



Out-of-pocket dental spending and catastrophic dental expenditures among adults with and without dental coverage in the United States

Gasto dental de bolsillo y gasto dental catastrófico en adultos con y sin cobertura dental en Estados Unidos

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Submitted: 24-01-2026 | Revised: 26-03-2026 | Accepted: 30-06-2026 | Published: 18-07-2026

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ABSTRACT

Introduction: Out-of-pocket payments create the largest financial barrier to dental care in the United States, where dental benefits are separate from medical insurance and coverage is incomplete. This study quantified out-of-pocket dental expenditures and catastrophic dental spending among US adults by dental coverage status. **Methods:** Cross-sectional analysis of the 2023 Medical Expenditure Panel Survey Household Component (full-year consolidated file HC-251 and dental visits file HC-248B) among 14,768 adults aged 18 years or older, using survey weights, strata and primary sampling units. Catastrophic dental spending was defined as out-of-pocket dental spending of at least 10% of annual family income, with sensitivity thresholds of 5% and 20%. **Results:** Dental coverage reached 52.1% of adults. Any dental visit was reported by 53.2% of adults with coverage and 34.0% without. Among adults with a visit, mean out-of-pocket dental spending was \$413 with coverage and \$606 without (adjusted geometric mean ratio 0.77, 95% CI 0.68-0.88). Catastrophic spending at the 10% threshold affected 0.4% of adults with coverage and 0.7% without; the unadjusted odds ratio was 0.58 (95% CI 0.37-0.93) and the adjusted odds ratio was 1.21 (95% CI 0.64-2.27). **Conclusions:** Dental coverage is associated with higher utilization and lower out-of-pocket spending among users, but the protective association with catastrophic spending is explained by income and disappears after adjustment, indicating that poverty rather than coverage drives catastrophic dental burden.

Keywords: dental care; insurance, dental; health expenditures; out-of-pocket expenditures; adult; United States.

RESUMEN

Introducción: Los pagos de bolsillo son la mayor barrera financiera a la atención dental en Estados Unidos, donde las prestaciones dentales están separadas del seguro médico. Se cuantificó el gasto dental de bolsillo y el gasto dental catastrófico en adultos según su cobertura dental. **Métodos:** Análisis transversal de la Encuesta de Panel de Gastos Médicos 2023 (archivo consolidado HC-251 y archivo de visitas dentales HC-248B) en 14,768 adultos de 18 años o más, con pesos, estratos y unidades primarias de muestreo. El gasto dental catastrófico se definió como gasto de bolsillo de al menos el 10% del ingreso familiar anual, con sensibilidad del 5% y el 20%. **Resultados:** El 52.1% tenía cobertura dental. El 53.2% con cobertura y el 34.0% sin ella refirieron visita dental. Entre los usuarios, el gasto de bolsillo medio fue de \$413 con cobertura y \$606 sin ella (razón de medias geométricas ajustada 0.77, IC 95% 0.68-0.88). El gasto catastrófico con el umbral del 10% afectó al 0.4% con cobertura y al 0.7% sin ella; la razón de probabilidades no ajustada fue 0.58 (IC 95% 0.37-0.93) y la ajustada 1.21 (IC 95% 0.64-2.27). **Conclusiones:** La cobertura dental se asocia con mayor utilización y menor gasto de bolsillo entre los usuarios, pero la asociación protectora con el gasto catastrófico se explica por el ingreso y desaparece tras el ajuste, lo que indica que la pobreza, más que la cobertura, determina la carga dental catastrófica.

Palabras clave: atención odontológica; seguro odontológico; gastos en salud; gastos de bolsillo; adulto; Estados Unidos.

INTRODUCTION

Dental care presents the highest level of financial barriers among all health care services in the United States.(1) Unlike medical care, adult dental benefits are usually not part of core health insurance. Traditional Medicare excludes routine dental care, Medicaid dental benefits for adults vary from state to state, and commercial plans sell dental coverage separately, frequently with annual maximums and coinsurance that shift the residual cost to the patient.(2) Adults therefore pay for much of their dental care out of pocket, and cost-related avoidance of dental treatment has persisted across decades despite broad coverage gains in medical care.(3) The consequences are clinical as well as financial: adults who defer care because of cost accumulate untreated disease, and unmet dental need attributed to cost has been linked prospectively to incident cardiovascular disease and dementia.(4)

Dental coverage in the United States is concentrated among working-age adults with employer-sponsored private benefits and contracts sharply at retirement, when adults move from Medicaid or employer plans into traditional Medicare without a dental benefit.(5,6) Among Medicare Advantage enrollees, the presence and generosity of dental benefits vary widely and shape whether beneficiaries obtain care.(7,8) Nationally representative studies document persistent socioeconomic and racial gradients in coverage, utilization and cost-related unmet dental need.(4,9,10) Out-of-pocket payments are the dominant financing source for adult dental care and account for a large share of total dental expenditure, a pattern that has held across two decades of survey data.(11,12)

In health financing research, catastrophic health expenditure is conventionally defined as out-of-pocket spending that exceeds 10% of household income or 40% of household capacity to pay.(13,14) The concept distinguishes spending that can be absorbed from spending that threatens a household's standard of living, and it anchors the Sustainable Development Goal indicator of financial protection. Applied to dentistry, studies in low- and middle-income countries show that out-of-pocket dental payments push a measurable fraction of households into catastrophic expenditure.(15-17) Evidence from high-income countries is sparser. In Spain, dental care was the health service that most frequently generated catastrophic household expenditure despite near-universal medical coverage,(18) and older adults in several European countries report dental care as a recurrent source of financial burden.(19) Estimates of catastrophic spending are also sensitive to the recall period, the items included and the threshold selected, which complicates cross-study comparison.(20,21) Two measurement points matter for the United States. First, the denominator in the US literature is usually annual family income rather than household consumption, because income is what survey respondents can report reliably and what public programs use to set cost sharing. Second, because US dental bills are moderate relative to income, the catastrophic measure may capture only the extreme tail of a broader distribution of financial strain.

Despite the size of the US dental market and the active policy debate about adding dental benefits to Medicare and to the essential health benefits, no recent nationally representative estimate has stratified out-of-pocket dental expenditures and catastrophic dental spending by whether adults hold dental coverage. Earlier tabulations of dental expenditure by coverage pre-date the current survey cycle,(11,22) and catastrophic dental spending has not been quantified in the United States with contemporary data. Cost-of-care analyses in the United States have instead concentrated on medical financial hardship among patients with serious illness,(23) leaving the routine dental burden of the general adult population largely undescribed. This gap weakens the empirical basis for judging how much financial protection dental coverage actually provides.

The objective of this study was to quantify out-of-pocket dental expenditures and catastrophic dental spending among US adults with and without dental coverage, and to characterize the empirical pathway from coverage through utilization to financial burden. It was anticipated that dental coverage would be associated with greater utilization and lower out-of-pocket spending per user, and that catastrophic dental spending would concentrate among lower-income adults regardless of coverage status.

METHODS

Study design and data source

Cross-sectional secondary analysis of the Medical Expenditure Panel Survey Household Component (MEPS-HC) for calendar year 2023. MEPS-HC is a nationally representative survey of the

civilian noninstitutionalized population of the United States conducted by the Agency for Healthcare Research and Quality.⁽²⁴⁾ The study used the 2023 Full Year Consolidated Data File (HC-251, released August 2025) and the 2023 Dental Visits File (HC-248B, released May 2025), downloaded as public-use ASCII files with their SAS programming statements from the AHRQ website (https://meps.ahrq.gov/mepsweb/data_stats/download_data_files.jsp). The files require no login and carry no access restrictions. Reporting followed the STROBE statement for observational studies, and elements of the RECORD extension were applied because the source is a routine survey dataset.

Study population

The analytic sample comprised persons aged 18 years and older with a positive survey weight and non-missing dental coverage indicators. Persons younger than 18 years ($n = 3,648$) and persons without a valid survey weight ($n = 355$) were excluded. The final sample included 14,768 adults, representing a weighted population of 259.7 million adults. Analyses that used family income as a denominator were restricted to the 14,296 adults in families with positive income, because a ratio of out-of-pocket spending to non-positive income is undefined and the conventional catastrophic threshold assumes a positive resource base.

Variables

Dental coverage was defined as reporting dental insurance at any time during 2023, based on a value of yes on any of the three round-specific dental insurance indicators in the consolidated file (DENTIN31_M23, DENTIN42_M23 and DENTIN53_M23). These indicators derive from the household-reported question about insurance that pays for dental visits, asked for each round of the survey. Adults whose available indicators were all equal to no were classified as without dental coverage. This person-level indicator captures whether an adult held dental insurance at some point during the year, regardless of the source or the generosity of the benefit, and it includes both private and public dental benefits.

Any dental visit was defined as at least one reported dental care visit during 2023 (DVTOT23 greater than zero). Out-of-pocket dental spending was the self/family payment amount for dental care (DVTSLF23), and total dental expenditure was the payment from all sources combined (DVTEXP23), both expressed in US dollars and recorded for the calendar year. Annual family income (FAMINC23) provided the denominator for burden measures. Catastrophic dental spending was defined as out-of-pocket dental spending equal to or greater than 10% of annual family income, restricted to persons in families with positive income. The 10% threshold follows the widely used operationalization of the Sustainable Development Goal indicator of financial protection. Sensitivity analyses used thresholds of 5% and 20%, and the proportion of family income devoted to out-of-pocket dental spending was computed as a continuous burden measure.

Covariates were age group (18-34, 35-44, 45-64 and 65 years or older), sex, race and ethnicity (Hispanic, non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, other or multiple race), family income as a percentage of the poverty line (poor or negative, near poor, low, middle and high), educational attainment (high school or less, some college or more) and general health insurance coverage (any private, public only, uninsured). These variables were selected as potential confounders of the association between dental coverage and spending outcomes, because they jointly determine access to employer-sponsored benefits, the demand for dental care and the capacity to pay. Special negative codes in the source files, including inapplicable, refused, do not know, not ascertained and cannot be computed, were treated as missing.

Statistical analysis

All estimates accounted for the complex survey design using the person weight (PERWT23F), the variance estimation stratum (VARSTR) and the primary sampling unit (VARPSU), with standard errors obtained by Taylor series linearization. Weighted percentages and means are reported with 95% confidence intervals. Because out-of-pocket dental spending is right-skewed, medians with interquartile ranges are presented alongside means, and the magnitude model used a logarithmic transformation. Weighted quantiles were computed from the person weights.

Associations between dental coverage and the three outcomes were estimated with survey-weighted logistic regression for any dental visit and for catastrophic dental spending, and with a survey-weighted log-linear model for out-of-pocket spending among adults with a visit. The two-step structure separates the decision to seek care from the amount paid conditional on seeking care, which avoids conflating utilization with intensity. Results are reported as odds ratios and as a geometric mean ratio with 95% confidence intervals. Models were adjusted for age

group, sex, race and ethnicity, poverty category, education and general insurance coverage, with unadjusted estimates computed for comparison. Design-based coefficient variance was estimated with the sandwich linearization of the pseudo-likelihood, which propagates the stratified clustered sampling into the regression standard errors. The significance level was 0.05, and no correction for multiplicity was applied because the outcomes represent distinct constructs within a single prespecified framework.

A supplementary analysis used the dental visits file (HC-248B) merged with person-level coverage to estimate the mean out-of-pocket payment per dental visit and the share of visits with any out-of-pocket payment, treating each visit as an observation that inherits the person weight and design identifiers. Missing data were handled by complete-case analysis within each estimate: the small number of adults with missing dental coverage was excluded from coverage-stratified analyses, and persons with non-positive family income were excluded only from the ratio-based catastrophic and burden measures, with the exclusion count reported. The primary catastrophic threshold of 10% was prespecified, and the 5% and 20% thresholds were examined to test the sensitivity of conclusions to the definition. All data management and analyses were performed in Python 3.14 with pandas, NumPy, SciPy and statsmodels, and the fixed-width data were parsed from the official SAS programming statements. The analysis script is deterministic and reproduces identical results on repeated execution, which was verified by running the script twice and confirming an unchanged metric file.

Ethical aspects

The study used de-identified public-use survey data, and no ethical approval or informed consent was required.

RESULTS

Dental coverage and utilization

The sample of 14,768 adults represented 259.7 million adults. Dental coverage was held by 52.1% (95% CI 50.4-53.8) of adults. Coverage was most common among adults aged 35-64 years, non-Hispanic White adults and adults with high income, and least common among adults aged 65 years or older, who constituted 11.5% of covered adults but 35.6% of adults without coverage (Table 1). The covered and uncovered groups differed most on economic characteristics. High-income adults represented 62.1% of the covered group and 30.1% of the uncovered group, adults with any private medical coverage represented 97.7% and 31.8%, and adults with public-only medical coverage represented 1.5% and 53.9% (Table 1). Educational attainment followed the same direction: adults with high school or less made up 42.0% of the covered group and 65.6% of the uncovered group. The sex distribution was nearly identical across groups, whereas Hispanic adults were overrepresented among the uncovered (22.5% versus 13.7%), and adults in the South constituted the largest regional group in both columns (Table 1). Coverage also varied with age in opposite directions at the extremes: adults aged 18-34 years made up 31.2% of the covered group and 25.8% of the uncovered group, whereas adults aged 65 years or older showed the reverse pattern (11.5% versus 35.6%) (Table 1).

Any dental visit was reported by 44.0% of adults overall. Utilization differed markedly by coverage: 53.2% of adults with dental coverage reported a visit compared with 34.0% of adults without coverage (Table 2). The unadjusted odds ratio for a dental visit was 2.18 (95% CI 2.00-2.37), and after adjustment for age group, sex, race and ethnicity, poverty category, education and general insurance coverage, dental coverage remained associated with a dental visit (odds ratio 1.68, 95% CI 1.47-1.93) (Table 3).

Out-of-pocket dental expenditures

Mean out-of-pocket dental spending among all adults was \$213 (95% CI \$193-233). The overall mean was similar between adults with coverage (\$220) and those without (\$206), because higher utilization among covered adults offset their lower spending per user (Table 2). Among adults with any dental visit, mean out-of-pocket spending was \$485, and it was \$413 with coverage versus \$606 without coverage. The median among users was \$64 overall, \$50 with coverage and \$110 without coverage, and the interquartile range for all users was \$0 to \$325 dollars (Figure 1). The proportion of users with any out-of-pocket payment was similar between groups (64.7% with coverage ver-

sus 64.4% without), while the amounts paid differed (Table 2). The median payment followed the same pattern: half of covered users paid \$50 or less, whereas half of uncovered users paid \$110 or less. In the adjusted log-linear model, covered users spent 0.77 times as much as uncovered users (95% CI 0.68-0.88), a 23% lower geometric mean; the unadjusted ratio was 0.61 (95% CI 0.55-0.69) (Table 3). Mean total dental expenditure among users was \$1,036 overall, \$1,003 with coverage and \$1,094 without coverage, whereas the out-of-pocket component was lower among covered users (Table 2). Out-of-pocket spending absorbed 0.45% of family income overall, with little difference by coverage (Table 2). At the visit level, mean out-of-pocket payment was \$218 per visit, \$188 with coverage and \$267 without coverage, and about half of all visits generated any out-of-pocket payment regardless of coverage (Table 2).

Catastrophic dental spending

Catastrophic dental spending at the 10% threshold affected 0.6% of adults in families with positive income. Prevalence was 0.4% among adults with dental coverage and 0.7% among adults without coverage (Table 4). At the 5% threshold, prevalence was 1.3% overall (0.9% with coverage versus 1.8% without), and at the 20% threshold it was 0.2% overall (0.1% versus 0.4%). At every threshold the unadjusted prevalence among adults without coverage was roughly double that among covered adults, although the absolute difference between groups was small. Catastrophic spending declined steeply and monotonically across poverty categories, from 2.0% among poor or negative adults and 2.5% among near-poor adults to 0.4% among middle-income and 0.1% among high-income adults (Table 5; Figure 2). Within poverty categories the gap between coverage groups was inconsistent and, for the near-poor stratum, the estimate for covered adults carried a wide confidence interval (Table 5). The estimates were restricted to adults with positive family income, who made up the large majority of the analytic sample, and the primary 10% threshold estimate remained below one adult in a hundred across coverage groups.

Adjusted associations and the coverage-to-burden framework

In the unadjusted model, dental coverage was associated with lower odds of catastrophic spending at the 10% threshold (odds ratio 0.58, 95% CI 0.37-0.93). After adjustment for age, sex, race and ethnicity, poverty category, education and general insurance coverage, the odds ratio was 1.21 (95% CI 0.64-2.27), with a confidence interval that included 1 (Table 3). At the 20% threshold the adjusted association was 0.57 (95% CI 0.23-1.40), compared with the unadjusted estimate of 0.29. Figure 1 integrates these components into an empirical pathway in which coverage raises utilization and lowers out-of-pocket spending per user, whereas catastrophic burden is governed by family income rather than by coverage itself (Figure 3).

Table 1. Characteristics of US adults aged 18 years and older by dental coverage status, 2023.

Characteristic	All adults	Dental coverage	No dental coverage
18-34 years	28.6 (0.5)	31.2 (0.8)	25.8 (0.8)
35-44 years	17.0 (0.5)	20.8 (0.7)	12.8 (0.6)
45-64 years	31.4 (0.5)	36.5 (0.7)	25.7 (0.6)
65 years or older	23.1 (0.5)	11.5 (0.5)	35.6 (0.9)
Male	48.7 (0.4)	49.5 (0.5)	47.8 (0.6)
Female	51.3 (0.4)	50.5 (0.5)	52.2 (0.6)
Hispanic	17.9 (1.2)	13.7 (0.9)	22.5 (1.7)
Non-Hispanic White	60.2 (1.2)	63.3 (1.2)	56.9 (1.6)
Non-Hispanic Black	12.1 (0.7)	11.9 (0.8)	12.4 (0.9)
Non-Hispanic Asian	6.6 (0.6)	7.7 (0.7)	5.4 (0.6)
Other or multiple race	3.1 (0.2)	3.5 (0.3)	2.8 (0.3)
Poor or negative	9.9 (0.4)	3.2 (0.3)	17.1 (0.7)
Near poor	3.3 (0.2)	1.3 (0.2)	5.6 (0.4)
Low income	11.3 (0.5)	6.3 (0.4)	16.7 (0.7)
Middle income	28.7 (0.7)	27.1 (1.0)	30.5 (0.9)
High income	46.8 (1.0)	62.1 (1.1)	30.1 (1.1)
High school or less	53.3 (0.9)	42.0 (1.0)	65.6 (0.9)

Characteristic	All adults	Dental coverage	No dental coverage
Some college or more	46.7 (0.9)	58.0 (1.0)	34.4 (0.9)
Any private	66.1 (0.8)	97.7 (0.2)	31.8 (0.9)
Public only	26.6 (0.7)	1.5 (0.2)	53.9 (1.0)
Uninsured	7.3 (0.5)	0.8 (0.1)	14.3 (0.8)
Northeast	17.2 (0.8)	18.3 (1.0)	16.0 (1.0)
Midwest	20.4 (0.8)	21.5 (1.1)	19.2 (0.8)
South	38.7 (1.2)	36.7 (1.5)	41.0 (1.5)
West	23.7 (1.3)	23.5 (1.7)	23.8 (1.3)

Note: Values are weighted percentages with standard error in parentheses. Source: Elaboration from AHRQ Medical Expenditure Panel Survey, 2023 Full Year Consolidated Data File (HC-251).

Table 2. Dental care utilization and out-of-pocket dental expenditures by dental coverage status, 2023.

Measure	All adults	Dental coverage	No dental coverage
Any dental visit, %	44.0 (0.8)	53.2 (0.9)	34.0 (0.9)
Out-of-pocket dental spending among all adults, USD	213 (10)	220 (13)	206 (15)
Mean out-of-pocket dental spending among users, USD	485 (21)	413 (23)	606 (43)
Median out-of-pocket dental spending among users, USD (IQR)	64 (0-325)	50 (0-276)	110 (0-400)
Users with any out-of-pocket payment, %	64.6 (1.0)	64.7 (1.2)	64.4 (1.3)
Mean total dental expenditure among users, USD	1,036 (30)	1,003 (31)	1,094 (58)
Out-of-pocket dental spending as share of family income, %	0.4 (0.1)	0.4 (0.1)	0.5 (0.1)
Mean out-of-pocket per dental visit, USD	218 (9)	188 (10)	267 (17)
Dental visits with any out-of-pocket payment, %	50.5 (0.9)	49.9 (1.0)	51.7 (1.3)

Note: USD = US dollars; IQR = interquartile range. Values are weighted estimates; means are shown with standard error in parentheses, medians with interquartile range. Source: Elaboration from AHRQ Medical Expenditure Panel Survey, 2023 Full Year Consolidated Data File (HC-251) and 2023 Dental Visits File (HC-248B).

Table 4. Prevalence of catastrophic dental spending by dental coverage status and threshold, 2023.

Group	≥5% of family income	≥10% of family income	≥20% of family income
All adults	1.3 (0.1)	0.6 (0.1)	0.2 (0.0)
Dental coverage	0.9 (0.2)	0.4 (0.1)	0.1 (0.0)
No dental coverage	1.8 (0.2)	0.7 (0.1)	0.4 (0.1)

Note: Catastrophic spending is defined as out-of-pocket dental spending equal to or above the indicated share of annual family income, among adults in families with positive income. Values are weighted percentages with standard error in parentheses. Source: Elaboration from AHRQ Medical Expenditure Panel Survey, 2023 Full Year Consolidated Data File (HC-251).

Table 3. Associations of dental coverage with dental care utilization, out-of-pocket dental spending and catastrophic dental spending.

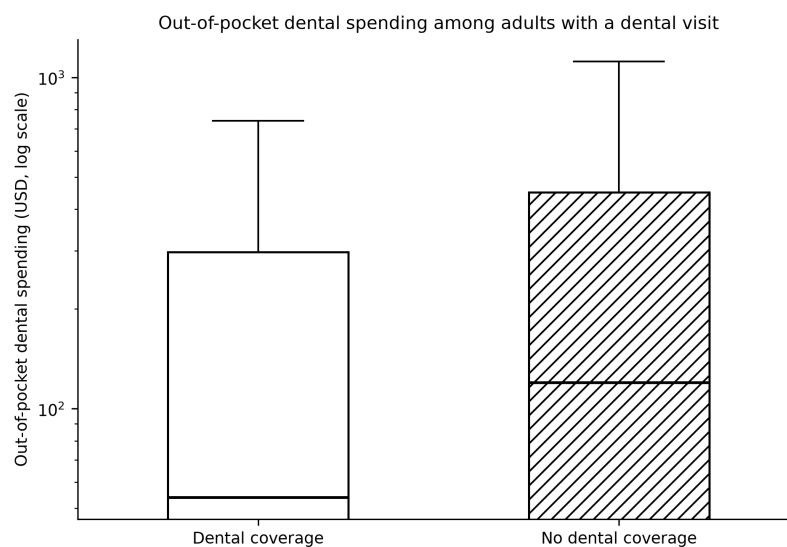
Outcome	Measure	Unadjusted (95% CI)	Adjusted (95% CI)	Adjusted p
Any dental visit	Odds ratio	2.18 (2.00-2.37)	1.68 (1.47-1.93)	0.000
Catastrophic dental spending (≥10% of family income)	Odds ratio	0.58 (0.37-0.93)	1.21 (0.64-2.27)	0.557
Catastrophic dental spending (≥20% of family income)	Odds ratio	0.29 (0.14-0.57)	0.57 (0.23-1.40)	0.219
Out-of-pocket dental spending among users	Geometric mean ratio	0.61 (0.55-0.69)	0.77 (0.68-0.88)	0.000

Note: Adjusted models include age group, sex, race and ethnicity, poverty category, education and general health insurance coverage. CI = confidence interval. Source: Elaboration from AHRQ Medical Expenditure Panel Survey, 2023 Full Year Consolidated Data File (HC-251).

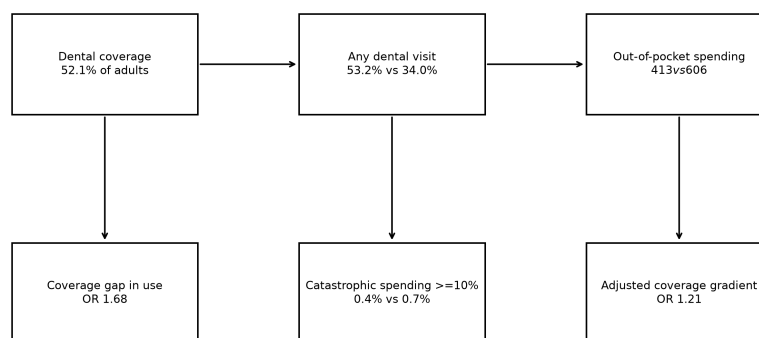
Table 5. Prevalence of catastrophic dental spending of at least 10% of family income by poverty category and dental coverage status, 2023.

Poverty category	All adults	Dental coverage	No dental coverage
Poor or negative	2.0 (0.4)	2.2 (1.0)	2.0 (0.5)
Near poor	2.5 (1.0)	6.9 (3.4)	1.4 (0.7)
Low income	1.1 (0.3)	1.8 (0.9)	0.9 (0.2)
Middle income	0.4 (0.1)	0.3 (0.1)	0.5 (0.1)
High income	0.1 (0.0)	0.1 (0.0)	0.2 (0.1)

Note: Values are weighted percentages with standard error in parentheses, among adults in families with positive income. Source: Elaboration from AHRQ Medical Expenditure Panel Survey, 2023 Full Year Consolidated Data File (HC-251).

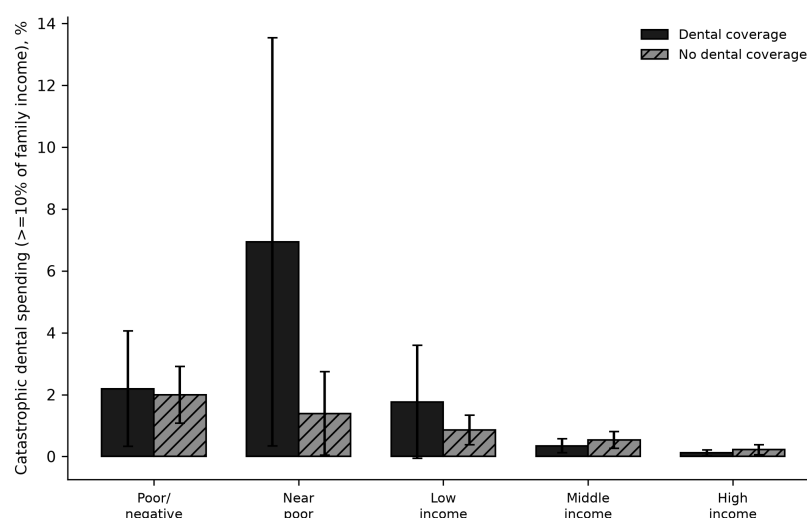
Figure 1. Distribution of out-of-pocket dental spending among US adults with a dental visit, by dental coverage status, 2023.

Note: Boxes show the interquartile range with the median; whiskers extend to 1.5 times the interquartile range. The vertical axis is logarithmic. Source: Elaboration from AHRQ Medical Expenditure Panel Survey, 2023 Full Year Consolidated Data File (HC-251).

Figure 3. Empirical framework of the pathway from dental coverage to financial burden among US adults, 2023.

Note: OR = odds ratio. Estimates shown are weighted; the out-of-pocket values are means among adults with a dental visit. Source: Elaboration from AHRQ Medical Expenditure Panel Survey, 2023 Full Year Consolidated Data File (HC-251).

Figure 2. Prevalence of catastrophic dental spending of at least 10% of family income by poverty category and dental coverage status, 2023.



Note: Error bars show 95% confidence intervals. Estimates are restricted to adults in families with positive income. Source: Elaboration from AHRQ Medical Expenditure Panel Survey, 2023 Full Year Consolidated Data File (HC-251).

DISCUSSION

The principal finding is that dental coverage increases utilization and lowers the amount that users pay out of pocket, but it does not independently reduce catastrophic dental spending once income is taken into account. Coverage and income therefore operate at different points of the burden pathway: coverage shapes whether adults seek care and how much they pay per visit, while family income determines whether that spending crosses a catastrophic threshold.

Coverage prevalence in this sample, about half of adults, is consistent with recent descriptions of the fragmented US dental financing system, in which benefits track private employment and shrink at retirement.^(5,6) The observation that dental coverage reaches only a minority of older adults, and that coverage among Medicare Advantage enrollees depends on benefit design, matches studies of the Medicare population.^(7,8) The utilization gap between covered and uncovered adults also reproduces a long-standing pattern observed in Canada, Australia and the United States, where insurance and income jointly predict whether adults obtain dental care.⁽²⁵⁻²⁷⁾ The concentration of coverage among high-income and privately insured adults means that the adults most exposed to out-of-pocket dental costs are also the least able to absorb them, a welfare loss that has been quantified for racial and ethnic disparities in dental access in the United States.⁽²⁸⁾

The lower out-of-pocket spending among covered users is the expected mechanical effect of insurance and matches evidence from the expansion of dental benefits in Korea, which reduced out-of-pocket payments among older adults.⁽²⁹⁾ It also aligns with a recent US analysis that framed dental insurance as a paradox: coverage increases use but can still leave substantial residual cost to the patient.⁽³⁰⁾ Absolute spending levels in this study are comparable to earlier MEPS-based series, which placed mean dental expenditure per user in the same range as the values reported here.^(11,22) The finding that covered and uncovered adults have similar average spending in the whole population, despite opposite utilization patterns, illustrates that the population-level financial consequence of coverage depends on both the price and the quantity of care. Disparities in out-of-pocket dental spending within countries have likewise been linked to socioeconomic position rather than to coverage alone, as reported for Israel and China.^(31,32)

Catastrophic dental spending was rare in this nationally representative US sample, far below the prevalence reported for dental care in Iran, China, Saudi Arabia and other low- and middle-income settings.^(16,17,33,34) The comparison is expected: catastrophic measures are denominated by household income, and US incomes are high relative to the typical out-of-pocket dental bill. The estimates are closer to the Spanish experience, where dental care still generated catastrophic expenditure despite universal medical coverage,⁽¹⁸⁾ and to the financial burden reported by older adults in several Central and Eastern European countries.⁽¹⁹⁾ The reversal of the coverage association

after adjustment is the key analytical result. Unadjusted estimates suggested protection because covered adults are disproportionately high-income; once poverty category and other covariates are controlled, coverage no longer predicted catastrophic spending. This pattern echoes systematic reviews showing that socioeconomic status, not insurance status alone, is the dominant determinant of catastrophic health expenditure,(35)and it parallels evidence that financial burden concentrates among lower-income beneficiaries even when insurance is present.(23,36) Special populations with constrained finances, such as formerly incarcerated older adults and patients with head and neck cancer, face dental expenditure burdens that coverage alone does not resolve.(37,38)

The mechanisms follow from the definitions. Insurance lowers the effective price of a dental visit and raises demand, which increases utilization and reduces the per-visit payment. Catastrophic spending, by contrast, is a ratio of out-of-pocket payment to family income, so it is mechanically dominated by the denominator.(13,14) For most adults with positive income, even a substantial dental bill stays below 10% of annual family income, which is why catastrophic dental spending is rare and why poverty, rather than coverage, orders its distribution. Methodological choices amplify this interpretation: estimates vary with the threshold, the recall period and the income measure, and results at the 5%, 10% and 20% thresholds moved in the expected direction.(20,21) The absence of an independent coverage effect on catastrophic spending should therefore be read as a property of the ratio definition, not as evidence that coverage provides no financial relief.

Catastrophic spending is rare by construction, whereas high financial burden is far more common. A dental bill that equals a small share of income can still force an adult to forgo other necessities, borrow or defer care, and the scoping reviews of oral health care costs describe exactly this broader spectrum of hardship.(12,39) In this sample, one in three adults who used dental care reported no out-of-pocket payment, but the remainder paid amounts that, while rarely catastrophic, were concentrated among lower-income users. Deferred dental care and medical debt attributed to dental needs are reported by a sizable minority of US adults and reinforce that the absence of catastrophic spending is not the same as the absence of burden.(28,40) This distinction is central to the framework in Figure 1: coverage acts on the amount paid per visit, whereas the welfare consequence of that payment depends on the payer's income.

The low prevalence of catastrophic dental spending in this sample contrasts with the substantial medical out-of-pocket burden documented in US populations, where high out-of-pocket spending among the poor and elderly and financial hardship among seriously ill patients are well established.(23,36) The difference reflects both the smaller absolute size of dental bills and the fact that adults without dental coverage often simply forgo care rather than incur large expenses, a substitution that converts potential financial burden into unmet need. This substitution is consistent with the observation that dental care is the health service most frequently skipped because of cost,(1)and with the welfare losses estimated for inequitable dental access in the United States.(28)

The strengths of this study include a current, nationally representative source, the explicit use of the survey design for all estimates, a reproducible analysis pipeline verified by repeated execution, and the combination of person-level and visit-level files to describe both the amount and the distribution of out-of-pocket spending. Restricting the sample to adults aged 18 years and older focuses the analysis on the population for whom dental coverage is most fragmented, and the prespecified thresholds make the burden estimates directly comparable with the financial protection literature. The study also contributes a conceptualization of the coverage-to-burden pathway that separates utilization, payment per visit and catastrophic burden, three quantities that are frequently conflated in policy discussion.

The results also speak to the comparative structure of dental financing. Jurisdictions that integrate dental care into their public coverage, or that explicitly cover the mouths of older adults, achieve more uniform access than the fragmented US system, where dental benefits are an optional rider rather than a core entitlement.(6)The Korean experience is instructive for the United States because it shows that expanding public dental benefits to older adults reduced out-of-pocket spending without eliminating it, a pattern that mirrors the residual payments observed among covered adults in this sample.(29)The US debate, which centers on whether to add a dental benefit to Medicare and whether adult dental care should be an essential health benefit, is therefore less about whether coverage lowers the price of care and more about whether the resulting reduction reaches the adults whose income places them at risk of catastrophic burden.(2,5)

These findings also bear on benefit design. The lower geometric mean among covered users shows that even incomplete dental benefits reduce out-of-pocket exposure, but the persistence of mean payments above \$400 among covered users points to the role of deductibles, coinsurance and annual maximums in leaving a residual burden. Plans that cap annual benefits or apply high coinsurance to major restorative work shift cost back onto patients precisely for the most expensi-

ve episodes, a design feature that has been documented in the United States.⁽³⁰⁾ Future research could therefore estimate the financial protection provided by specific benefit features rather than by coverage status alone, using plan-level data on maximums and cost sharing, and could test whether value-based designs that reduce cost sharing for preventive care alter the distribution of out-of-pocket spending. Longitudinal designs that follow adults through retirement and Medicare eligibility would also clarify how much of the coverage gap among older adults reflects benefit loss rather than lower demand.^(5,8)

The policy implications follow. Because coverage lowers out-of-pocket spending per user and raises utilization, expanding dental benefits to the roughly half of adults without them would likely increase treatment and reduce the cost of each visit, and proposals to add a Medicare dental benefit or to include adult dental care in essential health benefits address a real gap.^(2,7) Because catastrophic burden is income-driven, coverage expansion alone will not eliminate financial hardship; it needs to be paired with income-related cost-sharing protection for lower-income adults, such as reduced or eliminated cost sharing for the poorest beneficiaries. This interpretation agrees with the broader literature on financial burden and deferred dental care in the United States.^(12,39,40)

Study limitations

- The design is cross-sectional, so the associations cannot be interpreted causally; future work should exploit longitudinal panels or quasi-experimental variation such as Medicaid and Medicare Advantage dental benefit changes to estimate causal effects.^(7,41)
- Catastrophic spending was measured against family income rather than household consumption or capacity to pay, which can misclassify burden for adults whose income understates their resources; a capacity-to-pay definition should be tested in future analyses, and income was reported before the subtraction of medical spending, so the denominator may overstate resources for households with large medical bills.
- Dental coverage was self-reported and captured as any coverage during the year, so benefit generosity, waiting periods and annual maximums were not observed; administrative benefit data would sharpen the exposure and allow dose-response analyses.
- Some subgroup estimates, particularly among near-poor adults with coverage, rested on small cell sizes and wide confidence intervals and should be read with caution; pooling adjacent survey years would stabilize these cells.
- The analysis used a single survey year, so secular trends and the effect of the COVID-19 pandemic on dental use could not be examined; pooled multi-year files would strengthen precision and allow trend analysis.⁽¹¹⁾
- The results generalize to the civilian noninstitutionalized population and not to institutionalized adults or children, whose dental financing differs substantially.

CONCLUSIONS

This study quantified out-of-pocket dental expenditures and catastrophic dental spending among US adults according to dental coverage status in a nationally representative sample. Dental coverage was held by about half of adults and was associated with higher utilization and, among users, with substantially lower out-of-pocket spending. Catastrophic dental spending was rare, and its prevalence was ordered by family income rather than by coverage; the protective association observed before adjustment disappeared once sociodemographic factors were controlled. The empirical framework that emerges separates three components of the coverage-to-burden pathway: coverage drives utilization, it lowers the amount paid per visit, and income determines whether that payment becomes catastrophic. Policies that seek to relieve the financial burden of dental care should therefore combine coverage expansion with income-based cost-sharing protection for lower-income adults, since coverage alone is unlikely to eliminate the catastrophic burden concentrated among the poor.

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FUNDING

No financing

CONFLICT OF INTEREST

None

AUTHORSHIP CONTRIBUTIONS

Drafting – original draft: Maria Fernanda Escalante Freitez.
Writing–review and editing: Maria Fernanda Escalante Freitez.