Recommended Guidelines for Surveillance of Non-Traumatic Dental Care in Emergency Departments

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Introduction

Dental care, and in particular care for non-traumatic dental conditions (NTDCs), provided in emergency departments has been identified as both an indication of lack of access to the traditional primary care dental system, and an expensive and mostly ineffective alternative source of care. EDs generally provide only palliative care for oral problems (e.g., antibiotics and pain medication), addressing the symptoms, but not the cause of the problems. This results in patients often returning to EDs multiple times for the same problem. This situation leads to high costs to patients, insurance companies, and taxpayers.

Many investigators have drawn the conclusion, particularly at the state level, that policies supporting increased access to dental care in dental offices or clinics would result in significant cost savings and better oral health outcomes. While many states have started assessing data on dental related ED visits, there currently is no standardized protocol for collection and analysis of these data. Therefore, data interpretation and comparability of data between studies are in question. Concerns with lack of standardized methods include sources of the data, data content, analysis methods, and the way the data are reported. The lack of standardization impacts the ability of local, state, and national policy makers to address the problem. The premise of this project is that development of a standardized protocol for the collection, analysis, and reporting of ED data will allow local, state, and national policy makers to make better informed policy decisions that will result in more efficient use of scarce resources and promote better quality of life for individuals with improved access to "dental homes." The bases for the methods provided in this document are findings from the first phase of this project reported in the document, "Methods in Assessing Non-Traumatic Dental Care in Emergency Departments." The Executive Summary and Recommendations from that report are included in this document.

ASTDD ED Project and Purpose of this Document

The Association of State and Territorial Dental Directors (ASTDD) was funded by the DentaQuest Foundation beginning in 2015 to conduct this project. Phase 1 of the project was to develop a report from a literature review of research methods, data collection, analysis, and reporting in past studies of ED oral health care. The Phase 1 report has been used to guide Phase 2 of the project. ASTDD formed an advisory committee and workgroup for both phases. Some workgroup members continued through both phases, and some members with additional expertise or different perspectives on the issue were added for the second phase. All workgroup members provided input to the second phase to develop a standardized protocol and guidelines for the collection, analysis, and reporting of oral health ED data. The recommended methods from this project are intended to be used by states to contribute valid standardized data to national data repositories such as the National Oral Health Surveillance System (NOHSS).

To inform planning and development for this project, ASTDD initially convened conference calls with state oral health program directors, stakeholder organizations and individuals with an interest in the topic. Participants included the Centers for Disease Control and Prevention (CDC), Medicaid/Medicare/CHIP Services Dental Association, PEW Center on the States, Dental Quality Alliance, American Dental Association, state oral health program directors, and researchers studying ED dental care. Past surveillance and research activity on ED dental care, shortcomings of these activities, and available data were discussed. There was agreement on the need for standardization of methods contributing to best practices development for surveillance and intervention.

The two phases of this project address two DentaQuest Oral Health 2020 goals: 1) "Comprehensive national oral health measurement system" (target is "A comprehensive national and state oral health measurement system is in place.") and 2) "Mandatory inclusion of an adult dental benefit in publicly funded health insurance" (target is "By 2020, at least 30 states have a comprehensive Medicaid adult dental benefit and no states that currently have a Medicaid adult dental benefit roll back or eliminate that coverage."). It also addresses Health People 2020 Objective OH-16, "Increase the number of states and the District of Columbia that have an oral and craniofacial health surveillance system," as monitoring data on use of EDs for oral problems would be a component of surveillance of oral health and of the dental care system.

The overall project therefore, 1) describes ED dental care data and methods used to collect and report such data in the summarized findings from the literature review, and 2) introduces recommended data collection, analysis, and reporting protocol and guidelines. ASTDD will provide technical assistance to states for implementing the standardized ED oral health data methods protocol for collection, analysis, and reporting, along with the oral health surveillance technical assistance it already provides. Data from ED oral health data surveillance activities can be used to advocate for policy changes such as establishment of comprehensive adult Medicaid benefits and creation of ED diversion programs that will result in a reduction of dental related ED visits and better dental care and oral health outcomes for state populations.

The Executive Summary and Recommendations from the Phase 1 report, "Methods in Assessing Non-Traumatic Dental Care in Emergency Departments," are included here to orient the reader to the development of guidelines presented later in this Phase 2 report.

Executive Summary – Phase 1 Report

Background

Access to dental care continues as a major topic of interest among health organizations, state departments of health, state oral health programs, and the public. This includes the use of hospital emergency departments (EDs) for dental care. Though some ED usage for dental care due to oral trauma can be expected, particularly for oral trauma occurring during non-business hours and over weekends when many primary dental care offices and clinics are not open, a large proportion of oral problems presenting at EDs are not a result of trauma. These non-traumatic dental conditions (NTDCs) can be treated more effectively, or prevented altogether, through regular dental care in a primary dental care setting. Many investigators are exploring potential cost savings and improvements in quality of life through interventions designed to prevent or divert people from using EDs for oral problems, especially for NTDCs.

As with most public health problems, the first steps in addressing the issue are to confirm its existence and quantify its extent. Problems arise, however, when datasets and methods vary, resulting in a muddied picture of the problem's extent, distribution, and causal or predictive factors.

Purpose of the Report

The DentaQuest Foundation funded the Association of State and Territorial Dental Directors from December 1, 2014 through November 30, 2015 to search the scientific literature and online sources for reports on the use of

EDs for dental care. The intended purpose of this project is to fully explore the extent of variation in the different aspects of research conducted, including target populations, outcomes of interest, predictive factors investigated, data sources used, and specific research methods employed including the diagnostic codes used in defining ED dental care. This report presents the findings of the investigation, summarizes the positive and negative aspects of the findings, and provides recommendations on the conduct of future research. Specifically, standardization of methodology, to the extent possible, is recommended to provide for consistency in data collection, analysis, and reporting, and to aid in the collection of data for state and national surveillance of ED dental care. Standardized surveillance of the use of EDs for NTDCs would support national tracking and provide states with actionable data to plan and implement effective interventions.

Research Methods

Information on ED dental care investigations was gathered and thoroughly evaluated. Searches of the scientific literature in published scientific journals and posted internet reports focusing on government or organization websites was conducted. The scientific literature search involved multiple searches in PubMed using different combinations of terms to discover studies related to different aspects of dental care provided in emergency settings. An ongoing search was also established through an account with "My NCBI," the National Center for Biotechnology Information (NCBI) at the US National Library of Medicine (NLM). This provided a comprehensive listing of the most recent publications through October, 2015.

The search for online publications involved Google searching. The searches included both general and more specific search code, with more specific searches limited to online posting on government and organization websites, filtering out general opinion and other non-scientific postings on the subject.

The resulting collection of studies from these searches was then systematically reviewed to determine the specific population and research design aspects for each study. Findings were summarized and methods compared to explore similarities and differences. Findings were evaluated to form conclusions and recommendations for future research and investigation.

Summary of Findings

1. Investigations varied widely in terms of target populations of interest. Target populations ranged from national, state, and local levels down to a single hospital or ED. Some target populations were further defined by limiting the study population to those with specific demographic or other characteristics, or by specific aspects of patient care processes or outcomes.
2. Investigation outcomes of interest varied widely, including general access to dental care and ED use, counts and rates of ED general dental and NTDC usage, rates of ED return visits, rates of hospital admission for dental conditions, and trends or changes in rates of ED utilization for dental care.
3. Predictive factors investigated varied widely. Though some basic demographic and insurance status predictors were commonly investigated, other factors included urban/rural status and other environmental factors, psychological factors, other concurrent conditions, and changes in insurance coverage or policy (e.g., adult Medicaid coverage).
4. Data sources for investigations varied widely, though some national and state data systems were commonly used. Some studies (e.g., local hospital studies) used different sources of data but had similar variable content in the datasets.

5. Specific sets of diagnosis codes used to define dental care, or more specifically, NTDCs, varied. Few investigators used exactly the same sets of codes. Some investigators used similar codes with slight variations, while other investigators used very different sets of codes to define the same dental care category (e.g., NTDCs).
6. While there have been many investigations of the use of EDs for dental care that explored different aspects of the issue, the variation in studies and the methods employed have resulted in inconsistent data that often are not comparable. This does not allow for effective standardized surveillance of ED dental care at the state and local levels.
7. Standardized research protocols, including data collection, analysis, and reporting methods need to be developed and promoted, particularly at the state level, to ensure reliable comparable data sufficient for tracking and comparing state trends.

Recommendations Summary

- Specifically define study populations of interest, assess usability of data sources, and follow good investigation protocol in assessing ED dental care and planning interventions.
- Develop sets of codes and analysis methods, including important predictive factors that will most appropriately answer research questions with the underlying motivation of standardizing methods to the extent possible to allow for comparison to other studies on other populations.
- Encourage specific research on ED use for NTDCs, which includes the majority of unnecessary visits and costs and could most effectively be addressed in the primary dental care setting.
- Develop and promote standardized sets of codes and analysis methods providing appropriate basic ED dental use data for state oral health surveillance systems and for state data submission to a national data repository for tracking national ED dental care, allowing for comparability across states. Additional optional data analyses can be conducted by states as desired.

Recommendations from Phase 1 Report

General Recommendations

- Thoroughly define specific study populations to determine the presence and extent of the problem and for whom effective interventions can be implemented.
- Assess data sources to determine if the required information for the study population and research question(s) of interest are included.
- Establish whether a problem exists and quantify the size of the problem as the first stage of any study of predictive factors or interventions.
- Identify and promote research of specific risk or predictive factors that will aid in determining what types of interventions might be most effectively implemented or best targeted.
- Develop sets of codes and analysis methods that will most appropriately answer research questions with the underlying motivation of standardizing methods to the extent possible to allow for comparison to other studies on other populations.
- Promote specific code sets and guidelines for analysis methods for commonly used datasets in determining NTDC or general dental ED visit count and proportion outcomes to establish the extent of the problem, and to standardize basic data collection for surveillance.

- Encourage inclusion of commonly identified, associated predictive factors that will help determine effective intervention strategies and promote basic levels of consistency across studies, while also accounting for possible confounding effects in studies of additional predictive factors.
- Encourage specific research on ED use for NTDCs, which includes the majority of unnecessary visits and costs, and could most effectively be addressed in the primary dental care setting.

Recommendations Specific to States

- Thoroughly define whether the research or surveillance is for the entire state population or for a specific state sub-population of interest to determine the presence and extent of the problem, and for whom effective interventions could be implemented.
- Assess data sources to determine if the required information for the target population and research question(s) of interest are included. If the state is part of the SEDD system, there should be some consistency in data with other states in SEDD. If the state is not in the SEDD system, research should determine if there is a sufficient data source to investigate ED dental care and how consistent the data source is with SEDD?
- Establish whether a problem exists and quantify the size of the problem as a first stage of any investigation of predictive factors or interventions; this should be a part of state level oral health surveillance.
- Identify and promote research on use of specific risk or predictive factors that will aid in determining what types of interventions might be most effectively implemented or best targeted.
- Develop standardized sets of codes and analysis methods providing appropriate basic ED dental use data for state oral health surveillance systems and for state data submission to a national data repository for tracking national ED dental care, allowing for comparability across states. Additional optional data analyses can be conducted by states as desired.
- Promote standardized sets of codes and guidelines for analysis methods for commonly used state level datasets in determining NTDC and general dental ED visit data as part of standardized state and national oral health surveillance systems. Specifically explore further use of Medicaid data for tracking ED dental care in this population.
- Encourage inclusion of commonly identified associated predictive factors that will help determine effective intervention strategies and promote basic levels of consistency across studies, while also accounting for possible confounding effects in studies of additional predictive factors.
- Encourage specific research on ED use for NTDCs, which includes the majority of unnecessary visits and costs, and could most effectively be addressed with state and local level interventions, and data used to promote support and resources for such intervention programs.

Methods for Project Phase 2

The development of guidelines for ED oral care surveillance has been based on evaluation of past methods summarized in the Phase 1 report. The thorough literature search of past research and studies focused on the following aspects: 1) target populations, 2) outcomes of interest to the investigations, 3) predictive factors investigated, 4) data sources used, and 5) analysis methods and diagnosis codes employed. These are the key aspects considered in development of the ED oral care surveillance guidelines. The following sections will address guidelines and specific protocols as appropriate for each aspect of ED oral care surveillance.

Based on findings from the first phase of the project, the workgroup was formed for the second phase. Initial contacts and conference calls were conducted to discuss the purpose and goals for the project. Work proceeded on outcomes for the different aspects of ED oral care surveillance, materials were distributed, and a face to face meeting was held in Washington, D.C. Members discussed materials and provided input toward the final products and outcomes for the project. This document contains the components and guidance developed for use in ED oral care surveillance.

Target Populations/Outcomes of Interest/Predictor Variables/Data Sources and Codes

As addressed in the Phase 1 report, investigators have different motivations when conducting surveillance vs. conducting research studies to address hypotheses, with numerous research questions posed. Researchers may be interested in specific unique populations, specific predictive factors directly impacting access to dental care, or effects of changes in policy. Because of these differences, there has been great variation in target populations studied, data sources and elements used, and the statistical methods employed. When conducting surveillance, there is a need for standardization of methods for comparisons between populations and for trend assessment over time within a population. While the Phase 1 report summarized the variation in these factors among published research and studies, Phase 2 of this project addresses and recommends standardized methods and protocols for surveillance, particularly focusing on state level surveillance. While, these standardized methods and protocols can potentially be used for any investigation of any target population, the primary goal is to provide uniform surveillance methods for states, resulting in uniform nationwide state level surveillance activity. The following sections will address each component of research/surveillance, including target population, outcome of interest, predictive factors, data sources used to address the research question, and data and analysis methods employed, and provide suggested guidance for conducting state level surveillance of ED dental care.

Target Populations

International Studies

Though this report will focus on assessing research on dental care in the ED within the United States, such research is not limited to the United States. The Phase 1 report summarized the array of work that has been published from other countries. A perception of the problems of people seeking dental care from EDs is not unique to the United States. The guidelines presented from this project may have some generalizable use in other countries, but differences in health systems, insurance systems, and datasets will likely limit the applicability of many of the specific protocols presented.

National and Local Level

Within the United States, many researchers have assessed the ED dental care issue at the national level using nationally representative datasets with data elements to assess aspects of ED dental care, and more specifically, NTDCs. Different studies have used national datasets including the Nationwide Emergency Department Sample (NEDS) dataset of the Healthcare Cost and Utilization Project (HCUP), the Medical Expenditure Panel Survey (MEPS), and the National Hospital Ambulatory Medical Care Survey (NHAMCS). National subpopulations also have been investigated using these same datasets, for example limiting investigations to working-age adults, children, or very specific subpopulations such as sickle cell disease patients or people with Autism Spectrum

disorders. Other investigators have focused on national surveys specifically designed to address national subpopulations, for example the National Survey of Children's Health, a national survey limited to children.

Many investigators have selected a specific local population to research. Sometimes this will simply involve a specific convenience population (e.g. those presenting at the ED of a hospital) for simple assessments such as characterizing users and multiple users of the ED for oral care, or assessing barriers to oral care such as the impact of insurance coverage to those presenting at EDs for NTDCs. Other studies have focused on factors such as prescribing guidelines or drug seeking behavior.

Some of these studies were conducted by patient interview. Many studies have used data from hospitals/hospital systems in a community or metropolitan area. Somewhat more comprehensive studies include an entire geographic or demographic subpopulation of a state. Combinations of geographic areas and demographic subpopulations can also define a target population to track changes in health care access, for example enrollees or new enrollees in regional health insurance programs for low-income, uninsured residents.

Furthermore, variables can be used in defining target sub-populations for patient characteristics related to health care processes or outcomes. For example, some study populations are defined by outcomes of the ED for oral care visit, e.g. ED visit resulting in patient discharge; ED visit resulting either in discharge or hospital admission; or ED visit resulting in hospital admission. Subject demographics believed to be related to ED use for NTDCs often are investigated. Combinations of these factors have been used, for example, people covered by Medicaid who had been admitted to hospitals due to NTDCs.

The recommendations from this project can be used as general guidelines for assessing and conducting surveillance of ED dental care at a national or local level. However, the primary aim of ASTDD is to aid states, and specifically state oral health programs (SOHPs), in effectively improving the oral health of their state populations. State oral health surveillance systems are essential for providing accurate and reliable data for assessing aspects of oral health, contributing to effective program planning to address oral health related problems. Therefore, while the provided guidelines can generally be used, they are specifically intended to address ED oral care surveillance at the state level.

State Level

Many investigations have assessed ED visits for dental care at the state level to determine the extent of the problem and to use the information for planning intervention strategies or for advocating for state level policy change. The target population may be all people in the state, or a subpopulation of the state (e.g., children), and may simply seek to determine people in the state with ED visits specifically for dental care, or more specifically, for NTDCs. Rates and predictors of ED use for NTDCs have also been investigated.

Basic ED oral care usage can be assessed through hospital administrative data, such as emergency department discharge datasets. Studies sometimes have supplemented administrative data with interviews of ED dental users and community stakeholders, looking at such factors as insurance mix and Medicaid eligibility/ enrollment. Other studies used telephone interviews of statewide representative samples of people who had sought care for oral problems at EDs. Other state level subpopulations included members of specific healthcare plans to assess changes in accessing dental care and EDs for health care before and after healthcare plan enrollment. Examples

of state level healthcare plans investigated include plans for those with low income, WIC nutrition programs among those with Medicaid, and children participating in a food stamp program. State level changes in healthcare plans have also been studied, for example, rates and trends of ED dental visits before and after state elimination of dental benefits within a plan. State level investigation has also included analysis of data from different states to make comparisons. Between state comparisons require consistency in methods of data collection and analysis. Examples of data sources by target population level are summarized in Table 1.

Table 1: Examples of Data Sources for Different Target Population Levels

Target Population	Data Source
National	National Emergency Department Sample (NEDS)
National	Medical Expenditure Panel Survey (MEPS)
National	National Hospital Ambulatory Medical Care Survey (NHAMCS)
State	State Emergency Department Databases (SEDD)
State	Non-SEDD Individual State ED Discharge Data
Local	Individual Hospital ED data
Local	Community Data from Hospital EDs
Local	County Data from Hospital EDs
Special sub-population	Pediatric or Adults Only Subset of a Dataset
Special sub-population	Medicaid Data (or other low income related data)
Special sub-population	Race/Ethnicity Subset of Dataset

Outcomes of Interest

ED Utilization for Dental Care and NTDC Care – Counts and Rates

As with other aspects of ED dental care research, the specific outcomes investigated in published research vary widely. While some studies assess issues such as oral health status and access to care in relation to ED visits in general or ED visits for dental problems, the focus of this project is specific outcomes related to oral care provided in EDs. Basic outcomes specifically related to ED utilization for oral/dental care generally, or more specifically for NTDCs, include simple assessments of counts of ED visits for dental care or NTDCs, proportions of populations using EDs for dental care or NTDCs (e.g., in the past year), rates of ED visits among the populations (e.g., visits per 100,000 population), proportions of total ED visits that are for dental care or NTDCs, costs or charges associated with ED visits for dental care or NTDCs, and trends of any of these measures over time. ED oral/dental visits can be categorized by type of visit, such as visits for any dental condition or complaint, visits for oral/dental conditions not involving trauma (NTDC), visits for dental diagnoses considered to have low severity (treatable in dental offices during normal business hours), visits associated with caries diagnoses, or visits associated with a chief complaint of toothache. ED waiting times for care of NTDCs has also been an outcome of interest.

Other Outcomes Related to ED Utilization for Dental Care

An outcome of great interest has been the rate of same subject return visits to EDs for the same oral problem (if that can be determined), which has an obvious direct impact on total ED related costs for NTDCs. Some investigations have defined “high users” based on the number of patient ED visits in a given period of time. High users are of interest in terms of primary and secondary dental diagnoses, charges/costs, use of multiple

hospitals and subject characteristics. Factors influencing return visits of high users will be addressed in the Predictive Factors section.

Another outcome is dental related ED visits that for a small proportion of patients result in hospital admission, an outcome that can be studied among specified subpopulations as well. The typically high charges/costs associated with these hospital admissions also may be of interest.

Other Care Related Outcomes

Many investigations have explored the actual care received for NTDCs in EDs. Virtually all formal and informal reports find that in EDs where no dental personnel or dental clinics are present, care primarily is prescriptions for pain and antibiotics. Some studies have focused on dental related ED prescriptions, and more specifically on antibiotics and analgesics, including opioid, non-opioid, and combination analgesics. Drug seeking behavior (DSB) has been a related important topic of interest, given that DSB can result in oral pain given as the chief complaint, skewing the picture of true oral care in EDs. Efforts to curb ESB can be associated with lower rates of oral related ED visits.

Another outcome of interest is whether those presenting at an ED with NTDCs had follow-up care with a dentist. Where possible, investigations may assess whether subsequent dental office visits took place, how much time had passed since the ED visit, and what type of treatment was provided at the dental office.

Trends or Changes in Dental ED Utilization

In addition to point in time outcomes, there is interest in changes between two points in time or trends in ED use for oral conditions over time. This interest often is associated with factors such as the effects of enrollment in a new or established insurance plan or program, implementation of a program to divert patients with dental complaints to an urgent dental care clinic, or changes after health care reform or after elimination of Medicaid dental benefits for adults. The same outcomes mentioned previously can be measured at different points in time to assess such changes or trends.

Recommended and Optional State ED Oral/Dental Care Surveillance Outcomes

With the aim of promoting a standardized state level framework for state to use in evaluating and documenting the ED usage for oral care, the multitude of potential outcomes was assessed and a basic standard set of outcomes developed for state level ED oral care surveillance. These basic population statistics should provide a good picture of ED oral care for a given state. The data necessary to generate statistics for these outcomes should be readily available for most states. Data from SEDD can be used by most states, and many states not participating in SEDD will have state ED discharge databases similar to SEDD.

Most states participate in SEDD, but those states not participating usually still collect data in a similar format to data provided to the SEDD surveillance network. SEDD or equivalent state data are likely the most readily available data for states and SOHPs to access for surveillance activities related to ED oral/NTDC care. Specific guidelines and protocols provided in this report for SEDD data should have general applicability to non-SEDD state ED discharge data. More detailed information on SEDD is provided later in this document and in Appendix 1.

Table 2 summarizes the recommended outcomes for state ED oral care surveillance and provides the State Emergency Department Datasets variables that can be used to generate these outcome measures. These recommended measures all assess ED care for NTDCs, which is the category or oral care that is generally accepted as ideally being addressed in the primary dental care system. While trauma related oral conditions might be expected to present in the ED, NTDCs would not, and is the area of oral ED care that states would desire to address through various forms of intervention. Further details in specifically defining NTDCs are presented later in this report.

Recommended indicators (refer to Table 2 for additional detail):

1. ED visit for NTDC based on ***first listed*** diagnosis
2. ED visit for NTDC based on ***any listed*** diagnosis
3. ED visit for NTDC based on ***first listed reason for visit***
4. ED visit for NTDC based on ***any listed reason for visit***
5. ED visit for NTDC based on ***any listed diagnosis and/or any listed reason for visit (most inclusive).***

Recommended reporting: for each of the five recommended indicators, ASTDD suggests that states report, at a minimum:

- Count – number of ED visits associated with specific outcome in a given year
- Rate per 100,000 population using Census Bureau population estimates
  - Count divided by population multiplied by 100,000
- Rate per 10,000 ED visits
  - Count divided by total ED visits multiplied by 10,000
- Total charges associated with each indicator (use SEDD variable – TOTCHG. Generally, TOTCHG does not include professional fees and non-covered charges. Refer to SEDD's state specific notes for additional detail.)

Table 2: Recommended Outcomes and Associated SEDD Variables to Assess

Indicator	SEDD Data Element, ICD-9	SEDD Data Element, ICD-10	Comments/Notes
1. NTDC 1st diagnosis	DX1	I10_DX1	Include 1st listed diagnosis only
2. NTDC any diagnosis	DXn	I10_DXn	Include all listed diagnoses
3. NTDC 1st reason visit	DX_Visit_Reason1	I10_Visit_Reason1	Include 1st listed reason only
4. NTDC any reason visit	DX_Visit_Reasonn	I10_Visit_Reasonn	Include all listed reasons
5. NTDC any diagnosis/visit	DXn & DX_Visit_Reasonn	I10_DXn & I10_Visit_Reasonn	Include all listed diagnoses & reasons

States may wish to do analyses of ED discharge data to explore additional outcomes. Table 3 summarizes optional outcomes developed for state ED oral care surveillance and provides the State Emergency Department Datasets variables that can be used to generate these outcome measures. These measures address two additional ED oral care definitions. Any oral diagnosis includes all diagnoses for oral/dental conditions, including those related to trauma. Caries/Periodontal/Prevention (CPP) diagnoses include a subset of NTDC diagnoses that are considered to be related to caries, periodontal disease, or prevention procedures that are routinely provided in primary care general dental practices or clinics, and exclude procedures that would more likely be addressed by specialists. More details on defining these outcomes are provided later in this report.

Table 3: Optional Outcomes and Associated SEDD Variables to Assess

Optional Indicator	SEDD Data Element, ICD-9	SEDD Data Element, ICD-10	Comments/Notes
1. CPP 1st diagnosis	DX1	I10_DX1	Include 1st listed diagnosis only
2. CPP any diagnosis	DXn	I10_DXn	Include all listed diagnoses
3. CPP 1st reason visit	DX_Visit_Reason1	I10_Visit_Reason1	Include 1st listed reason only
4. CPP any reason visit	DX_Visit_Reasonn	I10_Visit_Reasonn	Include all listed reasons
5. CPP any diagnosis/visit	DXn & DX_Visit_Reasonn	I10_DXn & I10_Visit_Reasonn	Include all listed diagnoses & reasons
6. Any oral 1st diagnosis	DX1	I10_DX1	Include 1st listed diagnosis only
7. Any oral any diagnosis	DXn	I10_DXn	Include all listed diagnoses
8. Any oral 1st reason visit	DX_Visit_Reason1	I10_Visit_Reason1	Include 1st listed reason only
9. Any oral any reason visit	DX_Visit_Reasonn	I10_Visit_Reasonn	Include all listed reasons
10. Any oral any diagnosis/visit	DXn & DX_Visit_Reasonn	I10_DXn & I10_Visit_Reasonn	Include all listed diagnoses & reasons

States my wish to conduct additional analyses to those described. Other potential analyses that may be possible to conduct with SEDD or other similar state ED discharge data, State Inpatient Databases (SID), or other health/insurance databases are summarized in Table 4.

Table 4: Additional Optional Analyses if Data Available

Outcome
Prevalence or count oral/NTDC ED visit resulting in admission, overall and by condition (e.g. caries)
Prevalence or count oral NTDC ED visit before/after comparisons, e.g. diversion program
Rates oral/NTDC visits compared to rates total or other condition ED visits
Proportion oral/NTDC visits of total ED visits
Rates palliative vs. other treatment
Proportion of ED oral/NTDC visits with follow-up dental care (possible for Medicaid, may be possible for other medical/dental insurers)
Trends or changes in general for above outcomes and in comparisons to other conditions (e.g. back pain)
Return visits by same patient (where trackable using SEDD variables VisitLink and DaysToEvent) Frequencies and associated costs
Return visits for same condition (where trackable) Frequencies and associated costs
High users (as determined by number of ED visits) Frequencies and associated costs
High users by oral condition or by medications vs. Rx Frequencies and associated costs

Predictive Factors

Many investigators in past studies and reports have explored the associations of various predictive factors with ED dental utilization outcomes. The following sections roughly categorize potential predictive factors to use in ED oral care surveillance.

Demographics and Other Patient Factors

Basic demographic and patient factors are commonly evaluated with ED oral care as they are with almost all health related outcomes. Common demographic factors to consider are: age; sex; race/ethnicity; family or household income; education (or maternal educational level); marital status; employment; urban/rural status;

insurance type and insurance instability; physical, economic, and psychological factors; being foreign born; and health literacy level. Personal access related variables, which could include having insurance, might also include: insurance type; having reported a dental problem as the reason for the ED visit; use of EDs for other reasons; patient-reported severity of pain; participating in WIC vs. those who are not; not having a routine dental checkup/cleaning in the last three years; and special health care needs. Some of these factors are related to access to care, which is discussed further below.

A variation on assessing predictive factors involves assessing factors specifically associated with hospital admission for NTDCs. Hospital admission has been assessed in association with age, gender, the number of complex chronic conditions, being non-white, being publicly insured, having lower income, having intellectual and developmental disabilities (IDDs), and having a dental infection or other specific health conditions.

In addition to evaluating demographics, area or community factors have also been investigated. Examples include differences by urban/rural residence status, residence zip code level measures of poverty, effects of metropolitan residence status, census level variables, local dentist supply, and community level variables of income, education level, and primary language spoken in homes.

Access Issues/Policy Changes

One primary access factor investigated is dental insurance. Having insurance is often included with other subject level demographic factors as mentioned previously, and can include designation of private or public insurance or the actual primary payer. Other factors may include the duration of NTDC symptoms, the specific diagnosis, and barriers to dental care with private practice dentists. Having a dental home has been a specific predictor of interest.

Other studies investigate access in terms of population level, community level, or area level predictors. Some of these factors have been mentioned previously: urban/rural residence, hospital population insurance mix, DHPSA designation for county of residence, the Urban Influence Code (a measure for rurality), low-income population to dentist ratio, and state Medicaid policies. A more basic access barrier is lack of available dental care, including lack of community dental facilities and dental facilities' business hours related to time of day and day of week.
Many publications address magnitude and changes in ED dental care related to changes in policy, particularly those for dental insurance coverage. Examples include expansion of Children's Health Insurance Program (CHIP) coverage, state health care reform, and changes or elimination of adult dental benefits from Medicaid or other insurance plans. Changes in coverage status or new enrollment in programs could be assessed for effects. Other potential policy changes related to patient care include new drug policies or providing medications to patients vs. only providing prescriptions. Intervention programs specifically designed to curb ED use for NTDCs have been assessed. Similarly, changes after new neighborhood health centers open might be of interest.

A previously mentioned confounding factor of ED utilization is patients reporting dental pain to obtain prescriptions for opioids, i.e. drug seeking behavior (DSB). DSB impacts on reported ED dental care utilization must be considered.

Recommended/Optional State ED Oral/Dental Care Surveillance Stratification Factors

While many of these factors may be of interest, data to assess them may not be readily available. Some variables may be available from census data if linkage is possible to ED data. For the purposes of ED oral care surveillance that states are readily able to accomplish, recommendations focus on variables typically available in SEDD data. Table 5 summarizes recommended explanatory variables to include in surveillance of ED oral/NTDC care.

Recommended reporting stratification variables (refer to Table 5 for additional detail):

States, at a minimum, should report overall estimates plus estimates stratified by:

- Age (< 20, 20-44, 45-64, 65+)
  - State population estimates by age group are available from the U.S. Census
- Primary payer (Medicare, Medicaid, private insurance, uninsured, other)
  - NOTE: Information on the number of individuals with each payer type is not readily available. Because of this, it may not be possible to generate rate per 100,000 population.
- Race/ethnicity if available (white, black, Hispanic, Asian/Pacific Islander, Native American, other)
  - NOTE: The SEDD coding for race does not align with the U.S. Census coding for race. Because of this, it is not possible to generate rate per 100,000 population.

Table 5: Recommended stratification factors with SEDD data element names

Description	SEDD Data Element	Comments/Notes
Age	AGE or AGEGROUP	Most states report age while some may only report by age group.
Primary payer	PAY1	To ensure uniformity across states, PAY1 combines detailed categories into more general groups. Refer to SEDD's state specific notes for additional detail.
Race/ethnicity (if available)	RACE	HCUP coding includes race/ethnicity in one data element (RACE). If the state supplied race and ethnicity in separate data elements, ethnicity takes precedence over race in setting the HCUP value for race. Race is not available for all states. Refer to SEDD's state specific notes .

States may want to assess additional factors that may be associated with ED oral care. There are additional potential stratification variables in SEDD that states can use in stratified analysis. Table 6 summarizes optional explanatory variables that can be included in surveillance of ED oral/NTDC care.

Table 6: Optional stratification factors with SEDD data element names

Factors/Analyses	SEDD Data Element Name	Notes/Comments
Sex	FEMALE	
Marital status	MARITALSTATUSUB04	
Geographic location	ZIP or ZIP3	Patient zip code can be used to define geographic locations
Homelessness	Homeless	Not available for all states.
Weekend admission	AWEEKEND	Indicates whether ED visit occurred on a weekend, when dental offices/clinics might not be expected to be open.
Income	ZIPINC_QRTL	ZIPINC_QRTL provides a quartile classification of the estimated median household income of residents in the patient's ZIP Code. The quartiles are identified by values of 1 to 4, indicating the poorest to wealthiest populations. These values are derived from ZIP Code-demographic data obtained from Claritas. Because these estimates are updated annually, the value ranges for the ZIPINC_QRTL categories vary by year.
Revisit by same patient	VisitLink & DaysToEvent	The VisitLink data element is one of two data elements that are supplemental information created for HCUP States for which there are encrypted person identifiers. The visit linkage variable (VisitLink) can be

		used in tandem with the timing variable (DaysToEvent) to study multiple hospital visits for the same patient across hospitals and time while adhering to strict privacy regulations. Not available for all states.
Trends over time		Generate indicators for multiple years to determine if ED visits due to NTDC have increased, decreased or remained the same.

Data Sources/Available Data Elements/Diagnosis-Procedure Codes Studied

Data Sets/Sources and Available Data Elements

Data sources for investigating dental care provided in EDs are numerous. A full summary of many data sources at different population levels was presented in the Phase 1 report. State oral health programs will usually obtain and use state level data to elucidate a problem, implement interventions, or have others influence policymakers to address a problem. Because the focus of this report is state level surveillance of ED dental/NTDC care, information on state level data, and in particular, the State Emergency Department Datasets (SEDD) is a focus of this report. States may also be interested in comparing data from their state to national data, with the logical data source for national data being the Nationwide Emergency Department Sample (NEDS).

The Nationwide Emergency Department Sample (NEDS) includes data sampled from a family of state inpatient (SID) and state emergency department (SEDD) databases including software developed by the Healthcare Cost and Utilization Project (HCUP). NEDS is a stratified sample of about 20% of U.S. hospital EDs and contains data from 950 hospitals in 30 states. NEDS data can be used to generate national and regional estimates of ED use. Further information on NEDS can be found in Appendix 2.

State ED data may vary in availability and content of datasets. SEDD provides data that are generally available and consistent across states, allowing for comparisons among states. The State Emergency Department Databases (SEDD) are part of the family of databases including software developed by the Healthcare Cost and Utilization Project (HCUP). SEDD files include data on emergency visits at hospital emergency departments that do not result in hospitalization. Data on patients admitted to a hospital after an ED visit are included in the State Inpatient Databases (SID). SEDD files include all ED patients regardless of payer, and include clinical and non-clinical data. Thirty-five states currently participate in SEDD. Table 7 provides a complete listing of SEDD variables that may be in the state SEDD file. The two example state columns for Iowa and Kentucky show for each state the SEDD variables that the state dataset contains. In the electronic version of this document, variable names are linked to the complete definition and description of each variable. Further information on SEDD can be found in Appendix 1.

Table 7: SEDD Variables and Availability by State - Sample

Data Element	IA	KY
AGE	y	y
AGEDAY	y	y
AGEGROUP	-	-
AGEMONTH	y	y
AHAID	y	y
AHOUR	-	-
AMONTH	y	y

Data Element	IA	KY
APC	-	-
ATYPE	y	y
AWEEKEND	y	y
AYEAR	y	y
BILLTYPE	-	y
BMONTH	y	y
BODYSYSTEMn	y	y
BYEAR	y	y
CHARGE	y	y
CHGn	-	-
CHRONn	y	y
COMMUNITY_NONREHAB_NONLTAC	y	y
CPTCCSn	y	y
CPTDAYn	y	y
CPTHCPCS	y	y
CPTM1_n	y	y
CPTM2_n	y	y
CPTMod1	y	y
CPTMod2	y	y
CPTn	y	y
DHOUR	-	-
DIED	y	y
DISPUB04	y	y
DISPUNIFORM	y	y
DISP_X	y	y
DMONTH	y	y
DNR	-	-
DQTR	y	y
DSHOSPID	y	y
DURATION	-	-
DXCCSn	y	y
DXMCCSn	y	y
DXPOAn	-	-
DXVER	y	y
DX_Visit_Reasonn	y	y
DXn	y	y
DaysToEvent	y	-
ECODEn	y	y
E_CCSn	y	y
E_MCCSn	y	y
E_POAn	-	-
FEMALE	y	y
HCUP_ED	y	y
HCUP_OS	y	y
HFIPSSTCO	y	y
HISPANIC_X	y	y
HOSPBRTH	y	y
HOSPID	y	y
HOSPST	y	y
HOSP_NPI	-	y

Data Element	IA	KY
Homeless	-	-
INJURY	y	y
INJURY_CUT	y	y
INJURY_DROWN	y	y
INJURY_FALL	y	y
INJURY_FIRE	y	y
INJURY_FIREARM	y	y
INJURY_MACHINERY	y	y
INJURY_MVT	y	y
INJURY_NATURE	y	y
INJURY_POISON	y	y
INJURY_STRUCK	y	y
INJURY_SUFFOCATION	y	y
INTENT_ASSAULT	y	y
INTENT_SELF_HARM	y	y
INTENT_UNINTENTIONAL	y	y
KEY	y	y
LOS	y	y
LOS_X	y	y
MARITALSTATUSUB04	-	-
MARITALSTATUS_X	-	-
MDBOARD1	-	-
MDBOARD2	-	-
MDNUM1_R	y	-
MDNUM2_R	y	-
MDNUM3_R	y	-
MDNUM4_R	-	-
MDNUMTYPE1	-	-
MDNUMTYPE2	-	-
MDSPEC1	-	-
MDSPEC2	-	-
MEDINCSTQ	y	y
MOMNUM_R	-	-
MRN_R	y	-
MULTINJURY	y	y
NCHRONIC	y	y
NCPT	y	y
NDX	y	y
NECODE	y	y
NEOMAT	y	y
NPR	-	-
NREVCD	-	-
OBSERVATION	-	-
OFFSITE_ED_X	-	-
OPservice	y	y
ORPROC	-	-
OS_TIME	y	y
PAY1	y	y
PAY1_X	y	y
PAY2	y	y

Data Element	IA	KY
PAY2_X	y	y
PAY3	y	y
PAY3_X	y	y
PAYER1_X	-	-
PAYER2_X	-	-
PCLASSn	-	-
PL_CBSA	y	y
PL_NCHS	y	y
PL_RUCC	y	y
PL_UIC	y	y
PL_UR_CAT4	y	y
POA_Disch_Edit1	-	-
POA_Disch_Edit2	-	-
POA_Hosp_Edit1	-	-
POA_Hosp_Edit2	-	-
POA_Hosp_Edit3	-	-
POA_Hosp_Edit3_Value	-	-
PRCCSn	-	-
PRDAYn	-	-
PRMCCSn	-	-
PRMONTHn	-	-
PROCTYPE	y	y
PRVER	-	-
PRYEARn	-	-
PRn	-	-
PSTATE	y	y
PSTCO	y	y
PSTCO2	y	y
PointOfOriginUB04	y	y
PointOfOrigin_X	y	y
PrimLang	-	-
RACE	y	y
RACE_X	y	y
READMIT	-	-
REVCDn	-	-
REVCHGn	-	-
REVCODE	y	y
SERVDAY	y	y
SPLIT_IPED	-	-
STATE_AS	y	y
STATE_ED	y	y
STATE_OS	y	y
TOTCHG	y	y
TOTCHG_X	y	y
TOWN	-	-
UNITS	y	y
UNITn	-	-
U_BLOOD	y	y
U_CATH	y	y
U_CCU	y	y

Data Element	IA	KY
U_CHESTXRAY	y	y
U_CTSCAN	y	y
U_DIALYSIS	y	y
U_ECHO	y	y
U_ED	y	y
U_EEG	y	y
U_EKG	y	y
U_EPO	y	y
U_ICU	y	y
U_LITHOTRIPSY	y	y
U_MHSA	y	y
U_MRT	y	y
U_NEWBN2L	y	y
U_NEWBN3L	y	y
U_NEWBN4L	y	y
U_NUCMED	y	y
U_OBSERVATION	y	y
U_OCCTHERAPY	y	y
U_ORGANACQ	y	y
U_OTHIMPLANTS	y	y
U_PACEMAKER	y	y
U_PHYTHERAPY	y	y
U_RADTHERAPY	y	y
U_RESPTHERAPY	y	y
U_SPEECHTHERAPY	y	y
U_STRESS	y	y
U_ULTRASOUND	y	y
VisitLink	y	-
YEAR	y	y
ZIP	y	y
ZIP3	y	-
ZIPINC_QRTL	y	y

As stated earlier, states that don't participate in SEDD may still maintain and make available their own ED databases, and ED dental care data for states not participating in SEDD may be available through these state hospital discharge datasets. Guidelines and methods provided in this report can be used with non-SEDD data to the extent that these state databases have similar structure and content to SEDD.

A side note on ED oral care surveillance data sources is that Medicaid data availability presents an opportunity for investigating ED access and dental care in the primary care sector as medical and dental data for Medicaid subjects can be linked. For example, follow-up dental care subsequent to ED visits for dental problems can be explored. When using state Medicaid data, issues related to Medicaid data analysis must be addressed, including changes in eligibility affecting numerator and denominator determination in calculation of rates, and the use of procedure codes instead of diagnostic codes in dental insurance data. The obvious primary drawback to use of Medicaid data for state level surveillance is that the data are only for the Medicaid sub-population of the state.

Diagnosis-Procedure Codes Investigated

ICD-9 diagnosis codes used in analysis provide for direct comparisons between research studies to the extent that the same set of codes is used to define the same outcome. Unfortunately, this has not typically been the case in past published research, as highlighted in the Phase 1 report. There have been definite variations in the codes used by researchers. One major difference is whether there is interest in all dentally related condition or procedure, or if there is interest in a subset of dental conditions/procedures, with different study definitions employing different sets of codes (more or less restricted). Some past studies seeking to investigate any dental related care have used the entire range of ICD-9 codes 520-529.9. Others have used a broader range of dental/oral related codes to capture ED visits related to additional oral problems such as oral injuries/trauma or TMJ problems, and any conditions related to the teeth, jaws, head, face, and neck.

Researchers who are interested in access to EDs for specific dental conditions that are readily prevented or definitively treated through regular traditional dental care, have used a subset of dental codes. This category includes more specific definitions of NTDCs presenting in EDs, which is the primary focus of recommendations in this report. Investigators interested in NTDCs have limited their research to specific ICD codes determined to identify NTDCs. Though often similar, the exact sets of codes employed in analyses often have not been the same. Investigators interested in more specific types of diagnoses make use of a subset of NTDC related ICD-9 codes. Examples may be codes limited to dental infections or dental caries. The wide array of ICD-9 code set definitions is covered thoroughly in the Stage 1 report. Past ED oral care research has almost always involved use of the ICD-9 coding system. A fairly exhaustive range of dental/oral related ICD 9 codes and their descriptions are presented in Appendix 3.

The somewhat recent development and implementation of the ICD-10 coding system (2015) will result in using ICD-10 codes in most research going forward. Comparing studies and study definitions between studies using the two versions, or assessing trends across the ICD transition period requires translation of ICD-9 to ICD-10 codes. To develop recommended sets of codes for different ED oral/NTDC care definitions, we first had to address this transition to the new ICD-10 coding system. A crosswalk table was developed for translation of all oral/dental related ICD-9 codes to corresponding ICD-10 codes. Once this crosswalk table was completed, codes to define specific indicator definitions described in the Outcomes of Interest section of this report were considered, with input from the project workgroup. Specific sets of codes to define NTDC and CPP indicators (described previously) were determined.

Comparisons of ICD-9 and ICD-10 codes and ED oral indicator definitions are displayed in Table 8. ICD-10 descriptions are provided in the fourth column wherever they differ at all from the wording of the ICD-9 description (first column). In some cases, ICD-10 codes were either collapsed or expanded from ICD-9 codes. The final two columns of the table show the sets of recommended codes to define NTDC and the more restricted subset of codes defining CPP, which includes conditions that are commonly and readily treated in dental offices or clinics. Table 8 only shows the codes defining NTDC and the subset defining CPP. An accompanying Excel version of this crosswalk table is available and can be accessed via the ASTDD link, click here. This Excel file is an expanded version of Table 8 and includes all oral/dental related ICD-9 and corresponding ICD-10 codes, with columns to indicate codes defining NTDC and CPP. This Excel file is made available to states or other interested parties in addition to Table 8 for easier implementation in ED oral/NTDC care surveillance and data analysis activities.

Table 8. ICD-9 / ICD-10 Crosswalk Table with Recommended Code Sets to Define Non-Traumatic Dental Conditions (NTDC) and Caries/Periodontal/Preventive Conditions (CPP)

ICD-9 to ICD-10 Translation Website: http://www.icd10codesearch.com/

ICD- 9 Description	ICD-9 Code	ICD-10 Code	ICD-10 Description (if different)	NTDC	CPP
Anodontia	5200	K000		NTDC	
Supernumerary teeth	5201	K001		NTDC	
Abnormalities of size and form of teeth	5202	K002		NTDC	
Mottled teeth	5203	K003		NTDC	
Disturbances of tooth formation	5204	K004		NTDC	
Hereditary disturbances in tooth structure, not elsewhere classified	5205	K005		NTDC	
Disturbances in tooth eruption	5206	K006	Disturbances in tooth eruption	NTDC	
Disturbances in tooth eruption	5206	K010	Embedded teeth	NTDC	
Disturbances in tooth eruption	5206	K011	Impacted teeth	NTDC	
Teething syndrome	5207	K007	Teething syndrome	NTDC	
Other specified disorders of tooth development and eruption	5208	K008	Other specified disorders of tooth development	NTDC	
Unspecified disorder of tooth development and eruption	5209	K009	Disorder of tooth development, unspecified	NTDC	
Dental caries, unspecified	52100	K029	Dental caries, unspecified	NTDC	CPP
Dental caries limited to enamel	52101	K0261	Dental caries on smooth surface limited to enamel	NTDC	CPP
Dental caries extending into dentine	52102	K0262	Dental caries on smooth surface penetrating into dentine	NTDC	CPP
Dental caries extending into pulp	52103	K0263	Dental caries on smooth surface penetrating into pulp	NTDC	CPP
Arrested dental caries	52104	K023	Arrested dental caries	NTDC	CPP
Odontoclasia	52105	K0389	Other specified diseases of hard tissues of teeth	NTDC	CPP
Dental caries pit and fissure	52106	K0251	Dental caries pit and fissure surface limited to enamel	NTDC	CPP
Dental caries of smooth surface	52107	K0261	Dental caries on smooth surface limited to enamel	NTDC	CPP
Dental caries of smooth surface	52107	K0262	Dental caries on smooth surface penetrating into dentine	NTDC	CPP
Dental caries of smooth surface	52107	K0263	Dental caries on smooth surface penetrating into pulp	NTDC	CPP
Dental caries of root surface	52108	K027	Dental root caries	NTDC	CPP
Other dental caries	52109	K029	Dental caries, unspecified	NTDC	CPP
Excessive dental attrition, unspecified	52110	K030	Excessive attrition of teeth	NTDC	
Excessive attrition, limited to enamel	52111	K030	Excessive attrition of teeth	NTDC	
Excessive attrition, extending into dentine	52112	K030	Excessive attrition of teeth	NTDC	
Excessive attrition, extending into pulp	52113	K030	Excessive attrition of teeth	NTDC	
Excessive attrition, localized	52114	K030	Excessive attrition of teeth	NTDC	
Excessive attrition, generalized	52115	K030	Excessive attrition of teeth	NTDC	
Abrasion of teeth, unspecified	52120	K031	Abrasion of teeth	NTDC	
Abrasion, limited to enamel	52121	K031	Abrasion of teeth	NTDC	
Abrasion, extending into dentine	52122	K031	Abrasion of teeth	NTDC	
Abrasion, extending into pulp	52123	K031	Abrasion of teeth	NTDC	
Abrasion, localized	52124	K031	Abrasion of teeth	NTDC	
Abrasion, generalized	52125	K031	Abrasion of teeth	NTDC	
Erosion, unspecified	52130	K032	Erosion of teeth	NTDC	
Erosion, limited to enamel	52131	K032	Erosion of teeth	NTDC	
Erosion, extending into dentine	52132	K032	Erosion of teeth	NTDC	
Erosion, extending into pulp	52133	K032	Erosion of teeth	NTDC	
Erosion, localized	52134	K032	Erosion of teeth	NTDC	
Erosion, generalized	52135	K032	Erosion of teeth	NTDC	
Pathological resorption, unspecified	52140	K033	Pathological resorption of teeth	NTDC	
Pathological resorption, internal	52141	K033	Pathological resorption of teeth	NTDC	
Pathological resorption, external	52142	K033	Pathological resorption of teeth	NTDC	
Other pathological resorption	52149	K033	Pathological resorption of teeth	NTDC	
Hypercementosis	5215	K034		NTDC	
Ankylosis of teeth	5216	K035		NTDC	
Intrinsic posteruptive color changes of teeth	5217	K037	Intrinsic posteruptive color changes of hard tissues of teeth	NTDC	

ICD- 9 Description	ICD-9 Code	ICD-10 Code	ICD-10 Description (if different)	NTDC	CPP
Cracked tooth	52181	K0381		NTDC	CPP
Other specific diseases of hard tissues of teeth	52189	K0389		NTDC	CPP
Unspecified disease of hard tissues of teeth	5219	K039	Disease of hard tissues of teeth, unspecified	NTDC	CPP
Pulpitis	5220	K040		NTDC	CPP
Necrosis of the pulp	5221	K041		NTDC	CPP
Pulp degeneration	5222	K042		NTDC	CPP
Abnormal hard tissue formation in pulp	5223	K043		NTDC	
Acute apical periodontitis of pulpal origin	5224	K044		NTDC	CPP
Periapical abscess without sinus	5225	K047		NTDC	CPP
Chronic apical periodontitis	5226	K045		NTDC	CPP
Periapical abscess with sinus	5227	K046		NTDC	CPP
Radicular cyst	5228	K048		NTDC	
Other and unspecified diseases of pulp and periapical tissues	5229	K0490	Unspecified diseases of pulp and periapical tissues	NTDC	CPP
Other and unspecified diseases of pulp and periapical tissues	5229	K0499	Other diseases of pulp and periapical tissues	NTDC	CPP
Acute gingivitis, plaque induced	52300	K0500		NTDC	CPP
Acute gingivitis, non-plaque induced	52301	K0501		NTDC	CPP
Chronic gingivitis, plaque induced	52310	K0510		NTDC	CPP
Chronic gingivitis, non-plaque induced	52311	K0511		NTDC	CPP
Gingival recession, unspecified	52320	K060	Gingival recession	NTDC	CPP
Gingival recession, minimal	52321	K060	Gingival recession	NTDC	CPP
Gingival recession, moderate	52322	K060	Gingival recession	NTDC	CPP
Gingival recession, severe	52323	K060	Gingival recession	NTDC	CPP
Gingival recession, localized	52324	K060	Gingival recession	NTDC	CPP
Gingival recession, generalized	52325	K060	Gingival recession	NTDC	CPP
Aggressive periodontitis, unspecified	52330	K0520		NTDC	CPP
Aggressive periodontitis, localized	52331	K0521		NTDC	CPP
Aggressive periodontitis, generalized	52332	K0522		NTDC	CPP
Acute periodontitis	52333	K0520		NTDC	CPP
Chronic periodontitis, unspecified	52340	K0530		NTDC	CPP
Chronic periodontitis, localized	52341	K0531		NTDC	CPP
Chronic periodontitis, generalized	52342	K0532		NTDC	CPP
Periodontosis	5235	K0540		NTDC	CPP
Accretions on teeth	5236	K036	Deposits (accretions) on teeth	NTDC	CPP
Other specified periodontal diseases	5238	K055	Other periodontal diseases	NTDC	CPP
Other specified periodontal diseases	5238	K061	Gingival enlargement	NTDC	CPP
Unspecified gingival and periodontal disease	5239	K056	Periodontal disease, unspecified	NTDC	CPP
Major anomalies of jaw size, unspecified anomaly	52400	M2600	Unspecified anomaly of jaw size	NTDC	
Major anomalies of jaw size, maxillary hyperplasia	52401	M2601	Maxillary hyperplasia	NTDC	
Major anomalies of jaw size,	52402	M2603	Mandibular hyperplasia	NTDC	
Major anomalies of jaw size, maxillary hypoplasia	52403	M2602	Maxillary hypoplasia	NTDC	
Major anomalies of jaw size, mandibular hypoplasia	52404	M2604	Mandibular hypoplasia	NTDC	
Major anomalies of jaw size, macrogenia	52405	M2605	Macrogenia	NTDC	
Major anomalies of jaw size, microgenia	52406	M2606	Microgenia	NTDC	
Excessive tuberosity of jaw	52407	M2607		NTDC	
Major anomalies of jaw size, other specified anomaly	52409	M2609	Other specified anomalies of jaw size	NTDC	
Anomalies of relationship of jaw to cranial base, unspecified anomaly	52410	M2610	Unspecified anomaly of relationship of jaw-cranial base relationship	NTDC	
Anomalies of relationship of jaw to cranial base, maxillary asymmetry	52411	M2611	Maxillary asymmetry	NTDC	
Anomalies of relationship of jaw to cranial base, other jaw asymmetry	52412	M2612	Other jaw asymmetry	NTDC	
Anomalies of relationship of jaw to cranial base, other specified anomaly	52419	M2619	Other specified anomalies of jaw-cranial base relationship	NTDC	
Unspecified anomaly of dental arch relationship	52420	M2620		NTDC	
Malocclusion, Angle's class I	52421	M26211		NTDC	
Malocclusion, Angle's class II	52422	M26212		NTDC	

ICD- 9 Description	ICD-9 Code	ICD-10 Code	ICD-10 Description (if different)	NTDC	CPP
Malocclusion, Angle's class III	52423	M26213		NTDC	
Open anterior occlusal relationship	52424	M26220		NTDC	
Open posterior occlusal relationship	52425	M26221		NTDC	
Excessive horizontal overlap	52426	M2623		NTDC	
Reverse articulation	52427	M2624		NTDC	
Anomalies of interarch distance	52428	M2625		NTDC	
Other anomalies of dental arch relationship	52429	M2629		NTDC	
Unspecified anomaly of tooth position of fully erupted teeth	52430	M2630	Unspecified anomaly of tooth position of fully erupted tooth or teeth	NTDC	
Crowding of teeth	52431	M2631	Crowding of fully erupted teeth	NTDC	
Excessive spacing of teeth	52432	M2632	Excessive spacing of fully erupted teeth	NTDC	
Horizontal displacement of teeth	52433	M2633	Horizontal displacement of fully erupted tooth or teeth	NTDC	
Vertical displacement of teeth	52434	M2634	Vertical displacement of fully erupted tooth or teeth	NTDC	
Rotation of tooth/teeth	52435	M2635	Rotation of fully erupted tooth or teeth	NTDC	
Insufficient interocclusal distance of teeth (ridge)	52436	M2636	Insufficient interocclusal distance of fully erupted teeth (ridge)	NTDC	
Excessive interocclusal distance of teeth	52437	M2637	Excessive interocclusal distance of fully erupted teeth	NTDC	
Other anomalies of tooth position	52439	M2639	Other anomalies of tooth position of fully erupted tooth or teeth	NTDC	
Malocclusion, unspecified	5244	M264		NTDC	
Dentofacial functional abnormality, unspecified	52450	M2650	Dentofacial functional abnormalities, unspecified	NTDC	
Abnormal jaw closure	52451	M2651		NTDC	
Limited mandibular range of motion	52452	M2652		NTDC	
Deviation in opening and closing of the mandible	52453	M2653		NTDC	
Insufficient anterior guidance	52454	M2654		NTDC	
Centric occlusion maximum intercuspation discrepancy	52455	M2655		NTDC	
Non-working side interference	52456	M2656		NTDC	
Lack of posterior occlusal support	52457	M2657		NTDC	
Other dentofacial functional abnormalities	52459	M2659		NTDC	
Temporomandibular joint disorders, unspecified	52460	M2660	Temporomandibular joint disorder, unspecified	NTDC	
Temporomandibular joint disorders, unspecified	52460	M2669	Other specified disorders of temporomandibular joint	NTDC	
Temporomandibular joint disorders, adhesions and ankylosis (bony or fibrous)	52461	M2661	Adhesions and ankylosis of temporomandibular joint	NTDC	
Temporomandibular joint disorders, arthralgia of temporomandibular joint	52462	M2662	Arthralgia of temporomandibular joint	NTDC	
Temporomandibular joint disorders, articular disc disorder (reducing or non-reducing)	52463	M2663	Articular disc disorder of temporomandibular joint	NTDC	
Temporomandibular joint sounds on opening and/or closing the jaw	52464	M2669	Other specified disorders of temporomandibular joint	NTDC	
Other specified temporomandibular joint disorders	52469	M2669	Other specified disorders of temporomandibular joint	NTDC	
Dental alveolar anomalies, unspecified alveolar anomaly	52470	M2670	Unspecified alveolar anomaly	NTDC	
Alveolar maxillary hyperplasia	52471	M2671		NTDC	
Alveolar mandibular hyperplasia	52472	M2672		NTDC	
Alveolar maxillary hypoplasia	52473	M2673		NTDC	
Alveolar mandibular hypoplasia	52474	M2674		NTDC	
Vertical displacement of alveolus and teeth	52475	M2679	Other specified alveolar anomaly	NTDC	
Occlusal plane deviation	52476	M2679	Other specified alveolar anomaly	NTDC	
Other specified alveolar anomaly	52479	M2679	Other specified alveolar anomaly	NTDC	
Anterior soft tissue impingement	52481	M2681		NTDC	
Posterior soft tissue impingement	52482	M2682		NTDC	
Other specified dentofacial anomalies	52489	M264	Malocclusion, unspecified	NTDC	
Other specified dentofacial anomalies	52489	M2689	Other dentofacial anomalies	NTDC	
Unspecified dentofacial anomalies	5249	M269	Dentofacial anomaly, unspecified	NTDC	
Exfoliation of teeth due to systemic causes	5250	K080		NTDC	
Acquired absence of teeth, unspecified	52510	K08109	Complete loss of teeth, unspecified cause, unspecified class	NTDC	

ICD- 9 Description	ICD-9 Code	ICD-10 Code	ICD-10 Description (if different)	NTDC	CPP
Loss of teeth due to periodontal disease	52512	K08429	Partial loss of teeth due to periodontal diseases, unspecified class	NTDC	CPP
Loss of teeth due to caries	52513	K08439	Partial loss of teeth due to caries unspecified class	NTDC	CPP
Other loss of teeth	52519	K08499	Partial loss of teeth due to other unspecified cause, unspecified class	NTDC	CPP
Unspecified atrophy of edentulous alveolar ridge	52520	K0820		NTDC	
Minimal atrophy of the mandible	52521	K0821		NTDC	
Moderate atrophy of the mandible	52522	K0822		NTDC	
Severe atrophy of the mandible	52523	K0823		NTDC	
Minimal atrophy of the maxilla	52524	K0824		NTDC	
Moderate atrophy of the maxilla	52525	K0825		NTDC	
Severe atrophy of the maxilla	52526	K0826		NTDC	
Retained dental root	5253	K083		NTDC	
Complete edentulism, unspecified	52540	K08109	Complete loss of teeth, unspecified cause, unspecified class	NTDC	
Complete edentulism, class I	52541	K08101	Complete loss of teeth, unspecified cause, class I	NTDC	
Complete edentulism, class II	52542	K08102	Complete loss of teeth, unspecified cause, class II	NTDC	
Complete edentulism, class III	52543	K08103	Complete loss of teeth, unspecified cause, class III	NTDC	
Complete edentulism, class IV	52544	K08104	Complete loss of teeth, unspecified cause, class IV	NTDC	
Partial edentulism, unspecified	52550	K08409	Partial loss of teeth, unspecified cause, unspecified class	NTDC	CPP
Partial edentulism, class I	52551	K08401	Partial loss of teeth, unspecified cause, class I	NTDC	CPP
Partial edentulism, class II	52552	K08402	Partial loss of teeth, unspecified cause, class II	NTDC	CPP
Partial edentulism, class III	52553	K08403	Partial loss of teeth, unspecified cause, class III	NTDC	CPP
Partial edentulism, class IV	52554	K08404	Partial loss of teeth, unspecified cause, class IV	NTDC	CPP
Unspecified unsatisfactory restoration of tooth	52560	K0850	Unsatisfactory restoration of tooth, unspecified	NTDC	CPP
Open restoration margins	52561	K0851	Open restoration margins of tooth	NTDC	CPP
Unrepairable overhanging of dental restorative materials	52562	K0852		NTDC	CPP
Fractured dental restorative material without loss of material	52563	K08530		NTDC	CPP
Fractured dental restorative material with loss of material	52564	K08531		NTDC	CPP
Contour of existing restoration of tooth biologically incompatible with oral health	52565	K0854		NTDC	CPP
Allergy to existing dental restorative material	52566	K0855		NTDC	CPP
Poor aesthetics of existing restoration	52567	K0856	Poor aesthetic of existing restoration of tooth	NTDC	CPP
Other unsatisfactory restoration of existing tooth	52569	K0859	Other unsatisfactory restoration of tooth	NTDC	CPP
Osseointegration failure of dental implant	52571	M2761		NTDC	CPP
Post-osseointegration biological failure of dental implant	52572	M2762		NTDC	CPP
Post-osseointegration mechanical failure of dental implant	52573	M2763		NTDC	CPP
Other endosseous dental implant failure	52579	M2769		NTDC	CPP
Other specified disorders of the teeth and supporting structures	5258	K088	Other specified disorders of teeth and supporting structures	NTDC	CPP
Other specified disorders of the teeth and supporting structures		M2679	Other specified alveolar anomalies	NTDC	
Unspecified disorder of the teeth and supporting structures	5259	K089	Disorder of teeth and supporting structures, unspecified	NTDC	CPP
Developmental odontogenic cysts	5260	K090		NTDC	
Fissural cysts of jaw	5261	K091	Developmental (nonodotogenic) cysts of oral region	NTDC	
Other cysts of jaws	5262	M2749		NTDC	
Central giant cell (reparative) granuloma	5263	M271	Giant cell granuloma, central	NTDC	
Inflammatory conditions of jaw	5264	M272		NTDC	
Alveolitis of jaw	5265	M273		NTDC	
Perforation of root canal space	52661	M2751	Perforation of root canal space due to endodontic treatment	NTDC	CPP
Endodontic overfill	52662	M2752		NTDC	CPP
Endodontic underfill	52663	M2753		NTDC	CPP
Other periradicular pathology associated with previous endodontic treatment	52669	M2759		NTDC	CPP

ICD- 9 Description	ICD-9 Code	ICD-10 Code	ICD-10 Description (if different)	NTDC	CPP
Exostosis of jaw	52681	M278	Other specified diseases of jaws	NTDC	
Other specified diseases of the jaws	52689	M278	Other specified diseases of jaws	NTDC	
Unspecified disease of the jaws	5269	M279	Disease of the jaws, unspecified	NTDC	
Atrophy of salivary gland	5270	K110		NTDC	
Hypertrophy of salivary gland	5271	K111		NTDC	
Sialoadenitis	5272	K1120	Sialoadenitis, unspecified	NTDC	
Abscess of salivary gland	5273	K113		NTDC	
Fistula of salivary gland	5274	K114		NTDC	
Sialolithiasis	5275	K115		NTDC	
Mucocele of salivary gland	5276	K116		NTDC	
Disturbance of salivary secretion	5277	K117	Disturbances of salivary secretion	NTDC	
Disturbance of salivary secretion	5277	R682	Dry mouth, unspecified	NTDC	
Other specified diseases of the salivary glands	5278	K118	Other diseases of salivary glands	NTDC	
Unspecified disease of the salivary glands	5279	K119	Disease of the salivary glands, unspecified	NTDC	
Stomatitis and mucositis, unspecified	52800	K122	Cellulitis and abscess of mouth	NTDC	
Stomatitis and mucositis, unspecified	52800	K1230	Oral mucositis (ulcerative), unspecified	NTDC	
Mucositis (ulcerative) due to antineoplastic therapy	52801	K1231	Oral mucositis (ulcerative) due to antineoplastic therapy	NTDC	
Mucositis (ulcerative) due to antineoplastic therapy	52801	K1233	Oral mucositis (ulcerative) due to radiation	NTDC	
Mucositis (ulcerative) due to other drugs	52802	K1232	Oral mucositis (ulcerative) due to other drugs	NTDC	
Other stomatitis and mucositis (ulcerative)	52809	K121	Other forms of stomatitis	NTDC	
Other stomatitis and mucositis (ulcerative)	52809	K1239	Other oral mucositis (ulcerative)	NTDC	
Cancrum oris	5281	A690	Necrotizing ulcerative stomatitis	NTDC	
Oral aphthae	5282	K120	Recurrent oral aphthae	NTDC	
Cellulitis and abscess of oral soft tissues	5283	K122	Cellulitis and abscess of mouth	NTDC	
Cysts of oral soft tissues	5284	K098	Other cysts of oral region, not elsewhere classified	NTDC	
Diseases of lips	5285	K130		NTDC	
Leukoplakia of oral mucosa, including tongue	5286	K1321		NTDC	
Minimal keratinized residual ridge mucosa	52871	K1322		NTDC	
Excessive keratinized residual ridge mucosa	52872	K1323		NTDC	
Other disturbances of oral epithelium, including tongue	52879	K1329		NTDC	
Oral submucosal fibrosis, including of tongue	5288	K135	Oral submucosal fibrosis	NTDC	
Other and unspecified diseases of the oral soft tissues	5289	K1370	Unspecified lesions of oral mucosa	NTDC	
Other and unspecified diseases of the oral soft tissues	5289	K1379	Other lesions of oral mucosa	NTDC	
Glossitis	5290	K140		NTDC	
Geographic tongue	5291	K141		NTDC	
Median rhomboid glossitis	5292	K142		NTDC	
Hypertrophy of tongue papillae	5293	K143		NTDC	
Atrophy of tongue papillae	5294	K144		NTDC	
Plicated tongue	5295	K145		NTDC	
Glossodynia	5296	K146		NTDC	
Other specified conditions of the tongue	5298	K148	Other diseases of the tongue	NTDC	
Unspecified condition of the tongue	5299	K149	Disease of tongue, unspecified	NTDC	
Jaw pain	78492	R6884		NTDC	CPP
Nonspecific abnormal findings in saliva	7924	R859	Unspecified abnormal finding in specimens from digestive organs and abdominal cavity	NTDC	
Fitting and adjustment of dental prosthetic device	V523	Z463	Encounter for fitting and adjustment of dental prosthetic device	NTDC	CPP
Fitting and adjustment of orthodontic devices	V534	Z464	Encounter for fitting and adjustment of orthodontic device	NTDC	CPP
Orthodontics aftercare	V585	Z464	Encounter for fitting and adjustment of orthodontic device	NTDC	CPP
Dental examination	V722	Z0120	Encounter for dental examination and cleaning without abnormal findings	NTDC	CPP
Dental examination	V723	Z0121	Encounter for dental examination and cleaning with abnormal findings	NTDC	CPP

Dataset Development and Analyses

Data and analysis code are required to conduct ED oral care surveillance and generate the recommended ED oral surveillance indicators. For states that don't participate in SEDD, the existence and availability of ED data will need to be determined. As mentioned before, similarities of non-SEDD state data with SEDD data will allow for general use of recommendations and methods presented in this report. For SEDD states, data and resources for analysis are available online. Appendix 1 contains the detailed overview webpage of SEDD and has links to other SEDD webpages, including the links to data purchasing and data documentation and resources. Among the SEDD data resources are downloadable files for loading SEDD datasets into SAS, SPSS, and Stata.

Once the data are loaded, generating the indicators recommended in the report requires specific code. SAS sample code for generating recommended indicators is provided in Appendix 4. Instructions for setting up and using the code are included in the appendix. The code itself can be cut and pasted from Appendix 4 into SAS and modified as needed to meet the specific needs and desires of each state.

To guide analysis, an analysis grid was developed laying out the recommended and optional indicators and stratified analysis, and includes the SEDD variable names to use in generating the indicator output. The analysis grid is in Appendix 5. Further support can be sought from ASTDD. All of the information on recommended ED oral care indicators, their definitions, and conducting the data analysis to generate the indicators is summarized and available in the document, *Guidance on Assessing Emergency Department Data for Non-Traumatic Dental Conditions*.

Note: the ICD-9 and ICD-10 recommended code blocks are included in Appendix 4. The Oral/Dental ICD-9/ICD-10 Conversion Crosswalk Table Excel file is available to see corresponding ICD-9 and ICD-10 codes and their definitions, click here. This Excel file can also be used for creating different sets of codes for analysis if states choose to do analyses beyond the recommended and optional analyses presented.

Ongoing Challenges to ED Oral/NTDC Care Surveillance

The problematic aspects of research methods addressing ED use for oral problems in past research has primarily related to the inconsistencies of methods across studies. Research by nature is intended to address new research question in different target populations with different outcomes and predictors of interest. Likewise in investigations of ED oral/NTDC care, methodology will vary depending on the factors of interest to the researchers, including: definitions of ED treatments, predictors of ED use, and factors related to potentially effective intervention strategies. Surveillance on the other hand, is effective when conducted in a uniform standardized way across different populations and over time.

Another problematic aspect of research addressed in the Phase 1 report has been coding at the EDs. The lack of oral/dental training and knowledge among medical professionals providing care in EDs has been problematic in both accurate diagnosis of oral conditions and accurate use of the diagnosis codes. Likewise, physicians are not properly trained to provide the appropriate treatment for the oral problems underlying the presenting symptoms. The resulting care usually involves providing prescriptions for pain medications and/or antibiotics, along with advice to see a dentist. Coding for oral/dental conditions by physicians often relies on heavy use of codes such as "dental disorder unspecified" (ICD-9 code 525.9, also related codes 521.8, 521.9, and 525.8). Such

codes are not very informative, but more specific dental codes used may often be inaccurate. The problem of inaccurate and imprecise ICD-9 dental code use by physicians is not easily addressed.

Furthermore, many available datasets employ the use of unique identifiers associated with an ED visit, not a specific person. So repeat visits by a person cannot be identified or linked, and the extent of repeat visits to EDs for the same oral problem cannot be quantified. This is a major shortcoming, as repeat visits may represent a substantial portion of unnecessary treatment and costs that would potentially not occur if there was a source of regular definitive dental care.

Related to this lack of patient identity is the inability to link medical and ED data for a given patient to dental claims data. This precludes the ability to assess whether oral problems presenting in EDs have been addressed in the primary care dental setting. Furthermore, the utility of linked medical and dental data is limited by the long-standing use of treatment codes rather than diagnostic codes in dentistry. Initiatives for developing and implementing dental diagnostic codes are in process, but likely won't be widely implemented for some time. Also, the development of electronic health and dental records, with increased potential for linking, is also progressing.

Summary/Conclusions

The variation in past ED oral/NTDC investigative methods has limited the consistency and comparability of data. The use of standardized methods and protocols developed from this project will provide for more uniform and comparable ED oral/NTDC surveillance data for basic surveillance activities conducted by states.

Communications Plan

To promote the use of standardized state level ED oral care surveillance, the methods and recommendations from this project need to be disseminated with accompanying communication to encourage usage. A communication plan has been developed to guide these efforts. This communication plan is included in Appendix 6.

Appendix 1: State Emergency Department Databases (SEDD)

Copied from: https://www.hcup-us.ahrq.gov/seddoverview.jsp

Overview of the State Emergency Department Databases (SEDD)

The State Emergency Department Databases (SEDD) are part of the family of databases and software tools developed for the Healthcare Cost and Utilization Project (HCUP). The SEDD capture emergency visits at hospital-affiliated emergency departments (EDs) that do not result in hospitalization. Information about patients initially seen in the ED and then admitted to the hospital is included in the State Inpatient Databases (SID). The SEDD files include all patients, regardless of payer, providing a unique view of ED care in a State or in a defined market over time.

Developed through a Federal-State-Industry partnership sponsored by the Agency for Healthcare Research and Quality (AHRQ), HCUP data inform decision making at the national, State, and community levels.

This page provides an overview of the SEDD. For more details, see SEDD Database Documentation and the *Introduction to the SEDD* (PDF file, 163 KB; HTML)

About the SEDD

The SEDD capture discharge information on all ED visits in a given State that do not result in an admission. States make their SEDD files available for purchase through the HCUP Central Distributor. See Availability of HCUP Data for a list of State database participation and availability by year.

Thirty-five States currently participate in the SEDD:

- The SEDD contain the ED encounter abstracts in participating States, translated into a uniform format to facilitate multi-State comparisons and analyses.
- All of the databases include abstracts from hospital-affiliated ED sites. Composition and completeness of data files may vary from State to State.
- The SEDD contain a core set of clinical and nonclinical information on all patients, including individuals covered by Medicare, Medicaid, or private insurance, as well as those who are uninsured.
- In addition to the core set of uniform data elements common to all SEDD, some State data include other elements, such as the patient's race.

Free HCUP Tools & Software are also available to identify preventable hospitalizations, estimate costs, assess quality of care and patient safety, categorize diagnoses and procedures, and identify comorbidities.

Additional information on the SEDD may be found in the *Introduction to the SEDD* (PDF file, 163 KB; HTML).

SEDD Data Elements

The SEDD contain clinical and resource-use information that is included in a typical discharge abstract, with safeguards to protect the privacy of individual patients, physicians, and hospitals (as required by data sources). The SEDD contain more than 100 clinical and non-clinical variables included in a hospital discharge abstract, such as:

- All-listed diagnoses and procedures
- Patient demographics characteristics (e.g., sex, age, and, for some States, race)
- Expected payment source
- Total charges
- Hospital identifiers that permit linkage to hospital inpatient databases, such as the AHRQ-sponsored State Inpatient Databases (SID), and to the American Hospital Association Annual Survey File

Elements included in the SEDD are not always available for all States, including the hospital county identifiers or HCUP's Revisit Variables. Please see the Availability of Data Elements by Year.

SEDD File Structure

The SEDD are calendar year files based on discharge date for all data years except 2015. Because of the transition to ICD-10-CM/PCS on October 1, 2015, the 2015 SEDD are split into two parts. Nine months of the 2015 data with ICD-9-CM codes (discharges from Jan 1, 2015 - September 30, 2015) are in one set of files labeled Q1Q3. Three months of 2015 data with ICD-10-CM/PCS codes (discharges from October 1, 2015 - December 31, 2015) are in a separate set of files labeled Q4. More information about the changes to the HCUP databases for ICD-10-CM/PCS and use of data across the two coding system may be found on the HCUP-US Web site under ICD-10-CM/PCS Resources.

SEDD Areas of Research and HCUP Publications

The SEDD combined with SID discharges that originate in the ED are well suited for research that requires complete enumeration of hospital-based EDs within market areas or States. The SEDD promote comparative studies of health care services and support health care policy research on a variety of topics, including:

- Injury surveillance
- Access to health care in a changing health care marketplace
- Trends and correlations between ED use and environmental events
- Emerging infections
- Occurrence of nonfatal, preventable illness
- Community assessment and planning

The SEDD are used in a variety of publications:

- HCUP Statistical Briefs highlight a variety of health topics.
- Use the HCUP Publications Search Tool to find publications using the SEDD.
- Review featured publications on the HCUP Research Spotlights page.
- Read publications by the winners of the HCUP Outstanding Article of the Year Awards.

Purchase the SEDD

SEDD releases beginning in data year 1999 are available for purchase through the HCUP Central Distributor. Costs vary by State and data year.

All HCUP data users, including data purchasers and collaborators, must complete the online HCUP Data Use Agreement Training Tool, and must read and sign the Data Use Agreement for State Databases (PDF file, 53 KB; HTML). The SEDD are available for purchase online through the HCUP Central Distributor.

Questions regarding purchasing databases can be directed to the HCUP Central Distributor:

E-mail: HCUPDistributor@AHRQ.gov
Telephone: (866) 556-4287 (toll free)
Fax: (866) 792-5313 (toll free)

SEDD Hardware and Software Requirements

The SEDD data set comes in ASCII format and can be run on desktop computers with a DVD drive. To load and analyze the SEDD, you will need the following:

- A DVD drive
- A hard drive with one to four gigabytes of space available, depending on the SID being used
- SAS®, SPSS®, or similar analysis software

The data set comes with full documentation. SEDD documentation and tools, including programs for loading the ASCII file into SAS or SPSS, are also available on the SEDD Database Documentation page.

Appendix 2: The National Emergency Department Sample

Copied from: https://www.hcup-us.ahrq.gov/nedsoverview.jsp.

Overview of the Nationwide Emergency Department Sample (NEDS)

The Nationwide Emergency Department Sample (NEDS) is part of a family of databases and software tools developed for the Healthcare Cost and Utilization Project (HCUP). The NEDS is the largest all-payer emergency department (ED) database in the United States, yielding national estimates of hospital-based ED visits. Unweighted, it contains data from approximately 30 million ED visits each year. Weighted, it estimates roughly 135 million ED visits.

Developed through a Federal-State-Industry partnership sponsored by the Agency for Healthcare Research and Quality, HCUP data inform decisionmaking at the national, State, and community levels.

This page provides an overview of the NEDS. For more details, see NEDS Database Documentation and the *Introduction to the NEDS, 2014* (PDF file, 684 KB).

Contents:

About the NEDS

Sampled from the State Inpatient Databases (SID) and State Emergency Department Databases (SEDD), HCUP's NEDS can be used to create national and regional estimates of ED care. The SID contain information on patients initially seen in the ED and then admitted to the same hospital. The SEDD capture information on ED visits that do not result in an admission (i.e., treat-and-release visits and transfers to another hospital).

NEDS data are available from 2006 through 2014, which allows researchers to analyze trends over time. Key features of the most recent NEDS database year (2014) include:

- A large sample size, which provides sufficient data for analysis across hospital types and the study of relatively uncommon disorders and procedures
- Discharge data for ED visits from 945 hospitals located in 33 States and the District of Columbia, approximating a 20-percent stratified sample of U.S. hospital-based EDs
- Demographic data such as hospital and patient characteristics, geographic area, and the nature of ED visits (e.g., common reasons for ED visits, including injuries)
- ED charge information for 84 percent of patients, including individuals covered by Medicare, Medicaid, or private insurance, as well as those who are uninsured
- Children's hospitals with trauma centers, which are classified with adult and pediatric trauma centers in the current versions of the NEDS.

NEDS Data Elements

The NEDS contains clinical and resource-use information that is included in a typical discharge abstract, with safeguards to protect the privacy of individual patients, physicians, and hospitals (as required by data sources). The NEDS is composed of more than 100 clinical and nonclinical variables for each hospital stay. These include:

- International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis and external cause of injury codes
- ICD-9-CM and Current Procedural Terminology, Fourth Edition (CPT®-4) procedure codes

- Identification of injury-related ED visits including mechanism, intent, and severity of injury
- Admission and discharge status
- Patient demographics characteristics (e.g., sex, age, urban-rural designation of residence, national quartile of median household income for patient's ZIP Code)
- Expected payment source
- Total ED charges (for ED visits) and total hospital charges (for inpatient stays for ED visits that result in admission)
- Hospital characteristics (e.g., region, trauma center indicator, urban-rural location, teaching status)

NEDS Areas of Research and HCUP Publications

As a uniform, multi-State database, the NEDS promotes comparative studies of health care services and supports health care policy and research on a variety of topics, including:

- Use of and charges for ED services
- Medical treatment effectiveness
- Quality of ED care
- Impact of health policy changes
- Access to care
- Utilization of health services by special populations

The NEDS is used in a variety of publications:

- HCUP Statistical Briefs highlight a variety of health topics.
- Use the HCUP Publications Search Tool to find publications using the NEDS.
- Review featured publications on the HCUP Research Spotlights page.
- Read publications by the winners of the HCUP Outstanding Article of the Year Awards.

Purchase the NEDS

NEDS releases for data years 2006 through 2014 are available for purchase through the HCUP Central Distributor.

All HCUP data users, including data purchasers and collaborators, must complete the online HCUP Data Use Agreement Training Tool, and must read and sign the Data Use Agreement for Nationwide Databases (PDF file, 54 KB; HTML).

The NEDS are available for purchase online through the HCUP Central Distributor.

Questions regarding purchasing databases can be directed to the HCUP Central Distributor:

E-mail: HCUPDistributor@AHRQ.gov
Telephone: (866) 556-4287 (toll free)
Fax: (866) 792-5313 (toll free)

NEDS Hardware and Software Requirements

The NEDS data set is extremely large. The data are distributed as comma-separated value (CSV) files delivered via secure digital download from the Online HCUP Central Distributor. The files are compressed and encrypted with SecureZIP® from PKWARE.

To load and analyze the NEDS data on a computer, users will need the following:

- The password provided by the HCUP Central Distributor
- A hard drive with 60 to 100 gigabytes of space available
- A third-party zip utility such as ZIP Reader, Secure ZIP®, WinZip®, or Stuffit Expander®
- SAS®, SPSS®, Stata® or similar analysis software

The data set includes weights for producing national and regional estimates. NEDS documentation and tools, including programs for loading the CSV file into SAS, SPSS, or Stata, are also available on the NEDS Database Documentation page.

Please note the following based on the software you plan to use:

- In total, the CSV version of the NEDS is almost 19 gigabytes (GB).
- The NEDS files loaded into SAS are about 15 GB. Most SAS data steps will require twice the storage of the file, so that the input and output files can coexist. The largest use of space typically occurs during a sort, which requires work space approximately three times the size of the file. Thus, the NEDS files would require approximately 45 GB of available workspace to perform a sort.
- The NEDS files loaded into SPSS are about 30 GB.
- Because Stata loads the entire file into memory, it may not be possible to load every data element in the NEDS Core file into Stata. Stata users will need to maximize memory and use the "_skip" option to select a subset of variables. More details are provided in the Stata load programs.

With a file this size and without careful planning, space could easily become a problem in a multi-step program with the NEDS. It is not unusual to have several versions of a file marking different steps while preparing it for analysis and more versions for the actual analyses; therefore, users should be aware that the amount of space required can escalate rapidly.

Appendix 3: Oral/Dental Related ICD 9 Codes

Downloaded from: https://www.cms.gov/Medicare/Coding/ICD9ProviderDiagnosticCodes/codes.html

Codes in table do not include decimal after 3rd digit

ICD 9 Code	Description
5200	Anodontia
5201	Supernumerary teeth
5202	Abnormalities of size and form of teeth
5203	Mottled teeth
5204	Disturbances of tooth formation
5205	Hereditary disturbances in tooth structure, not elsewhere classified
5206	Disturbances in tooth eruption
5207	Teething syndrome
5208	Other specified disorders of tooth development and eruption
5209	Unspecified disorder of tooth development and eruption
52100	Dental caries, unspecified
52101	Dental caries limited to enamel
52102	Dental caries extending into dentine
52103	Dental caries extending into pulp
52104	Arrested dental caries
52105	Odontoclasia
52106	Dental caries pit and fissure
52107	Dental caries of smooth surface
52108	Dental caries of root surface
52109	Other dental caries
52110	Excessive attrition, unspecified
52111	Excessive attrition, limited to enamel
52112	Excessive attrition, extending into dentine
52113	Excessive attrition, extending into pulp
52114	Excessive attrition, localized
52115	Excessive attrition, generalized
52120	Abrasion, unspecified
52121	Abrasion, limited to enamel
52122	Abrasion, extending into dentine
52123	Abrasion, extending into pulp
52124	Abrasion, localized
52125	Abrasion, generalized
52130	Erosion, unspecified
52131	Erosion, limited to enamel
52132	Erosion, extending into dentine
52133	Erosion, extending into pulp
52134	Erosion, localized
52135	Erosion, generalized
52140	Pathological resorption, unspecified
52141	Pathological resorption, internal
52142	Pathological resorption, external
52149	Other pathological resorption

ICD 9 Code	Description
5215	Hypercementosis
5216	Ankylosis of teeth
5217	Intrinsic posteruptive color changes
52181	Cracked tooth
52189	Other specific diseases of hard tissues of teeth
5219	Unspecified disease of hard tissues of teeth
5220	Pulpitis
5221	Necrosis of the pulp
5222	Pulp degeneration
5223	Abnormal hard tissue formation in pulp
5224	Acute apical periodontitis of pulpal origin
5225	Periapical abscess without sinus
5226	Chronic apical periodontitis
5227	Periapical abscess with sinus
5228	Radicular cyst
5229	Other and unspecified diseases of pulp and periapical tissues
52300	Acute gingivitis, plaque induced
52301	Acute gingivitis, non-plaque induced
52310	Chronic gingivitis, plaque induced
52311	Chronic gingivitis, non-plaque induced
52320	Gingival recession, unspecified
52321	Gingival recession, minimal
52322	Gingival recession, moderate
52323	Gingival recession, severe
52324	Gingival recession, localized
52325	Gingival recession, generalized
52330	Aggressive periodontitis, unspecified
52331	Aggressive periodontitis, localized
52332	Aggressive periodontitis, generalized
52333	Acute periodontitis
52340	Chronic periodontitis, unspecified
52341	Chronic periodontitis, localized
52342	Chronic periodontitis, generalized
5235	Periodontosis
5236	Accretions on teeth
5238	Other specified periodontal diseases
5239	Unspecified gingival and periodontal disease
52400	Major anomalies of jaw size, unspecified anomaly
52401	Major anomalies of jaw size, maxillary hyperplasia
52402	Major anomalies of jaw size, mandibular hyperplasia
52403	Major anomalies of jaw size, maxillary hypoplasia
52404	Major anomalies of jaw size, mandibular hypoplasia
52405	Major anomalies of jaw size, macrogenia
52406	Major anomalies of jaw size, microgenia
52407	Excessive tuberosity of jaw
52409	Major anomalies of jaw size, other specified anomaly
52410	Anomalies of relationship of jaw to cranial base, unspecified anomaly
52411	Anomalies of relationship of jaw to cranial base, maxillary asymmetry

ICD 9 Code	Description
52412	Anomalies of relationship of jaw to cranial base, other jaw asymmetry
52419	Anomalies of relationship of jaw to cranial base, other specified anomaly
52420	Unspecified anomaly of dental arch relationship
52421	Malocclusion, Angle's class I
52422	Malocclusion, Angle's class II
52423	Malocclusion, Angle's class III
52424	Open anterior occlusal relationship
52425	Open posterior occlusal relationship
52426	Excessive horizontal overlap
52427	Reverse articulation
52428	Anomalies of interarch distance
52429	Other anomalies of dental arch relationship
52430	Unspecified anomaly of tooth position
52431	Crowding of teeth
52432	Excessive spacing of teeth
52433	Horizontal displacement of teeth
52434	Vertical displacement of teeth
52435	Rotation of tooth/teeth
52436	Insufficient interocclusal distance of teeth (ridge)
52437	Excessive interocclusal distance of teeth
52439	Other anomalies of tooth position
5244	Malocclusion, unspecified
52450	Dentofacial functional abnormality, unspecified
52451	Abnormal jaw closure
52452	Limited mandibular range of motion
52453	Deviation in opening and closing of the mandible
52454	Insufficient anterior guidance
52455	Centric occlusion maximum intercuspation discrepancy
52456	Non-working side interference
52457	Lack of posterior occlusal support
52459	Other dentofacial functional abnormalities
52460	Temporomandibular joint disorders, unspecified
52461	Temporomandibular joint disorders, adhesions and ankylosis (bony or fibrous)
52462	Temporomandibular joint disorders, arthralgia of temporomandibular joint
52463	Temporomandibular joint disorders, articular disc disorder (reducing or non-reducing)
52464	Temporomandibular joint sounds on opening and/or closing the jaw
52469	Other specified temporomandibular joint disorders
52470	Dental alveolar anomalies, unspecified alveolar anomaly
52471	Alveolar maxillary hyperplasia
52472	Alveolar mandibular hyperplasia
52473	Alveolar maxillary hypoplasia
52474	Alveolar mandibular hypoplasia
52475	Vertical displacement of alveolus and teeth
52476	Occlusal plane deviation
52479	Other specified alveolar anomaly
52481	Anterior soft tissue impingement
52482	Posterior soft tissue impingement
52489	Other specified dentofacial anomalies

ICD 9 Code	Description
5249	Unspecified dentofacial anomalies
5250	Exfoliation of teeth due to systemic causes
52510	Acquired absence of teeth, unspecified
52511	Loss of teeth due to trauma
52512	Loss of teeth due to periodontal disease
52513	Loss of teeth due to caries
52519	Other loss of teeth
52520	Unspecified atrophy of edentulous alveolar ridge
52521	Minimal atrophy of the mandible
52522	Moderate atrophy of the mandible
52523	Severe atrophy of the mandible
52524	Minimal atrophy of the maxilla
52525	Moderate atrophy of the maxilla
52526	Severe atrophy of the maxilla
5253	Retained dental root
52540	Complete edentulism, unspecified
52541	Complete edentulism, class I
52542	Complete edentulism, class II
52543	Complete edentulism, class III
52544	Complete edentulism, class IV
52550	Partial edentulism, unspecified
52551	Partial edentulism, class I
52552	Partial edentulism, class II
52553	Partial edentulism, class III
52554	Partial edentulism, class IV
52560	Unspecified unsatisfactory restoration of tooth
52561	Open restoration margins
52562	Unrepairable overhanging of dental restorative materials
52563	Fractured dental restorative material without loss of material
52564	Fractured dental restorative material with loss of material
52565	Contour of existing restoration of tooth biologically incompatible with oral health
52566	Allergy to existing dental restorative material
52567	Poor aesthetics of existing restoration
52569	Other unsatisfactory restoration of existing tooth
52571	Osseointegration failure of dental implant
52572	Post-osseointegration biological failure of dental implant
52573	Post-osseointegration mechanical failure of dental implant
52579	Other endosseous dental implant failure
5258	Other specified disorders of the teeth and supporting structures
5259	Unspecified disorder of the teeth and supporting structures
5260	Developmental odontogenic cysts
5261	Fissural cysts of jaw
5262	Other cysts of jaws
5263	Central giant cell (reparative) granuloma
5264	Inflammatory conditions of jaw
5265	Alveolitis of jaw
52661	Perforation of root canal space
52662	Endodontic overfill

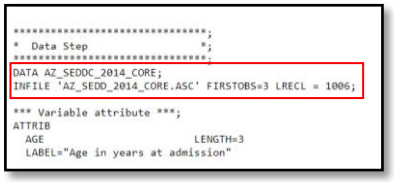
ICD 9 Code	Description
52663	Endodontic underfill
52669	Other periradicular pathology associated with previous endodontic treatment
52681	Exostosis of jaw
52689	Other specified diseases of the jaws
5269	Unspecified disease of the jaws
5270	Atrophy of salivary gland
5271	Hypertrophy of salivary gland
5272	Sialoadenitis
5273	Abscess of salivary gland
5274	Fistula of salivary gland
5275	Sialolithiasis
5276	Mucocele of salivary gland
5277	Disturbance of salivary secretion
5278	Other specified diseases of the salivary glands
5279	Unspecified disease of the salivary glands
52800	Stomatitis and mucositis, unspecified
52801	Mucositis (ulcerative) due to antineoplastic therapy
52802	Mucositis (ulcerative) due to other drugs
52809	Other stomatitis and mucositis (ulcerative)
5281	Cancrum oris
5282	Oral aphthae
5283	Cellulitis and abscess of oral soft tissues
5284	Cysts of oral soft tissues
5285	Diseases of lips
5286	Leukoplakia of oral mucosa, including tongue
52871	Minimal keratinized residual ridge mucosa
52872	Excessive keratinized residual ridge mucosa
52879	Other disturbances of oral epithelium, including tongue
5288	Oral submucosal fibrosis, including of tongue
5289	Other and unspecified diseases of the oral soft tissues
5290	Glossitis
5291	Geographic tongue
5292	Median rhomboid glossitis
5293	Hypertrophy of tongue papillae
5294	Atrophy of tongue papillae
5295	Plicated tongue
5296	Glossodynia
5298	Other specified conditions of the tongue
5299	Unspecified condition of the tongue
78492	Jaw pain
87343	Open wound of lip, without mention of complication
87344	Open wound of jaw, without mention of complication
87349	Open wound of other and multiple sites of face, without mention of complication
87350	Open wound of face, unspecified site, complicated
87351	Open wound of cheek, complicated
87352	Open wound of forehead, complicated
87353	Open wound of lip, complicated
87354	Open wound of jaw, complicated

ICD 9 Code	Description
87359	Open wound of other and multiple sites of face, complicated
87360	Open wound of mouth, unspecified site, without mention of complication
87361	Open wound of buccal mucosa, without mention of complication
87362	Open wound of gum (alveolar process), without mention of complication
87363	Open wound of tooth (broken) (fractured) (due to trauma), without mention of complication
87364	Open wound of tongue and floor of mouth, without mention of complication
87365	Open wound of palate, without mention of complication
87369	Open wound of other and multiple sites of mouth, without mention of complication
87370	Open wound of mouth, unspecified site, complicated
87371	Open wound of buccal mucosa, complicated
87372	Open wound of gum (alveolar process), complicated
87373	Open wound of tooth (broken) (fractured) (due to trauma), complicated
87374	Open wound of tongue and floor of mouth, complicated
87375	Open wound of palate, complicated
87379	Open wound of other and multiple sites of mouth, complicated
V523	Fitting and adjustment of dental prosthetic device
V534	Fitting and adjustment of orthodontic devices
V585	Orthodontics aftercare
V722	Dental examination

Appendix 4: Sample SAS Code for SEDD Analysis

To assist states with the process of generating the ED-NTDC indicators, ASTDD is providing sample SAS code. If you are using SPSS or Stata you will need to modify the code accordingly. ***IMPORTANT: All states should review and revise the sample code to meet their individual needs.*** States may have multiple SEDD files for a given year, but the data needed for the recommended ED-NTDC indicators are in the core file. Following are instructions on how to load the core file into your statistical package.

- Go to the HCUP website: https://www.hcup-us.ahrq.gov/db/state/sedddbdocumentation.jsp
- Scroll down to "File Specifications and Load Programs". Click on the load program link for the statistical software package you will be using (SAS, SPSS, Stata). This example uses SAS.
    - Select the state and year you want to download
    - For the database option select SEDD
    - Click "Find"
    - A set of load programs for your state and year will appear at the bottom of the page
    - Select "Core SAS load program" and save to your hard drive
- After saving the load program, insert the correct file address and name for your state "core.asc" file in the code line at the beginning of the Data Step
- Run the load program and the core.asc file will be loaded into SAS



```
*******************************;
*  Data Step                  *;
*******************************;
DATA AZ_SEDDC_2014_CORE;
INFILE 'AZ_SEDD_2014_CORE.ASC' FIRSTOBS=3 LRECL = 1006;

*** Variable attribute ***;
ATTRIB
  AGE                         LENGTH=3
  LABEL="Age in years at admission"
```

Sample SAS Code

NOTE: Before using this code you should change the "set" file name to match the name and location of your data file. ***All states should review and revise the sample code to meet their individual needs.***

Coding for recommended indicator #1, ED visit for NTDC based on **first listed diagnosis. This coding is for **pre-2015** data sets with ICD-9 diagnostic codes. For 2015 datasets, both ICD-9 and ICD-10 codes should be included.*

```
data StateCore; set StateCore;
NTDC_dx1=0; *set variable to 0 and then change to 1 if first DX variable has an NTDC code;
If DX1 in ('5200', '5201', '5202', '5203', '5204', '5205', '5206', '5207', '5208', '5209', '52100', '52101',
'52102', '52103', '52104', '52105', '52106', '52107', '52108', '52109', '52110', '52111', '52112',
'52113', '52114', '52115', '52120', '52121' '52122', '52123', '52124', '52125', '52130', '52131',
'52132', '52133', '52134', '52135', '52140', '52141', '52142', '52149', '5215', '5216', '5217',
'52181', '52189', '5219', '5220', '5221', '5222', '5223', '5224', '5225', '5226', '5227', '5228',
'5229', '52300', '52301', '52310', '52311', '52320', '52321', '52322', '52323', '52324', '52325',
'52330', '52331', '52332', '52333', '52340', '52341', '52342', '5235', '5236', '5238', '5239',
'52400', '52401', '52402', '52403', '52404', '52405', '52406', '52407', '52409', '52410', '52411',
'52412', '52419', '52420', '52421', '52422', '52423', '52424', '52425', '52426', '52427', '52428',
'52429', '52430', '52431', '52432', '52433', '52434', '52435', '52436', '52437', '52439', '5244',
'52450', '52451', '52452', '52453', '52454', '52455', '52456', '52457', '52459', '52460', '52461',
'52462', '52463', '52464', '52469', '52470', '52471', '52472', '52473', '52474', '52475', '52476',
'52479', '52481', '52482', '52489', '5249', '5250', '52510', '52512', '52513', '52519', '52520',
'52521', '52522', '52523', '52524', '52525', '52526', '5253', '52540', '52541', '52542', '52543',
'52544', '52550', '52551', '52552', '52553', '52554', '52560', '52561', '52562', '52563', '52564',
'52565', '52566', '52567', '52569', '52571', '52572', '52573', '52579', '5258', '5259', '5260',
'5261', '5262', '5263', '5264', '5265', '52661', '52662', '52663', '52669', '52681', '52689',
'5269', '5270', '5271', '5272', '5273', '5274', '5275', '5276', '5277', '5278', '5279', '52800',
'52801', '52802', '52809', '5281', '5282', '5283', '5284', '5285', '5286', '52871', '52872',
'52879', '5288', '5289', '5290', '5291', '5292', '5293', '5294', '5295', '5296', '5298', '5299',
```

'78492', '7924', 'V523', 'V534', 'V585', 'V722', 'V723')
then NTDC_dx1=1;
run;

Coding for recommended indicator #1, ED visit for NTDC based on **first listed diagnosis. This coding is for **post-2015** data sets with ICD-10 diagnostic codes. For 2015 datasets, both ICD-9 and ICD-10 codes should be included.*

```
data StateCore; set StateCore;
NTDC_dx1=0; *set variable to 0 and then change to 1 if first I10_DX variable has an NTDC code;
If I10_DX1 in ('A690', 'K000', 'K001', 'K002', 'K003', 'K004', 'K005', 'K006', 'K007', 'K008', 'K009', 'K010', 'K011',
'K023', 'K0251', 'K0261', 'K0262', 'K0263', 'K027', 'K029', 'K030', 'K031', 'K032', 'K033', 'K034',
'K035', 'K036', 'K037', 'K0381', 'K0389', 'K039', 'K040', 'K041', 'K042', 'K043', 'K044', 'K045', 'K046',
'K047', 'K048', 'K0490', 'K0499', 'K0500', 'K0501', 'K0510', 'K0511', 'K0520', 'K0521', 'K0522',
 'K0530', 'K0531', 'K0532', 'K0540', 'K055', 'K056', 'K060', 'K061', 'K080', 'K08101', 'K08102',
 'K08103', 'K08104', 'K08109', 'K0820', 'K0821', 'K0822', 'K0823', 'K0824', 'K0825', 'K0826', 'K083',
'K08401', 'K08402', 'K08403', 'K08404', 'K08409', 'K08429', 'K08439', 'K08499', 'K0850', 'K0851',
 'K0852', 'K08530', 'K08531', 'K0854', 'K0855', 'K0856', 'K0859', 'K088', 'K089', 'K090', 'K091',
'K098', 'K110', 'K111', 'K1120', 'K113', 'K114', 'K115', 'K116', 'K117', 'K118', 'K119', 'K120', 'K121',
'K122', 'K1230', 'K1231', 'K1232', 'K1233', 'K1239', 'K130', 'K1321', 'K1322', 'K1323', 'K1329', 'K135',
'K1370', 'K1379', 'K140', 'K141', 'K142', 'K143', 'K144', 'K145', 'K146', 'K148', 'K149', 'M2600', 'M2601',
'M2602', 'M2603', 'M2604', 'M2605', 'M2606', 'M2607', 'M2609', 'M2610', 'M2611', 'M2612',
'M2619', 'M2620', 'M26211', 'M26212', 'M26213', 'M26220', 'M26221', 'M2623', 'M2624', 'M2625',
'M2629', 'M2630', 'M2631', 'M2632', 'M2633', 'M2634', 'M2635', 'M2636', 'M2637', 'M2639', 'M264',
'M2650', 'M2651', 'M2652', 'M2653', 'M2654', 'M2655', 'M2656', 'M2657', 'M2659', 'M2660', 'M2661',
'M2662', 'M2663', 'M2669', 'M2670', 'M2671', 'M2672', 'M2673', 'M2674', 'M2679', 'M2681', 'M2682',
'M2689', 'M269', 'M271', 'M272', 'M273', 'M2749', 'M2751', 'M2752', 'M2753', 'M2759', 'M2761',
'M2762', 'M2763', 'M2769', 'M278', 'M279', 'R682', 'R6884', 'R859', 'Z0120', 'Z0121', 'Z463', 'Z464')
then NTDC_dx1=1;
run;
```

Coding for recommended indicator #2, ED visit for NTDC based on **any listed diagnosis. This coding is for **pre-2015** data sets with ICD-9 diagnostic codes. For 2015 datasets, both ICD-9 and ICD-10 codes should be included. NOTE: SEDD has variables for up to 25 diagnoses.*

```
data StateCore; set StateCore;
array  DX{25} DX1--DX25;
NTDC_dx_any=0; *set variable to 0 and then change to 1 if any DX variables have an NTDC code;
Do i=1 to 25;
if DX{i} in (insert ICD-9 codes listed for recommended indicator #1)
then NTDC_dx_any=1;
end;
run;
```

Coding for recommended indicator #2, ED visit for NTDC based on **any listed diagnosis. This coding is for **post-2015** data sets with ICD-10 diagnostic codes. For 2015 datasets, both ICD-9 and ICD-10 codes should be included. NOTE: SEDD has variables for up to 25 diagnoses.*

```
data StateCore; set StateCore;
array DX{25} I10_DX1—I10_DX25;
NTDC_dx_any=0; *set variable to 0 and then change to 1 if any I10_DX variables have an NTDC code;
```

Do i=1 to 25;
if DX{i} in (***insert ICD-10 codes listed for recommended indicator #1***)
then NTDC_dx_any=1;
end;
run;

Coding for recommended indicator #3, ED visit for NTDC based on **first listed reason for visit. This coding is for **pre-2015** data sets with ICD-9 diagnostic codes. For 2015 datasets, both ICD-9 and ICD-10 codes should be included.*

data StateCore; set StateCore;
NTDC_RsnVis1=0;
If DX_Visit_Reason1 in (***insert ICD-9 codes listed for recommended indicator #1***)
then NTDC_RsnVis1=1;
run;

Coding for recommended indicator #3, ED visit for NTDC based on **first listed reason for visit. This coding is for **post-2015** data sets with ICD-10 diagnostic codes. For 2015 datasets, both ICD-9 and ICD-10 codes should be included.*

data StateCore; set StateCore;
NTDC_RsnVis1=0;
If I10_Visit_Reason1 in (***insert ICD-10 codes listed for recommended indicator #1***)
then NTDC_RsnVis1=1;
run;

Coding for recommended indicator #4, ED visit for NTDC based on **any listed reason for visit. This coding is for **pre-2015** data sets with ICD-9 diagnostic codes. For 2015 datasets, both ICD-9 and ICD-10 codes should be included. NOTE: SEDD has variables for up to 3 reasons for visit.*

data StateCore; set StateCore;
array rsn{3} DX_Visit_Reason1--DX_Visit_Reason3;
NTDC_RsnVis_any=0; *set variable to 0 and then change to 1 if any DX_Visit_ReasonN variables have an NTDC code;
Do i=1 to 3;
if rsn{i} in (***insert ICD-9 codes listed for recommended indicator #1***)
then NTDC_RsnVis_any=1;
end;
run;

Coding for recommended indicator #4, ED visit for NTDC based on **any listed reason for visit. This coding is for **post-2015** data sets with ICD-10 diagnostic codes. For 2015 datasets, both ICD-9 and ICD-10 codes should be included. NOTE: SEDD has variables for up to 3 reasons for visit.*

data StateCore; set StateCore;
array rsn{3} I10_Visit_Reason1—I10_Visit_Reason3;
NTDC_RsnVis_any=0; *set variable to 0 and then change to 1 if any I10_Visit_ReasonN variables have an NTDC code;
Do i=1 to 3;
if rsn{i} in (***insert ICD-10 codes listed for recommended indicator #1***)

```
then NTDC_RsnVis_any=1;
end;
run;
```

Coding for recommended indicator #5, ED visit for NTDC based on **any listed diagnosis and/or any listed reason for visit.*

```
data StateCore; set StateCore;
NTDC_DXorRsn=0;
if NTDC_dx_any=1 or NTDC_RsnVis_any=1 then NTDC_DXorRsn=1;
run;
```

**To generate counts for the five indicators.*

```
proc freq data = StateCore;
tables NTDC_dx1 NTDC_dx_any NTDC_RsnVis1 NTDC_RsnVis_any NTDC_DXorRsn;
run;
```

To generate rate per 100,000 population. NOTE: This is **not SAS code.*

(indicator count/population estimate) * 100,000
Example: First diagnosis NTDC count is 36,188, state population estimate is 4,400,477
Rate of ED NTDC visits per 100,000 population = (36,188 / 4,400,477) * 100,000 = 822.4 per 100,000 population

To generate rate per 10,000 ED visits. NOTE: This is **not SAS code.*

(indicator count / total ED visit count) * 10,000
Example: First diagnosis NTDC count is 36,188, total ED visit count is 2,036,780
rate of ED NTDC per 10,000 ED visits = (36,188 / 2,036,780) * 10,000 = 177.7 per 10,000 ED visits

**To generate total charges, use the following SAS code. The first diagnosis indicator is used in this example.*

```
proc means data=StateCore mean median min max stddev sum;
var totchg;
where NTDC_dx1=1;
run;
```

**For recommended stratified analyses by age group, race/ethnicity, and primary payer, use variables AGE, PAY1, and RACE.*

```
data StateCore; set StateCore;
if age lt 20 then agecat=1;
if age ge 20 and age lt 45 then agecat=2;
if age ge 45 and age lt 65 then agecat=3;
if age ge 65 then agecat=4;
run;

PROC FORMAT; *to format primary payer, race, and new age category variables;
value agec 1='<20 years' 2='20-44 years' 3='45-64 years' 4='65 or more years';
value pay 1='Medicare' 2='Medicaid' 3='Private' 4='Self Pay' 5='No charge' 6='Other';
```

```
value rac 1='white' 2='black' 3='Hispanic' 4='Asian/PacIsl' 5='NatAmer' 6='Other';
value yn 0='No' 1='Yes';
run;
```

**Example - stratified analysis for NTDC first diagnosis indicator.*

```
proc freq data=StateCore;
tables agecat pay1 race;
where NTDC_dx1=1;
format agecat agec. pay1 pay. race rac.;
run;
```

**Example - to compare NTDC=yes vs. NTDC=no stratified analysis for NTDC first diagnosis.*

```
proc freq data=StateCore;
tables NTDC_dx1*(agecat pay1 race);
format agecat agec. pay1 pay. race rac. NTDC_dx1 yn.;
run;
```

For the two optional indicators: 1) CPP (Caries, Periodontal, Preventive) and 2) any oral/dental conditions, do analyses as above with the following sets of codes :

CPP ICD-9 codes

'52100', '52101', '52102', '52103', '52104', '52105', '52106', '52107', '52108', '52109', '52181', '52189', '5219', '5220', '5221', '5222', '5224', '5225', '5226', '5227', '5229', '52300', '52301', '52310', '52311', '52320', '52321', '52322', '52323', '52324', '52325', '52330', '52331', '52332', '52333', '52340', '52341', '52342', '5235', '5236', '5238', '5239', '52512', '52513', '52519', '52550', '52551', '52552', '52553', '52554', '52560', '52561', '52562', '52563', '52564', '52565', '52566', '52567', '52569', '52571', '52572', '52573', '52579', '5258', '5259', '52661', '52662', '52663', '52669', '78492', 'V523', 'V534', 'V585', 'V722' 'V723'

CPP ICD-9 codes

'K029', 'K0261', 'K0262', 'K0263', 'K023', 'K0389', 'K0251', 'K0261', 'K027', 'K0381', 'K0389', 'K039', 'K040' 'K041', 'K042', 'K044', 'K047', 'K045', 'K046', 'K0490', 'K0499', 'K0500', 'K0501', 'K0510', 'K0511', 'K060', 'K0520', 'K0521', 'K0522', 'K0530', 'K0531', 'K0532', 'K0540', 'K036', 'K055', 'K061', 'K056', 'K08429', 'K08439', 'K08499', 'K08409', 'K08401', 'K08402', 'K08403', 'K08404', 'K0850', 'K0851', 'K0852', 'K08530', 'K08531', 'K0854', 'K0855', 'K0856', 'K0859', 'M2761', 'M2762', 'M2763', 'M2769', 'K088', 'K089', 'M2751', 'M2752', 'M2753', 'M2759', 'R6884', 'Z463', 'Z464', 'Z0120', 'Z0121'

Any Oral Dental Condition ICD-9 codes

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Any Oral Dental Condition ICD-10 codes

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Appendix 5: Recommended and Optional ED Oral Care Surveillance Indicators Analysis Grid

Based on ICD-9 and ICD-10 diagnostic codes, ASTDD has created three broad categories for ***ED visits due to oral conditions***: (1) non-traumatic dental conditions (NTDC); (2) caries, periodontal, and preventive conditions/procedures (CPP); and 3) any oral/dental related condition. NTDC includes caries, periodontal disease, erosion, occlusal anomalies, cysts, impacted teeth, teething, and all other non-traumatic conditions associated with the oral cavity. Any diagnoses that are deemed due to trauma are excluded from this definition. CPP includes only those conditions directly associated with dental caries, periodontal disease, or preventive procedures associated with these diseases that are routinely provided in the dental private practice or dental clinic setting. CPP would include diagnoses related to dental caries, gingival and periodontal conditions, loss of teeth (not due to trauma), endodontic conditions, and caries and periodontal related preventive procedures. The codes for NTDC are a subset of all oral/dental related codes, and the codes for CPP are a subset of the NTDC codes. Refer to the ICD-9 / ICD-10 Conversion Table listing of all oral/dental related condition diagnoses (including trauma related), and the specific subsets of ICD-9 and ICD-10 codes defining NTDC and CPP conditions.

Analyzing an ED database will allow you to evaluate a multitude of oral health indicators. Because the total number of indicators can be overwhelming, ASTDD has developed a core or foundational set of indicators to include in a state ED-NTDC surveillance system. We also include optional indicators that states may want to evaluate in addition to the core set. We encourage states to expand their ED-NTDC surveillance to include some of these suggested optional indicators or other indicators that a state may determine to be of interest based on the needs and resources of the individual state.

Recommended Indicator	Recommended Reporting *Count, Rate per 100,000 Population, Rate per 10,000 ED Visits, Charges (if available)*	SEDD Variables for Classifying NTDC ICD-9 (ICD-10)
1. ED visit for NTDC based on *first listed diagnosis*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DX1 (I10_DX1) Include only the 1st DX
2. ED visit for NTDC based on *any listed diagnosis*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DXn (I10_DXn) Include all listed DXs
3. ED visit for NTDC based on *first listed reason for visit*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DX_Visit_Reason1 (I10_Visit_Reason1) Include only the 1st reason
4. ED visit for NTDC based on *any listed reason for visit*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DX_Visit_Reasonn (I10_Visit_Reasonn) Include all listed reasons
5. ED visit for NTDC based on *any listed diagnosis and/or any listed reason for visit (most inclusive)*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DXn (I10_DXn) DX_Visit_Reasonn (I10_Visit_Reasonn) Include all listed DXs and all listed reasons

Optional Indicator	Recommended Reporting *Count, Rate per 100,000 Population, Rate per 10,000 ED Visits, Charges (if available)*	SEDD Variables for Classifying CPP and All Oral Conditions ICD-9 (ICD-10)
6. ED visit for CPP based on *first listed diagnosis*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DX1 (I10_DX1) Include only the 1st DX
7. ED visit for CPP based on *any listed diagnosis*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DXn (I10_DXn) Include all listed DXs
8. ED visit for CPP based on *first listed reason for visit*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DX_Visit_Reason1 (I10_Visit_Reason1) Include only the 1st reason
9. ED visit for CPP based on *any listed reason for visit*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DX_Visit_Reasonn (I10_Visit_Reasonn) Include all listed reasons
10. ED visit for CPP based on *any listed diagnosis and/or any listed reason for visit (most inclusive)*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DXn (I10_DXn) DX_Visit_Reasonn (I10_Visit_Reasonn) Include all listed DXs and all listed reasons
11. ED visit for any oral/dental condition based on *first listed diagnosis*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DX1 (I10_DX1) Include only the 1st DX
12. ED visit for any oral/dental condition based on *any listed diagnosis*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DXn (I10_DXn) Include all listed DXs
13. ED visit for any oral/dental condition based on *first listed reason for visit*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DX_Visit_Reason1 (I10_Visit_Reason1) Include only the 1st reason
14. ED visit for any oral/dental condition based on *any listed reason for visit*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DX_Visit_Reasonn (I10_Visit_Reasonn) Include all listed reasons
15. ED visit for any oral/dental condition based on *any listed diagnosis and/or any listed reason for visit (most inclusive)*	Overall, where possible stratified by age (< 1, 1-17, 18-44, 45-64, 65-84, 85+), primary payer (Medicare, Medicaid, private insurance, uninsured, other) and if available race/ethnicity	DXn (I10_DXn) DX_Visit_Reasonn (I10_Visit_Reasonn) Include all listed DXs and all listed reasons

Stratification Variables	Recommended Reporting *Count, Rate per 100,000 Population, Rate per 10,000 ED Visits, Charges (if available)*	SEDD Variables for Classifying CPP and All Oral Conditions ICD-9 (ICD-10)
Recommended Stratification Variables (shown above)	Age, Primary Payer, Race/Ethnicity (if available)	AGE or AGEGROUP, PAY1, RACE
Optional Stratification Variables for Additional Analyses	Sex, Marital Status, Geographic Location (zip code), Homelessness, Weekend Admission, Income (community level),	FEMALE, MARITALSTATUSUB04, ZIP, Homeless, AWEEKEND, ZIPINC_QRTL

Other	Recommended Reporting *Count, Rate per 100,000 Population, Rate per 10,000 ED Visits, Charges (if available)*	SEDD Variables for Classifying CPP and All Oral Conditions ICD-9 (ICD-10)
Additional SEDD Analyses to Consider	Patient Revisits for Same Condition (if states have variables) Trend Analyses	VisitLink and DaysToEvent outcomes over multiple years (using year datasets for range of interest)

SEDD data element for charges (if available): TOTCHG

US Census Bureau State Population Estimates for Years 2010 – 2016 – for calculating prevalence per 100,000 population:
https://www2.census.gov/programs-surveys/popest/tables/2010-2016/state/totals/nst-est2016-01.xlsx
Note: ZIP variable for subject zip code can be used to link to other data, e.g. urban/rural status (RUCA), DHPSA data, census data, etc.

APPENDIX 6: COMMUNICATION PLAN: GOAL-SPECIFIC
Emergency Department Oral Care Surveillance Project

Problem Statement	As part of building a comprehensive national oral health measurement system, data are needed to monitor dental care, and more specifically non-traumatic (preventable) dental care (NTDC), provided in emergency departments(EDs). Past methods of collecting data and conducting research have used different data sources, to assess different target populations with varying research methods, outcomes of interest, predictive factors, and different definitions (different sets of codes) of dental care and NTDC.
Goal	To develop, disseminate, and promote use of standardized research, surveillance, and reporting protocols for ED dental care, with a focus on state level data and surveillance. Standardized methods will enable comparisons and trend tracking among states
Target Audience(s)	1) State oral health programs; 2) state Medicaid agencies; 3) federal agencies and organizations addressing dental, medical, hospital and health care access issues; 4) third party payers; and others interested in surveillance efforts to establish levels of non-traumatic dental care being provided in emergency departments.
Objectives	1) Develop an ICD-9/ICD-10 crosswalk file for dental code translation. 2) Develop uniform definitions for dental care and NTDC provided in EDs, including codes sets for both ICD-9 and ICD-10 coding systems. 3) Develop recommended primary surveillance outcome measures for ED dental care, and the methods for generating these outcome measures from common data sources. 4) Develop recommended protocol for predictive/control factors to use in assessment of ED dental care outcomes.
Key Messages	1) Consistency in research protocol is important for nation-wide surveillance of ED dental care. 2) Consistency in research protocol will enable between-state comparisons and over-time trend analysis of ED dental care 3) Use of recommended protocols will contribute to efforts for standardized surveillance data repositories of state level oral health data.
Planned Channels and Materials	Post report and summary guideline documents to website; announce to ASTDD members/SOHPs and national partners via weekly digest with website link; presentations at NOHC and other meetings.
Plan for Pre-testing Messages and Materials	Materials are reviewed by a project workgroup of subject experts, as well as ASTDD staff and consultants.
Planned Activities and Timelines	Workgroup conference calls and an in-person meeting. Planning conference calls to be held in June/July 2016. The in-person meeting to be held in Washington D.C. in November, 2016. Protocol materials to be circulated among workgroup members by May, 2017. Final protocol documents to be completed by June, 2017.
Evaluation Design, Methods and Measures	# of ASTDD website hits; annual member and partner surveys and any targeted queries regarding use and changes in procedures and outcomes. If resources are available, a formal assessment and evaluation of use of the guideline methods

	and the impact of their use might be conducted in the future.
Responsible Parties and Partnerships	Michael Manz is the lead on the project. The project workgroup provides input and feedback in materials development. ASTDD staff and consultants provide input and editing for final documents.
Budget/Resources Needed	Consultant time, support materials, travel for in-person workgroup meeting. Funded by grant from DQF.
Protocol for Review and Approval	ASTDD staff and consultants will review for final development. ASTDD BOD provides final approval. DentaQuest will review and provide feedback as appropriate.
Progress Notes: circulating materials to receive and incorporate feedback from expert workgroup.	