simmer-Beck M**, McCunniff M, Mathew M, Daneman B. Kansas City Oral Health Surveillance: Oral Health Status 2007-2008-A Final Report of the outcomes of a project supported by *The REACH Healthcare Foundation* 2008.

Module Author, "Care for the Disabled," Extended Care Permit/Dental Safety Net in Kansas and Missouri-An On-Line CE Course (30 CE hours or 3 College CR hours). July 2006. Revised July 2007 & July 2009.

Simmer-Beck M. The multiple sclerosis patient: Oral and systemic challenges. *Oral B case studies in dental hygiene* 3(2):1-8, 2005.

Contributor, "Dental School: OSHA Review Course," University of Missouri Kansas City, School of Dentistry, Annual Blood borne Pathogen Training for faculty and staff available on Blackboard 2004-2005.

PUBLISHED ABSTRACTS:

Gadbury-Amyot CC, **Simmer-Beck M.** Increasing Access to Oral Healthcare Services to Underserved Children through a Collaborative School-Based Program Using Expanded Scope of Practice Dental Hygienists and Dental Hygiene Students. *International J Dent Hyg* 2013 (in press).

Gadbury-Amyot CC, **Simmer-Beck M.** Increasing Access to Oral Healthcare Services to Underserved Children through a Collaborative School-Based Program Using Expanded Scope of Practice Dental Hygienists and Dental Hygiene Students. *J Dent Hyg* 2013 (in press).

Siruta KJ, Gadbury-Amyot CC, **Simmer-Beck M.** Ahmed A, Holt LA, Mitchell TV. Extending Oral Health Care Services to Underserved Children Through a School-based Collaboration: Part #3 Cost Analysis. *J Dent Hyg* (in press). *Awarded 2nd place in the poster competition*

Simmer-Beck M. Williams KB, Gadbury-Amyot CC, Keselyak N, Bray KK. Measuring the Short-Term Effects of Incorporating Academic Service-Learning throughout a Dental Hygiene Curriculum. *J Dent Hyg* 2012;86(1):30.

Simmer-Beck M. Williams KB, Gadbury-Amyot CC, Keselyak N, Bray KK. Measuring the Short-Term Effects of Incorporating Academic Service-Learning throughout a Dental Hygiene Curriculum. *J Dent Educ* 2011;75(2):209.

Keselyak N, Gadbury-Amyot CC, **Simmer-Beck M.** Examining Peer Assessment in a Didactic Team-Based Learning Course. *J Dent Hyg* 2010;Fall;84(4).

Gadbury-Amyot CC, **Simmer-Beck M.** Extending oral healthcare services to unserved and (ECP) dental hygienist as the coordinator. *International J Dent Hyg* 2010;8(3):183-197. *Abstract was ranked in the top 20 and selected to be published.

Keselyak N, Gadbury-Amyot CC, **Simmer-Beck M.** Examining Peer Assessment in a Didactic Team-Based Learning Course. *J Dent Educ* 2010;74(2):154-155.

Hong L, **Simmer-Beck M**, McCunniff M, Mathew M, Daneman B. Dental Erosion, Caries Experience, and Risk Factors Among Young Children. *J Dent Res*, Special Issue 2010;98:1095.

Simmer-Beck M, Gadbury-Amyot CC, Black MA, Ferris HB, Marse B, Eplee H. Poster Presentation at the American Dental Hygienists' Association Annual Session. Expanding the Role of Dental Hygienists Providing Access to Care Using a School Based Model and Teledentistry. *Journal of Dental Hygiene* 83(4):207-08, Fall 2009. Archived at: http://www.adha.org/downloads/Research_Abstract_2009.pdf.

Simmer-Beck M, Gadbury-Amyot CC, Ferris HB, Marse B, Eplee H. Poster Presentation at the North American Dental Hygiene Research Conference. Expanding the Role of Dental Hygienists Providing Access to Care Using a School Based Model and Teledentistry. *Canadian Journal of Dental Hygiene* 43(6):279, Nov-Dec 2009.

Mitchell TV, Keselyak NT, **Simmer-Beck M**, Bray KK. Clinical Skills: Investigating the Millennial learner's Ability to Self Assess. 2008 ADEA Annual Session: Poster Abstracts *J Dent Educ*. 2008 72:2; 202.

Simmer-Beck M, Keselyak, NT. Developing Instructional Materials: An Independent Study Practicum for Dental Hygiene Students. *Journal of Dental Hygiene* 81(4): 10, October 2007. Archived at: http://www.adha.org/downloads/Research_Abstract_2007.pdf.

Keselyak NT, Saylor C, **Simmer-Beck M**, Bray KK. Evaluation of Group Assessment in a Didactic Dental Hygiene Course. *Journal of Dental Hygiene* 81 (4): 7, October 2007. Archived at: http://www.adha.org/downloads/Research_Abstract_2007.pdf.

Keselyak NT, **Simmer-Beck M**. Dental Hygiene Students' Perceptions of an Academic Service Learning Course on Special Needs Patients. *Journal of Dental Hygiene* 81 (1): 36, January 2007. Archived at: www.ingentaconnect.com/content/adha/jdh/2007/00000081/00000001/art00036;jsessionid=5o64rb480m1f.alice.

INTELLECTUAL PROPERTY:

Beck M, Forgy T. Patent # 6471514, Ergonomic grip for hand instruments. Filed on: 2/23/01. Issued on: 10/29/02.

GRANT EFFORTS (extramural funding):

<u>Title and Role on Project</u>	<u>Source of Funding</u>	<u>Amount</u>	<u>Dates</u>
Miles of Smiles PI: M Simmer-Beck I: CC Gadbury-Amyot	The REACH Healthcare Foundation	Not funded \$56,128	Submitted 2012
Kansas Oral Health School Screening Initiative PI: M Simmer-Beck	Kansas Department of Health and Environment	Funded \$10,000	09/1/12- 08/31/13
Miles of Smiles PI: M Simmer-Beck I: CC Gadbury-Amyot	The REACH Healthcare Foundation	Funded \$88,680	1/1/12- 12/31/12
Effectiveness of a Dental Hygiene Expanded Scope of Practice Model F-31 fellowship grant PI: M Simmer-Beck	NIH/NIDCR	Not funded	Submitted 2011
Kansas Oral Health School Screening Initiative PI: M Simmer-Beck	Kansas Department of Health and Environment	Funded \$10,000	09/1/11- 08/31/12
Miles of Smiles PI: M Simmer-Beck I: CC Gadbury-Amyot	The REACH Healthcare Foundation	Funded \$55,076	7/1/11- 12/31/11
Kansas Oral Health School Screening Initiative PI: M Simmer-Beck	Kansas Department of Health and Environment	Funded \$10,000	02/1/11- 08/31/11
Miles of Smiles PI: M Simmer-Beck I: CC Gadbury-Amyot	The REACH Healthcare Foundation	Funded \$110, 152	7/1/10- 6/30/11
Miles of Smiles at Westview Elementary PI: M Simmer-Beck I: CC Gadbury-Amyot	The National Children's Oral Health Foundation	Funded \$8000	6/1/09- 6/1/2010
National Children's Oral Health Foundation Affiliate award PI: M Simmer-Beck I: CC Gadbury-Amyot	ADHA Institute	Funded \$3500	1/1/09- 1/1/10

<u>Title and Role on Project</u>	<u>Source of Funding</u>	<u>Amount</u>	<u>Dates</u>
Miles of Smiles PI: M Simmer-Beck I: CC Gadbury-Amyot	The REACH Healthcare Foundation	Funded \$103,252	8/1/07- 2/1/09
Miles of Smiles PI: M Simmer-Beck I: CC Gadbury-Amyot	The REACH Healthcare Foundation	Funded \$124,954	8/1/08- 2/1/10
REACH Oral Health Monitoring and Surveillance PI: B Daneman I: M Simmer-Beck , L Hong, M McCunniff	The REACH Healthcare Foundation	Funded \$109,817	6/1/07- 2/1/09
Miles of Smiles PI: M Simmer-Beck I: CC Gadbury-Amyot	The REACH Healthcare Foundation	Not Funded \$125,000	Submitted 2007
The Short and Long Term Effects of Infiltrating Academic Service Learning in Dental Hygiene Curriculum PI: M Simmer-Beck	ADHA Institute	Not Funded \$11,200	Submitted 2007
Providing Oral Health Education to Under-Served Communities in Missouri PI: Branson BG I: M Simmer-Beck	The ADA Foundation Harris Fund for Children's Dental Health	Funded \$3506	6/1/06- 8/1/07
Expansion of Oral Health Safety Net Services to Kansas City Children PI: B Daneman I: BG Branson, M Simmer-Beck	The Sprint Foundation	Not Funded \$9609.50	Submitted 2006
Infusing Service Learning into Dental Hygiene Curriculum PI: M Simmer-Beck Co PI: BG Branson, NK Keselyak	Corporation for National & Community Service	Not Funded \$355,739	Submitted 2006

<u>Title and Role on Project</u>	<u>Source of Funding</u>	<u>Amount</u>	<u>Dates</u>
Targeting Youth: Introduction to the Health Professions PI: CC Gadbury-Amyot I: NK Keselyak, M Simmer-Beck	HRSA	Not Funded \$49,987 (HRSA did not receive funding for this project)	Submitted 2005

GRANT EFFORTS (intramural funding):

<u>Title and Role on Project</u>	<u>Source of Funding</u>	<u>Amount</u>	<u>Dates</u>
The Short and Long Term Effects of Infusing Academic Service Learning in Dental Hygiene Curriculums PI: M Simmer-Beck	The Reinhardt Foundation	Funded \$1738.20	8/1/06- 8/1/12
Comparison of Muscle Activity Associated with Varying Structural Differences in Dental Hygiene Mirrors PI: M Simmer-Beck	The Reinhardt Foundation	Funded \$2098.50	1/1/04- 6/1/05

GRADUATE RESEARCH COMMITTEES:

Master's Thesis:

Supervisory Committee Member, Kylie Siruta, Masters of Science in Dental Hygiene Education, Extending Oral Healthcare Services to Unserved and Underserved Children through a School Based Collaboration between a Dental Hygiene Program and a School District: Part 3 – The Economic Impact, 2009-2011.

Supervisory Committee Member, Catherine Saylor, Masters of Science in Dental Hygiene Education, Evaluation of Social Interaction, Task Management, and Trust Among Dental Hygiene Students in a Collaborative Learning Environment, 2006-2009.

Supervisory Committee Member, Masami Takahashi, Masters of Science in Dental Hygiene Education, A Study to Determine the Outcome of Sealants Placed by Dental Hygiene Students in a School-Based Sealant Program, 2007-2008.

Graduate Project:

Supervisory Committee Chair, Virginia Hardgraves, Masters of Science in Dental Hygiene Education, Geriatric Oral Care in Assisted and Long Term Care Facilities in Arkansas-A Baseline Survey of Current Status, Needs, and Barriers, 2011-2012.

Supervisory Committee Member, Debra James, Masters of Science in Dental Hygiene Education, "Examining the Effect of the FlexTend Orthotic Device® on Grip Strength: A Pilot Study," 2006-2009.

UNDERGRADUATE RESEARCH COMMITTEE:

Supervised Undergraduate Research Practicum, Molly Bauer and Erin Keeven, "A Comparison of Saliva pH, Buffering Capacity and *Streptococcus mutans* in Relation to Tobacco Smoking," 2009-2010. *Project was funded by UMKC SEARCH and presented by students in Apr. 2010 at the SEARCH symposium.

PRESENTATIONS AND CONFERENCES (International & National):

*Gadbury-Amyot CC, **Simmer-Beck M.** *Poster Presentation.* Increasing Access to Oral Healthcare Services to Underserved Children Through a Collaborative School-Based Program Using Expanded Scope of Practice Dental Hygienists and Dental Hygiene Students. 19th International Symposium on Dental Hygiene, Cape Town, South Africa August 14-17, 2013 (invited).

Gadbury-Amyot CC, ***Simmer-Beck M.** *Poster Presentation.* Increasing Access to Oral Healthcare Services to Underserved Children Through a Collaborative School-Based Program Using Expanded Scope of Practice Dental Hygienists and Dental Hygiene Students. American Dental Hygienists' Association 90th Annual Session, Boston, MA June 19-22, 2013 (invited).

*Siruta KJ, Gadbury-Amyot CC, **Simmer-Beck M,** Ahmed A, Holt LA, Mitchell TV. *Poster Presentation.* Extending Oral Health Care Services to Underserved Children Through a School-based Collaboration: Part #3 Cost Analysis. American Dental Hygienists' Association 89th Annual Session, Phoenix AZ, June 13-19, 2012 (invited)
*Awarded 2nd place in the poster competition

Simmer-Beck M, Williams KB, *Gadbury-Amyot CC, Keselyak N, Bray KK. *Poster Presentation.* Measuring the Short-Term Effects of Incorporating Academic Service-Learning throughout a Dental Hygiene Curriculum. North American Dental Hygiene Research Conference, Bethesda, Maryland, Oct. 20-22, 2011 (invited).

***Simmer-Beck M,** Williams KB, Gadbury-Amyot CC, Keselyak N, Bray KK. *Poster Presentation.* Measuring the Short-Term Effects of Incorporating Academic Service-Learning throughout a Dental Hygiene Curriculum. American Dental Education Association 2011 Annual Session, San Diego, CA, Mar 14, 2011 (invited).

*Gadbury-Amyot CC, **Simmer-Beck M.** *Poster Presentation.* Extending oral healthcare services to unserved and (ECP) dental hygienist as the coordinator. International Federation of Dental Hygienists 18th International Symposium, Glasgow Scotland, July 1-3, 2010 (invited). *Abstract was ranked in the top 20

- Keselyak N, Gadbury-Amyot CC, ***Simmer-Beck M.** *Poster Presentation.* Examining Peer Assessment in a Didactic Team-Based Learning Course. American Dental Hygienists' Association 87th Annual Session, Las Vegas NC, June 18-21, 2010 (invited).
- *Keselyak N, Gadbury-Amyot CC, **Simmer-Beck M.** *Poster Presentation.* Examining Peer Assessment in a Didactic Team-Based Learning Course. American Dental Education Association 2010 Annual Session, Gaylord National Harbor, Washington, DC. Feb. 27- Mar. 3, 2010 (invited).
- *Hong L, **Simmer-Beck M**, McCunniff M, Mathew M, Daneman B. Dental Erosion, Caries Experience, and Risk Factors Among Young Children. *J Dent Res*, Special Issue 2010;98:1095.
- ***Simmer-Beck M**, Gadbury-Amyot CC, Black MA, Ferris HB, Marse B, Eplee H. *Poster Presentation.* Expanding the Role of Dental Hygienists Providing Access to Care Using a School Based Model and Teledentistry. American Dental Hygienists' Association 86th Annual Session, Washington DC, June 17-22, 2009 (invited).
- ***Simmer-Beck M**, Gadbury-Amyot CC, Ferris HB, Marse B, Eplee H. *Poster Presentation.* Expanding the Role of Dental Hygienists Providing Access to Care Using a School Based Model and Teledentistry. North American Dental Hygiene Research Conference, Bethesda, Maryland, June 15-17, 2009 (invited).
- *Branson B, **Simmer-Beck M.** *Poster Presentation.* Simple Computer Applications for Marketing Oral Health Programs. 2008 National Oral Health Conference 2008, Miami, Florida (invited).
- *Mitchell TV, Keselyak NT, **Simmer-Beck M**, Bray KK. *Poster Presentation.* Dental Hygiene Faculty and Student Perceptions of Clinical Skills – Investigating the Millennial Learner's Ability to Self-Assess. American Dental Education Association 2008 Annual Session, Dallas, Texas. March 27-31, 2008 (invited).
- ***Simmer-Beck M**, Keselyak NT, Branson BG, Bray KK, Gadbury-Amyot CC. *Faculty Development Workshop.* Create Alternative Learning Environments and Opportunities through Academic Service Learning. American Dental Education Association 2008 Annual Session, Dallas, Texas. March 27-31, 2008 (invited).
- *Keselyak NT, Mitchell TV, **Simmer-Beck M**, Bray KK. *Poster Presentation.* Comparison of Dental Hygiene Student Self-Assessments on Competence and Faculty Perceptions of Student Competence in Clinical Skills. American Dental Hygienists' Association 84th Annual Session, New Orleans, LA, June 21- 26, 2007 (invited).

Keselyak NT, ***Simmer-Beck M.** *Poster Presentation.* Developing Instructional Materials an Independent Study Practicum. American Dental Hygienists' Association 84th Annual Session, New Orleans, LA, June 21- 26, 2007 (invited).

*Keselyak NT, **Simmer-Beck M,** Saylor C. *Poster Presentation.* Evaluation of Group Assessment in a Didactic Dental Hygiene Course. American Dental Hygienists' Association 84th Annual Session, New Orleans, LA, June 21- 26, 2007 (invited).

*Keselyak NT, **Simmer-Beck M.** *Poster Presentation.* Dental Hygiene Students' Perceptions of an Academic Service Learning Course on Special Needs Patients. American Dental Hygienists' Association 83rd Annual Session, Orlando, Florida, June 21- 26, 2006 (invited).

***Simmer-Beck M,** Branson BG, Villalpando TM, Holt LA. *Poster Presentation.* Comparison of Tactile Sensitivity Associated With Varying Weights of Explorers. American Dental Education Association 2006 Annual Session, Orlando, Florida, March 8-11, 2006 (invited).

***Simmer-Beck M,** *Branson BG. *Faculty Development Workshop.* Clinical Ergonomics: Strategies for Teaching and Evaluating. American Dental Education Association 2005 Annual Session, Baltimore MD, March 2005 (invited).

*Branson BG, ***Simmer-Beck, M.** *Lunch and Learn.* Strategies for Ergonomic Excellence. *Lunch and Learn.* American Dental Education Association 2004 Annual Session, Seattle, WA, March 2004 (invited).

PRESENTATIONS AND CONFERENCES (regional/local):

Local Anesthesia for the Dental Hygienist (*workshop for dental hygienists*). University of Missouri-Kansas City, School of Dentistry, Continuing Education May 2013 (contributed).

***Simmer-Beck M.** *Poster Presentation.* Increasing access to oral healthcare services to underserved children through a collaborative school-based program using expanded scope of practice dental hygienists and dental hygiene students: A feasibility study. 2013 UMKC Health Research Summit, Kansas City, MO April 2013.

Local Anesthesia for the Dental Hygienist (*workshop for dental hygienists*). University of Missouri-Kansas City, School of Dentistry, Continuing Education Sept. 2011 (contributed).

Miles of Smiles-a collaboration between the Olathe School District and the University of Missouri-Kansas City School of Dentistry. REACH legislative field trip Dec. 3, 2009.

Service Learning in Dental Hygiene. *Lecture*. Departmental Update Faculty In-service, University of Missouri-Kansas City School of Dentistry. June 11, 2009.

Academic Service-Learning: new initiatives. 2009 FaCET Symposium, University of Missouri-Kansas City, Faculty Center for Excellence in Teaching, Kauffman Foundation Conference Center, Kansas City, MO. Apr. 3rd, 2009 (invited).

Branson BB, **Simmer-Beck M.** Ergonomic Decision Making. *Lunch & Learn*. University of Missouri-Kansas City, School of Dentistry, Sept. 15, 2008.

Local Anesthesia for the Dental Hygienist (*workshop for dental hygienists*). University of Missouri-Kansas City, School of Dentistry, Continuing Education June 2008 (contributed).

Branson BB, **Simmer-Beck M.** *Lecture*. Enhancing the Professional Roles of Dental Hygienists through Public Health. KDHA Annual Session, Topeka, KS Sept. 29th 2007 (invited).

Simmer-Beck M., Branson BB, *Lecture*. Practical Tips for Enhancing Your Professional Role. KDHA Annual Session, Topeka, KS Sept. 29th 2007 (invited).

Simmer-Beck M, Keselyak NT, Cohen Margaret W, Mace M. *Lecture*. Enhancing Student Learning and Civic Engagement through Academic Service Learning. Teaching Renewal Conference 2007, Columbia MO (invited).

Branson B, **Simmer-Beck M.** *Lecture*. Enhancing Access to Oral Health Care Through Academic Service Learning. MO Oral Health Summit 2006, Columbia, MO. Sept. 28-29th (invited).

Local Anesthesia for the Dental Hygienist (*workshop for dental hygienists*). University of Missouri-Kansas City, School of Dentistry, Continuing Education Sept 2006 (contributed).

Simmer-Beck, M. *Lecture*. Extended Practice Settings for Registered Dental Hygienists. Oral Health Kansas, Johnson County Community College August 2005 (invited).

Local Anesthesia for the Dental Hygienist (*workshop for dental hygienists*). University of Missouri-Kansas City, School of Dentistry, Continuing Education May 2005 (contributed) .

Local Anesthesia for the Dental Hygienist (*workshop for dental hygienists*). University of Missouri-Kansas City, School of Dentistry, Continuing Education May 2004 (contributed).

Simmer-Beck, M. *Table Clinic.* Strategies to Create Neutral Hand Positions. Midwest Dental Conference, Kansas City, MO, March 2004.

PROFESSIONAL ASSOCIATIONS:

2013	American Public Health Association-Student Member
2011-Present	AcademyHealth-Student Member
2011-Present	American Association for Dental Research-Student Member
2007-Present	Oral Health Kansas
2003-Present	Sigma Phi Alpha National Dental Hygiene Honor Society
2002-Present	American Dental Education Association
1994-Present	American Dental Hygienists' Association
1994-Present	Kansas Dental Hygienists' Association

PROFESSIONAL ASSOCIATION OFFICES AND ACTIVITIES:

2009	President, Sigma Phi Alpha Dental Hygiene Honor Society -Alpha Gamma Chapter
2008	Vice President-President Elect, Sigma Phi Alpha Dental Hygiene Honor Society -Alpha Gamma Chapter
2005-2010	Membership Support, UMKC Dental Hygienists' Alumni Association
2004-Present	Board Member, UMKC Dental Hygienists' Alumni Association
2005-President	American Dental Hygienists' Association UMKC Student Chapter-faculty co-advisor
2006-2007	Table Clinic Chair, UMKC Dental Hygienists' Alumni Association
2004-2006	Fundraising Chair, Sigma Phi Alpha Dental Hygiene Honor Society Alpha Gamma Chapter

HONORS:

2013	Awarded Institute for Oral Health Sigma Phi Alpha Scholarship
2013	Selected to be a Dental Quality Alliance Ambassador, Chicago IL. (initial cadre)
2012	Selected for participation in the Systematic Screening and Assessment of Oral Health Workforce Innovations site visit conducted by ICF International and sponsored by the Robert Wood Johnson Foundation
2012	Miles of Smiles awarded "Outstanding Organization Award" from Oral Health Kansas
2010	Dean's Dental Hygiene Undergraduate Distinguished Teaching Award, UMKC School of Dentistry
2010	Class of 2010 Dental Hygiene Undergraduate Distinguished Teaching Award, UMKC School of Dentistry
2009	2009 Dr. Robert Menchetti Junior Faculty Award
2009	Dental Hygiene Undergraduate Class of 2009 Clinical Instructor of the Year

- 2009 “Miles of Smiles” received “Partnership Recognition” from Olathe District Schools in recognition for the School of Dentistry’s participation in Olathe District Schools Community Development Program
- 2008 Faculty Recognition and Development Fund Award
- 2008 Dental Hygiene Undergraduate Distinguished Teaching Award, UMKC School of Dentistry
- 2006 Selected for and Completed the New Faculty Teaching Scholar Program (Aug. 2005-July 2006)
- 2005 “Students in the City” Academic Service Learning Faculty Fellows Award Recipient
- 2003 UMKC School of Dentistry Alumni Association Scholarship
- 2003 Inducted into the Dental Hygiene National Honor Society, Sigma Phi Alpha, Alpha Gamma Chapter
- 2003 Women’s Council Graduate Assistance Fund
- 2003 ADEA Oral-B Scholarship for Dental Hygiene Students Pursuing Academic Careers Recipient 2003

COURSES TAUGHT (undergraduate):

- | | | |
|--------------|----------|---|
| 2008-Present | DH 3285 | Seminar in Dental Hygiene I, Course Director |
| 2008-2011 | DH 4260C | Dental Hygiene Clinic IV, Course Director |
| 2008-2011 | DH 4260C | Dental Hygiene Clinic IV Seminar, Course Director |
| 2007-2010 | DH 4220 | Community Oral Health Field Experiences, Faculty Service-Learning Mentor |
| 2007-2011 | DH 4260C | Dental Hygiene Clinic IV, Clinical Instructor |
| 2007-2010 | DH 4120C | Dental Hygiene Clinic III, Course Director |
| 2007-2010 | DH 4120C | Dental Hygiene Clinic III Seminar, Course Director |
| 2007-2010 | DH 4120C | Dental Hygiene Clinic III, Clinical Instructor |
| 2007-2010 | DH 4060C | Dental Hygiene Clinic II, Course Director |
| 2007-2010 | DH 4060C | Dental Hygiene Clinic II Seminar, Course Director |
| 2004-2010 | DH 4060C | Dental Hygiene Clinic II, Clinical Instructor |
| 2004-2010 | DH 3280C | Dental Hygiene Clinic I, Clinical Instructor |
| 2004-Present | DH 4660 | Independent Study in Dental Hygiene-Special Patient Care, Pediatric Care, Extended Care Permit, Course Director |
| 2006-2007 | DH 4660 | Independent Study in Dental Hygiene-Instruction Materials |
| 2004-2007 | DH 4660 | Independent Study in Dental Hygiene-Forensic Dentistry |
| 2004-Present | DH 4120 | Seminar in Dental Hygiene III, Course Director |
| 2004-Present | DH 4020 | Local Anesthesia, Clinical Instructor |
| 2005-2007 | DH 3220 | Dental Biomaterials, Course Director |
| 2004-2007 | DH 3080L | Intro to Dental Hygiene Practice, Clinical Instructor |
| 2004-2006 | DH 4065 | Seminar in Dental Hygiene II, Course Director |

COURSES TAUGHT (graduate):

- | | | |
|--------------|---------|--|
| 2006-Present | DH 5599 | Research and Thesis- <i>individualized instruction</i> |
| 2005-Present | DH5510 | Student Teaching I- <i>individualized instruction</i> |

2005-Present DHGR 5530 Clinical Instruction & Conference *I-individualized instruction*

INTERNSHIP & EXTERNSHIP SPONSORSHIP

Spring Semester 2009	Degree Completion Internship Sponsor-Michelle Swanson	North Central Wisconsin University
Spring Semester 2005	Graduate Student Externship Sponsor-Marsha Black	University of North Carolina