



# Appendix

## Methodology<sup>1</sup>

### Data Sources

Findings from the *Faces of Medicaid* data brief, [Examining Oral Health Care Utilization and Expenditures for Low-Income Adults](#),<sup>2</sup> are based on analyses of Medicaid Analytic eXtract (MAX) data from 2011, which include data for fee-for-service (FFS) and managed care claims for 44 states.<sup>3</sup> Demographic and eligibility information were derived from the MAX person summary files. Community characteristics<sup>4</sup> (region, urban influence, high poverty) and health resources (number of primary physicians per 1,000 residents, number of dentist per 1,000 residents, and number of federally qualified health centers per 1,000 residents) were extracted from the Area Health Resources Files (AHRF) 2015 file and linked to MAX data by state and county code. Information on state-level Medicaid adult dental coverage was gathered from published sources.<sup>5,6</sup>

### Study Population and Design

A total of 16,188,925 beneficiaries were eligible for this study; all of them were ages 21 to 64 and had no restricted Medicaid eligibility. Three sub-populations were identified by diagnosis code or care setting in which services were provided: (1) pregnant women; (2) the intellectually/developmentally disabled; and (3) nursing facility residents.

Outpatient dental services were identified by category of service (Exhibit 1), using procedure codes in the MAX other services claims file.

### EXHIBIT 1: Categories of Outpatient Dental Services and Procedure Codes

Category of Service	Procedure Codes
Diagnostic	D0100 - D0999
Preventive	D1000 - D1999
Restorative	D2000 - D2999
Endodontics	D3000 - D3999
Periodontics	D4000 - D4999
Prosthodontics-removable	D5000 - D5899
Maxillofacial prosthetics	D5900 - D5999
Implant services	D6000 - D6199
Prosthodontics-fixed	D6200 - D6999
Oral and maxillofacial surgery	D7000 - D7999
Orthodontics	D8000 - D8999
Adjunctive general services	D9000 - D9999

Avoidable hospital inpatient and emergency department (ED) dental services were identified by diagnosis code and place of service code in MAX inpatient and outpatient claims files. Utilization and expenditures for outpatient and avoidable hospital inpatient and ED dental services — or ambulatory care-sensitive conditions (ACS) were calculated. ACS are conditions for which effective outpatient care could prevent the need for hospital-based services, or for which early intervention can prevent complications to more severe disease.<sup>7</sup> This study looked at ACS associated with dental-related conditions and the ICD-9-CM discharge diagnostic codes corresponding to dental-related ACS. Codes ranged from 521.0 - 523.9, 524.3 - 524.6, 525.0 - 525.9, 526.4 - 526.5, 528.0 - 529.0.<sup>8</sup>



The total number of distinct service utilizers, total claimed services, and costs were measured for each type of outpatient dental service, and for inpatient hospital and ED dental services. The numbers of utilizers and services were also calculated by: state, the state’s category of dental coverage for Medicaid-enrolled adults, and the length of time that coverage had been in place in each state. The percentage of service utilizers among total beneficiaries, as well as the mean number of services and expenditures for each user, were also calculated. Beneficiaries were categorized by type of service used for further statistical analysis.

### Statistical Analysis<sup>9</sup>

Predicted probability of using a dental service and expected dental expenditures for a beneficiary were estimated using regression analysis. Predictors included: (1) demographics [age group, gender, race group]; (2) Chronic Illness and Disability Payment System [CDPS] diagnostic classification [19 categories]; (3) community characteristics; and (4) state Medicaid adult dental benefit coverage [2011]. (Exhibit 2).

#### EXHIBIT 2: Variables of Analysis, *Faces of Medicaid Adult Oral Health*

Variable Category	Values
<b>Demographics</b>	
Age group (years)	21 - 34; 35 - 44; 45 - 64
Gender	Male; Female; Unknown
Race group	White; Black or African-American; American Indian or Alaskan Native; Asian; Hispanic/Latino + one or more races; More than one race; Other; Unknown
<b>CDPS Diagnostic Classification</b>	
Chronic illness/disability categories	Cancer; Cardiovascular; Central nervous system; Cerebrovascular; Developmental disability; Diabetes; Eye; Gastrointestinal; Genital; Hematologic; Infectious disease; Metabolic; Psychiatric; Pulmonary; Renal; Skeletal and connective; Skin; Substance abuse
<b>Community Characteristics</b>	
Urban influence	Noncore; Micropolitan; Small metro area; Large metro area
Region	Midwest; Northeast; South; West
Health professional shortage area designation	Yes; No
Dentists per 1,000 residents	0 - 0.45; 0.46 - 0.61; 0.62 - 0.75; 0.76 - 3.80
<b>State Medicaid Adult Dental Benefit Coverage</b>	
State benefits grouped by oral health care comprehensiveness in 2011	<b>Extensive:</b> AK, CT, DC, ID, KY, MI, NJ, NM, NY, ND, PA, SD, WI <b>Limited:</b> AR, FL, IL, IN, IA, LA, ME, MA, MN, MT, NE, NC, OH, OR, RI <b>Emergency-only:</b> GA, HI, KS, MD, MS, NV, NH, OK, SC, TN, WV, WY <b>None:</b> AL, AZ, CA, CO, DE, MO, TX, UT, VT, VA, WA

Sensitivity analysis without health resources predictors was also performed to confirm the robustness and validity of analysis. The average predicted probabilities of dental service use by state dental coverage were calculated. Average predicted probabilities of urban influence, and quartile of dentist density per 1,000 residents, were estimated similarly.



## Study Limitations

This study had a number of limitations:

1. **The study did not include data from six states**, as these were not available at the time of the analyses. Nothing suggests that together these states are qualitatively different from the 44 included in the study, so it is reasonable to expect the exclusion of these states did not significantly alter study results.
2. **Managed care claims data do not specify the cost of the service.** Thus, mean expenditures could only be calculated for services reimbursed through FFS payment models, which were present in 42 states,<sup>10</sup> and represented 69 percent of all claims for services delivered. Treatment expenditures for encounters were estimated based on FFS data and credited by procedure code for managed care encounters.
3. **In contrast to the study's 2011 claims and expenditure data, measures of urban influence were based on 2013 data, and measures of high poverty were based on 2014 data** — both extracted from the AHRF 2015 file. This was because the AHRF “Urban Influence Code” is updated every 10 years, and 2013 data were the closest to the study year; the “High Poverty Typology Code” was newly added to the AHRF and was not available in 2011.<sup>11</sup> While the study years of these AHRF datasets differed from that of the utilization and expenditure data, the authors presume that they are relatively stable over time, so that their use in identifying associations in 2011 is still valid.
4. **The study did not analyze length of individuals' Medicaid enrollment.** It is reasonable that utilization and expenditures vary as length of enrollment grows — perhaps with pent-up demand at the onset of enrollment leading to greater utilization and costs with shorter enrollment periods. The absence of that analysis in this study, however, prevented exploration of that potential effect. It also did not exclude beneficiaries who did not meet continuous-enrollment requirements: all claims for non-elderly, adult Medicaid beneficiaries with any length of enrollment in 2011 were included.
5. **As the study period preceded Medicaid eligibility expansions under the Affordable Care Act, the study population was qualitatively different than that in states that expanded eligibility starting in 2014.** Specifically, childless adults meeting state income eligibility requirements were absent from the study population; therefore, efforts to extrapolate findings to project utilization and expenditures for adult Medicaid beneficiaries in Medicaid-expansion states from this point forward should take this into account.
6. **There were some inconsistencies in state coverage category for the following no-coverage states: California, Missouri and Texas.** MAX file data included processed claims for these three states despite their lack of coverage. By comparison, no claims were reimbursed in other no-coverage states. This inconsistency may be due to delays in claims processing or benefit coverage for special populations such as pregnant women.
7. **Presently, and in 2011, dental claims do not require diagnoses codes, therefore the study could not associate service use with specific diagnoses;** nor identify reasons that led beneficiaries to seek dental treatment, the prevalence/severity of dental disease, or the recurrent nature of a specific dental problem.
8. **The study examined county-level data based on a beneficiary's county of residence, not place of service.** County-level data are a limited proxy for community factors, as health resources (e.g., oral health care providers) can be accessed by residents across large geographic areas.



## ABOUT THE CENTER FOR HEALTH CARE STRATEGIES

The Center for Health Care Strategies (CHCS) is a nonprofit policy center dedicated to improving the health of low-income Americans. It works with state and federal agencies, health plans, providers, and consumer groups to develop innovative programs that better serve people with complex and high-cost health care needs. For more information, visit [www.chcs.org](http://www.chcs.org).

## ADDITIONAL RESOURCES

Since 2000, CHCS' *Faces of Medicaid series* has shed light on the prevalence of specific conditions among Medicaid beneficiaries, patterns of service use, and costs. By better understanding the Medicaid population, states and health plans can identify new opportunities to improve care, enhance health outcomes, and control spending. To learn more, visit [www.chcs.org/faces-of-medicaid/](http://www.chcs.org/faces-of-medicaid/).

To explore CHCS' full portfolio of work related to oral health, visit [www.chcs.org/topics/oral-health/](http://www.chcs.org/topics/oral-health/).

## ENDNOTES

<sup>1</sup> This study was approved by the Institutional Review Board (IRB) of the University of California, San Diego, and subject to data use agreement with the Centers for Medicare & Medicaid Services (CMS).

<sup>2</sup> S. Chazin and J. Glover. "Examining Oral Health Care Utilization and Expenditures for Low-Income Adults." Center for Health Care Strategies. November 2017. Available at: <https://www.chcs.org/resource/examining-oral-health-care-utilization-expenditures-low-income-adults/>.

<sup>3</sup> Data for Arizona, Colorado, Hawaii, Idaho, Louisiana, and Maine were not available at the time of the analyses.

<sup>4</sup> The 2015 Area Health Resource File included 2013 urban influence data and 2014 poverty data.

<sup>5</sup> PBS News Hour (November 17, 2011). How Have Medicaid Dental Benefits Changed in Your State? American Dental Association. Available at: <http://www.pbs.org/newshour/rundown/how-have-medicaid-dental-benefits-changed-in-your-state-1/>.

<sup>6</sup> Centers for Medicare & Medicaid Services (2011). Medicaid Managed Care Enrollment Report. Available at: <https://www.medicaid.gov/medicaid-chip-program-information/by-topics/data-and-systems/downloads/2011-medicaid-mc-enrollment-report.pdf>.

<sup>7</sup> Agency for Healthcare Research and Quality (2002). "Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions." Available at: <https://www.ahrq.gov/downloads/pub/ahrqqi/pqiguide.pdf>.

<sup>8</sup> Centers for Medicare & Medicaid Services. ICD-9-CM Diagnosis and Procedure Codes: Abbreviated and Full Code Titles. Available at: <https://www.cms.gov/Medicare/Coding/ICD9ProviderDiagnosticCodes/codes.html>.

<sup>9</sup> Data analyses were generated using SAS software, Version 9.3 of the SAS System for Windows. Copyright © 2002-2010 SAS Institute Inc., Cary, NC, USA.

<sup>10</sup> All claims for dental services in California and Oregon were for encounters. Six states were not included in the analysis.

<sup>11</sup> This code classified a county as high-poverty if 20 percent or more of its residents were poor, as measured by the American Community Survey five-year estimates for 2008-2012. Available at: <https://www.census.gov/programs-surveys/acs/technical-documentation/table-and-geography-changes/2012/5-year.html>.