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DENTAL COVERAGE AND COST-RELATED DELAYS IN DENTAL CARE UTILIZATION AMONG U.S. ADULTS: A 2008–2017 NHIS STUDY BY CITIZENSHIP STATUS

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Abstract

Maintaining oral health is vital for overall well-being, yet immigrant communities in the United States continue to face inequalities in access to dental care. This research, which draws on data from the National Health Interview Survey conducted between 2008 and 2017, investigates dental coverage and delayed dental care utilization due to cost, stratified by citizenship status. By applying Andersen's behavioral model of health services use, the study examines a representative dataset of 308,904 adults (weighted $N \sim 100$ million) through detailed descriptive statistics, trend analyses, and multivariable regressions. Results showed that non-citizens were consistently less likely to have dental coverage and more likely to delay dental care due to cost compared to U.S.-born citizens, although these disparities were largely explained by enabling factors such as income and insurance access. Naturalized citizens, despite improvements, still experienced notable disadvantages. Predisposing and need factors, including age, gender, health behaviors, and chronic conditions, also contributed to cost-related delays. However, structural socioeconomic barriers remained the most powerful determinants. Our findings underscore the urgent need for policies that expand affordable dental coverage and address systemic inequities. Strengthening enabling resources can significantly narrow disparities, ensuring that oral health access is equitable across citizenship groups.

Keywords: citizenship, social determinants of health, dental coverage, dental utilization, health disparities

Research Highlights

What is the current knowledge?

- Poor oral health is associated with serious systemic conditions, yet adult dental services are often excluded from essential health coverage in the United States.
- Immigrants and non-citizens face multiple barriers to dental care, including exclusion from public health insurance programs, language barriers, and fear of discrimination.
- Citizenship status is gaining recognition as a structural determinant of health, which reflects broader challenges tied to immigration policy, economic disparities, and the structure of healthcare systems.

What is new in this study?

- Applying Andersen's behavioral model of health services use, this study differentiates the roles of predisposing, enabling, and need factors in shaping dental care access.
- This study shows that enabling factors, such as income and insurance access, primarily explain disparities in dental coverage and delayed are, not citizenship status itself.
- The analysis reveals that after adjusting for enabling factors, non-citizens and naturalized citizens are not at higher risk of cost-related dental care delays compared to U.S.-born citizens.
- Findings highlight that modest gains in dental coverage after Affordable Care Act implementation have not fully closed gaps, underscoring the need for expanded adult dental benefits and structural reforms.

INTRODUCTION

Oral health is a fundamental component of overall health and well-being. Poor oral health has been associated not only with dental issues like tooth loss, oral pain, and infections but also with systemic conditions such as cardiovascular disease, diabetes, pregnancy complications, and respiratory illness (Öçbe et al., 2025). Despite its importance, oral health care remains largely siloed from the broader healthcare delivery and financing system in the United States. Dental insurance is typically provided separately from medical insurance, and unlike pediatric dental services—classified as essential under the Affordable Care Act (ACA)—adult dental services are not guaranteed coverage under most public or private insurance plans (Song et al., 2021).

Previous studies stratified dental care access by age, race/ethnicity, urban/rural area, socioeconomic status, and disability status (Edelstein, 2002; Cha & Cohen, 2021; Horner-Johnson et al., 2015; Nasseh & Vujicic, 2014; Wu et al., 2022). However, not many studies have looked into how dental care access is influenced by one's citizenship status. Immigrants and non-citizens face compounding structural barriers including ineligibility for public insurance programs, language barriers, fear of discrimination, and lack of familiarity with the U.S. healthcare system (Asad & Clair, 2018; Castañeda et al., 2015; Hacker et al., 2015). These factors can significantly affect whether individuals have dental coverage and whether they seek or delay necessary care.

Furthermore, the cost of dental care is a well-documented deterrent for both insured and uninsured adults, even in recent years, as evidenced by recent statistics shared by American Dental

Association's Health Policy Institute (2024). Across all age groups, individuals are more likely to postpone dental services compared to other healthcare needs, such as medical treatment, prescription medication, eyeglasses, or mental health care, due to financial constraints (Vujicic et al., 2016). Delaying dental care because of cost exacerbate oral health issues, lead to higher long-term healthcare expenses, and diminish overall quality of life (Thompson et al., 2014). Even those with dental insurance often encounter high out-of-pocket expenses or restricted provider networks, which further hinder timely access to care (Fellows et al., 2022). Thus, delays caused by financial barriers are a critical indicator of accessibility to oral health services.

Citizenship status has emerged as an important social determinant of health in recent research. Studies suggest that non-citizens are disproportionately affected by policies that restrict access to healthcare resources, including dental insurance (Cheng et al., 2019; Wilson et al., 2016). However, citizenship is not a biological or behavioral factor; it is a structural marker that reflects deeper issues related to immigration policy, economic inequality, and health system design (Martinez et al., 2015; Pierre, 2022).

Previous studies have often examined oral healthcare access broadly, without distinguishing between lack of utilization due to cost versus other reasons. Moreover, few studies have stratified findings by citizenship status while controlling for factors that influence dental care utilization. To address these gaps, this study uses data from the 2008 to 2017 National Health Interview Survey (NHIS) to examine disparities in dental insurance coverage and cost-related delays in dental care utilization.

This study employs Andersen's behavioral model of health services use as its guiding framework. The model conceptualizes healthcare utilization as a function of predisposing factors (e.g., demographic characteristics), enabling resources (e.g., access to insurance), and need (e.g., individual health status; Andersen, 1995; Babitsch et al., 2012). Our analysis explores how these dimensions collectively influence disparities in dental coverage and utilization across different citizenship statuses. Our two research questions are: (1) Are there any differences in dental coverage and delayed dental care due to cost across citizenship groups?; and (2) What predisposing, enabling, and need factors predict access to dental coverage and cost-related delays in care?

METHODS

Data Sources and Sample

This study utilized the NHIS, an annual cross-sectional household survey administered by the National Center for Health Statistics (NCHS), part of the Centers for Disease Control and Prevention (CDC). The NHIS employs a multistage stratified cluster sampling design to collect comprehensive health-related information from a representative sample of the civilian, non-institutionalized U.S. population (Blewett et al., 2018). Data from 2008 to 2017 were pooled to provide robust estimates and examine trends over time. This 10-year period captures years before and after the implementation of the ACA, allowing for temporal analysis of its potential impact on dental insurance coverage and care access.

We merged data from the Sample Adult and Person Files to generate a comprehensive analytic dataset. The Sample Adult file includes detailed health behavior and healthcare access variables, while the Person file provides household- and demographic-level information. After excluding individuals with missing data on key variables (e.g., citizenship status, dental insurance, or cost-

related delay in dental care utilization), the final unweighted analytic sample consisted of 308,904 adults aged 18 and older. Sampling weights, strata, and primary sampling units were applied to ensure nationally representative estimates, in accordance with NCHS analytic guidelines.

Measures

Citizenship Status. Citizenship was self-reported in NHIS using a combination of variables related to country of birth and naturalization status. The key NHIS variables included PLBORN (place of birth), USABORN (U.S.-born status), and CITZNSTP (citizenship status). Individuals who were born in the United States or U.S. territories were categorized as U.S.-born citizens. Foreign-born respondents were further classified using the CITZNSTP variable. Those who reported having become naturalized citizens were grouped as naturalized citizens. All others who were foreign-born and had not become naturalized citizens were categorized as non-citizens. This group may include lawful permanent residents, temporary visa holders, refugees/asylees, and undocumented immigrants. Although NHIS does not directly capture immigration documentation status, this three-level categorization (i.e., U.S.-born citizen, naturalized citizen, non-citizen) is commonly used in research and reflects meaningful gradients in access to health insurance, public benefits, and healthcare utilization opportunities. This recoding allowed us to create analytically distinct groups that reflect differences in structural access to care related to immigration and legal status.

Primary Outcomes. *Dental insurance coverage* was measured by responses to whether the respondents had any dental insurance that paid for part or all of dental care costs within the past year. The binary variable (yes/no) served as an indicator of structural access to oral health services. *Delayed dental care due to cost* was assessed via the question: "During the past 12 months, was there any time when you needed dental care but could not get it because you couldn't afford it?" Affirmative responses were as 1 (yes); all others were coded as 0 (no). This variable captures perceived affordability barriers.

Independent Variables. Predictor variables were informed by Andersen's behavioral model and categorized as: *Predisposing factors* include age group (8-24, 25-44, 45-64, ≥65), sex (male/female), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, Asian, other), and educational attainment (<high school, high school/GED, some college, bachelor's or higher). *Enabling factors* include employment status (working, not working, never worked), family income relative to the federal poverty level (<100%, 100-199%, 200-399%, ≥400%), health insurance status (insured/uninsured). Dental insurance (yes/no) was also used as an enabling factor when evaluating cost-related delay in dental care utilization. *Need factors* were measured using self-related health (excellent/very good/good vs. fair/poor), smoking status (never, former, current), alcohol use (never, former, current), and diagnosed conditions (hypertension, depression).

Statistical Analysis

Statistical analyses were conducted using Stata SE 17 (StataCorp, College Station, TX0, and results were weighted to reflect the U.S. adult population. All analyses accounted for NHIS's complex sampling design using Taylor series linearization to adjust standard errors. Descriptive statistics summarized sample characteristics across citizenship groups. Group differences were assessed using Rao-Scott chi-square tests for categorical variables and survey-weighted means for continuous variables.

To assess temporal trends, we performed segmented linear regression to examine year-by-year changes in dental insurance coverage and delayed care due to cost, stratified by citizenship status. We modeled trends in R with year included as a continuous predictor, adjusting for age, sex, and race/ethnicity.

For multivariable analysis, we conducted logistic regression to examine predictors of the two primary outcomes. Three models were constructed sequentially (see Figure 1): Model 1 included predisposing variables only; Model 2 added enabling factors; and Model 3 added need factors. This approach aligns with Andersen's framework and enables isolation of each domain's contribution. Model diagnostics included variance inflation factors to assess multicollinearity, and predictive margins were estimated to facilitate interpretation. Odds ratios (ORs) with 95% confidence intervals (CIs) were reported, with *p*-values <0.05 considered statistically significant.

Figure 1

Stepwise Logistic Regression Analysis Models Using Andersen's Behavioral Model for Health Services Use
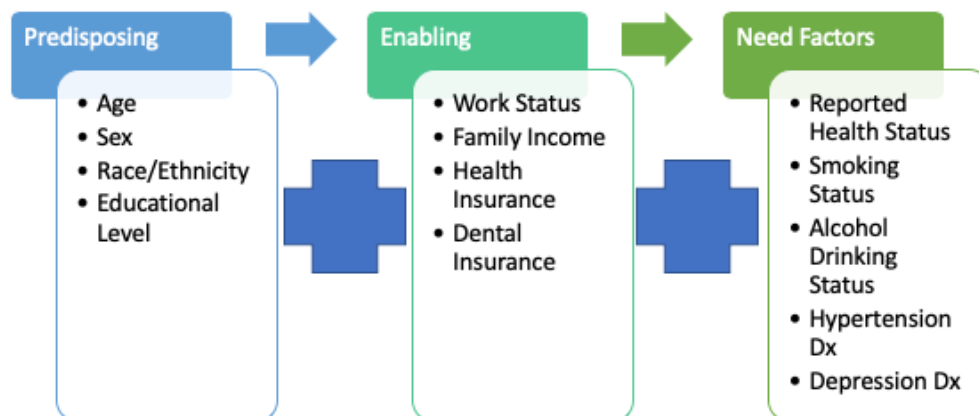
RESULTS

Trends in Dental Coverage and Delayed Dental Care Due to Cost by Citizenship Status

Among the adults included in the analysis, U.S.-born citizens constituted the majority of the sample (84.2%), followed by naturalized citizens (9.8%), and non-citizens (6.0%). Demographic distributions varied notably by citizenship status. Non-citizens were more likely to identify as Hispanic or Asian, have lower household incomes, report less formal education, and lack both health and dental insurance. Naturalized citizens had slightly higher educational attainment than non-citizens but also experienced financial and coverage-related disadvantages compared to U.S.-born citizens (see Table 1).

Dental insurance coverage patterns differed markedly by citizenship. U.S.-born citizens had the highest coverage rates through the study period with a dip between 2008 and 2011 (from 57.1% to 54.6%), followed by a recovery and gradual increase post-ACA implementation, reaching 58.9% in 2017. Naturalized citizens followed a similar trend but at slightly lower levels, peaking at 49.7%. Non-citizens consistently had the lowest dental coverage, starting at 36.2% in 2008 and increasing modestly to 38.5% by 2017. Despite these gains, the coverage gap between U.S.-born citizens and non-citizens remained wide and persistent over the decade (see Figure 2).

Patterns of delayed dental care due to cost also varied by citizenship. Non-citizens reported the highest rates in 2008 (19.4%), though this declined gradually to 16.3% in 2017. Among U.S.-born citizens, delay due to cost increased slightly between 2008 and 2010 (from 12.0% and 13.5%) before declining to 11.9% in 2017. Naturalized citizens reported the lowest rates of delay over most years, decreasing from 13.4% in 2008 to 10.6% in 2017. These trends suggest that while non-citizens experienced some improvement over time, financial barriers remained disproportionately high compared to other groups (see Figure 3).

Table 1

Weighted Percentages and Standard Errors of All Variables, 2008-2017 NHIS Data

Variables	Weighted % (SE)			
	US Born Citizen	Naturalized Citizen	Non-Citizen	Total
Population Variable				
Citizenship Status				
US Born Citizen				82.46% (0.20)
Naturalized Citizen				9.31% (0.12)
Non-citizen				8.23% (0.14)
Outcome Variable				
Dental Coverage*				
Yes	48.50% (0.24)	44.86% (0.47)	26.41% (0.50)	46.32% (0.23)
No	51.50% (0.24)	55.14% (0.47)	73.59% (0.50)	53.68% (0.23)
Predisposing Variables				
Age*				
18-24	13.42% (0.17)	5.56% (0.24)	12.19% (0.35)	12.59% (0.15)
25-34	17.07% (0.14)	12.94% (0.27)	29.60% (0.41)	17.72% (0.13)
35-44	15.63% (0.10)	20.30% (0.31)	27.13% (0.38)	17.03% (0.10)
45-54	18.07% (0.12)	22.31% (0.34)	17.01% (0.33)	18.37% (0.11)
55-64	16.69% (0.11)	18.51% (0.33)	8.32% (0.26)	16.16% (0.10)
65 or older	19.12% (0.16)	20.39% (0.37)	5.76% (0.20)	18.13% (0.15
Sex*				
Male	48.05% (0.14)	47.00% (0.38)	51.68% (0.42)	48.25% (0.13)
Female	51.95% (0.14)	53% (0.38)	48.32% (0.42)	51.75% (0.13)
Race/Ethnicities*				
Hispanic	7.59% (0.15)	37.55% (0.57)	60.87% (0.77)	14.83% (0.23)
Non-Hispanic White	77.11% (0.28)	25.78% (0.47)	12.74% (0.38)	66.96% (0.31)
Non-Hispanic Black	12.80% (0.23)	9.29% (0.32)	6.90% (0.29)	11.98% (0.20)
Non-Hispanic Asian	1.53% (0.05)	26.65% (0.50)	19.06% (0.55)	5.32% (0.10)
Non-Hispanic all other	0.97% (0.07)	0.73% (0.07)	0.43% (0.06)	0.91% (0.06)

Variables	Weighted % (SE)			
	US Born Citizen	Naturalized Citizen	Non-Citizen	Total
Education*				
Less than high school	10.63% (0.12)	17.86% (0.35)	39.14% (0.65)	13.66% (0.15)
GED/high school graduate	27.05% (0.17)	21.32% (0.35)	22.07% (0.39)	26.11% (0.16)
Some college	21.45% (0.15)	15.01% (0.32)	9.72% (0.27)	19.88% (0.14)
College or higher	40.87% (0.25)	45.81% (0.50)	29.07% (0.62)	40.35% (0.25)
Enabling Variables				
Work Status*				
Never worked	4.29% (0.08)	7.52% (0.21)	15.33% (0.33)	5.51% (0.08)
No work	34.78% (0.19)	29.38% (0.37)	20.21% (0.36)	33.06% (0.17)
Currently working	60.93% (0.21)	63.10% (0.41)	64.46% (0.42)	61.43% (0.19)
Family Income to FPL*				
Poor: FPL < 100%	11.95% (0.18)	13.41% (0.31)	27.51% (0.49)	13.39% (0.17)
Low: 100% ≤ FPL < 200%	16.57% (0.15)	19.77% (0.35)	29.92% (0.41)	17.99% (0.15)
Middle: 200% ≤ FPL < 300%	29.76% (0.17)	29.29% (0.38)	24.53% (0.39)	29.27% (0.16)
High: FPL ≥ 400%	41.73% (0.31)	37.53% (0.51)	18.04% (0.47)	39.34% (0.30)
Health Insurance*				
Not covered	11.79% (0.13)	12.84% (0.29)	43.98% (0.65)	14.57% (0.14)
Covered	88.21% (0.13)	87.16% (0.29)	56.02% (0.65)	85.43% (0.14)
Need Variables				
Reported Health Status*				
Poor to Fair	13.02% (0.12)	14.40% (0.30)	10.96% (0.31)	12.97% (0.11)
Good to Excellent	86.98% (0.12)	85.60% (0.30)	89.04% (0.31)	87.03% (0.11)
Smoking Status*				
Current smoker	19.21% (0.15)	9.48% (0.22)	10.95% (0.28)	17.60% (0.14)
Former smoker	23.32% (0.14)	18.54% (0.30)	12.56% (0.28)	21.98% (0.13)
Never smoker	57.47% (0.19)	71.98% (0.34)	76.49% (0.37)	60.42% (0.17)
Alcohol Drinking Status*				
Current drinker	67.88% (0.22)	55.24% (0.42)	51.48% (0.46)	65.34% (0.20)
Former drinker	14.88% (0.12)	11.59% (0.27)	10.65% (0.26)	14.22% (0.11)
Lifetime abstainer	17.24% (0.17)	33.17% (0.40)	37.87% (0.44)	20.45% (0.16)
Hypertension*	31.60% (0.17)	30.33% (0.36)	16.40% (0.32)	30.21% (0.15)
Yes	68.40% (0.17)	68.40% (0.36)	83.60% (0.32)	69.79% (0.15)
No				
Depression*				
Yes	7.38% (0.14)	5.93% (0.31)	6.18% (0.42)	7.21% (0.13)
No	92.62% (0.14)	94.07% (0.31)	93.82% (0.42)	92.79% (0.13)

Note. *Rao-Scott chi-squared tests, *p*-value <0.001.

Figure 2

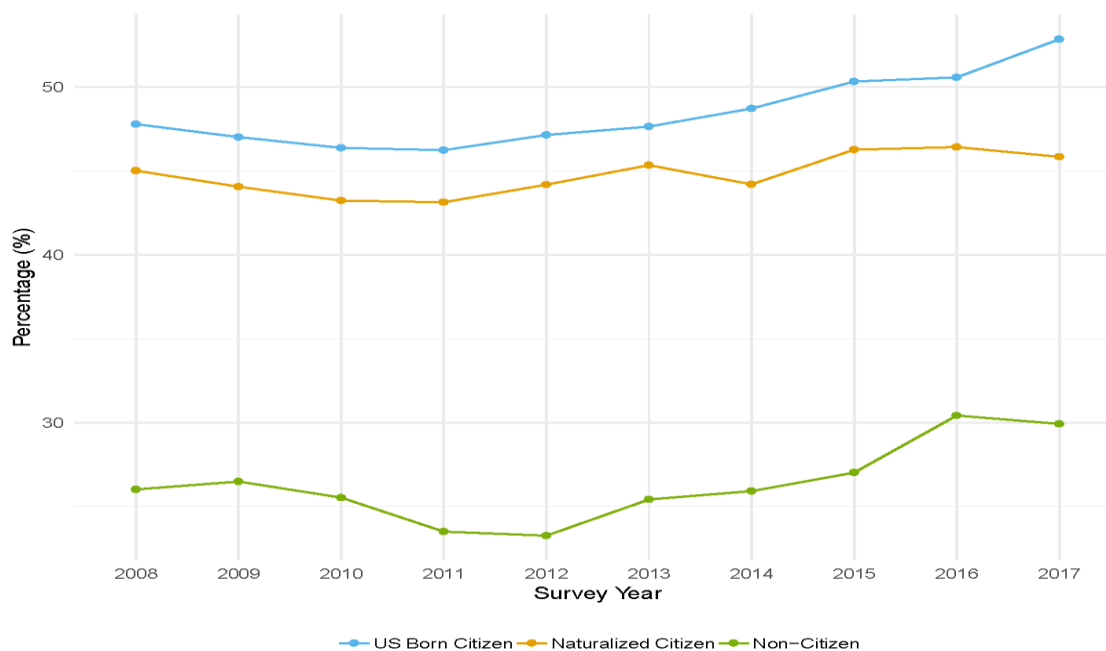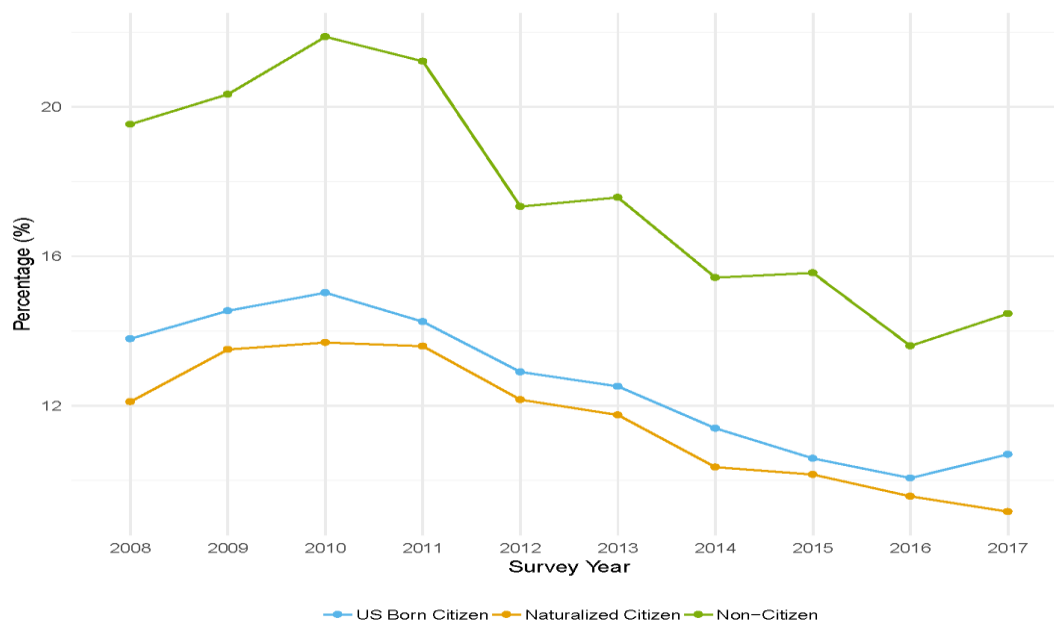*Trend Analysis of Dental Coverage by Citizenship Status, 2008 to 2017*

Figure 3

Trend Analysis of Delayed Dental Care due to Cost by Citizenship Status, 2008 to 2017

Predictors of Dental Coverage

In logistic regression models, citizenship status was a strong predictor of dental coverage. In the unadjusted model, naturalized citizens had 15% lower odds (OR = 0.85, 95% CI [0.78, 0.93]) and non-citizens had 36% lower odds (OR=0.64, CI [0.56, 0.73]) of having dental insurance compared to U.S.-born citizens. After adjusting for predisposing and enabling factors (Model 2), the disparity narrowed but remained significant. In the fully adjusted model (Model 3), naturalized citizens had 10% lower odds (OR = 0.90, CI [0.83, 0.98] and non-citizens had 27% lower odds (OR = 0.73, CI [0.63, 0.84]).

Enabling factors exerted the strongest influence on dental coverage. Individuals with family income ≥400% of the FPL had nearly 9.4 times greater odds of having dental insurance than those <100% FPL (OR = 9.39, CI [8.53, 10.23]). Possessing health insurance was also strongly associated with dental coverage (OR = 30.95, CI [26.54, 36.08]). Higher educational attainment, particularly a bachelor's degree or higher, significantly increased the likelihood of dental insurance (OR = 1.6, CI [1.50, 1.74]). Conversely, older adults (≥65), those unemployed, and individuals reporting good-to-excellent self-rated health were less likely to have coverage (see Table 2).

Table 2

Predictors of Dental Coverage Based on Andersen's Behavioral Model of Health Services Utilization

Covariates	Odds Ratio (95% Confidence Interval)		
	Predisposing Only (Model 1)	**Predisposing + Enabling (Model 2)**	**Predisposing + Enabling + Need (Model 3)**
Citizenship Status (ref: US born citizen)			
Naturalized citizen	**0.91 (0.87, 0.95)**	**0.91 (0.87, 0.96)**	**0.90 (0.83, 0.98)**
Non-citizen	**0.47 (0.45, 0.49)**	**0.79 (0.75, 0.83)**	**0.73 (0.63, 0.84)**
Predisposing Factors			
Age (ref: 18-24)			
25-34	0.99 (0.95, 1.04)	**0.76 (0.71, 0.81)**	**0.81 (0.69, 0.94)**
35-44	**1.34 (1.28, 1.40)**	**0.87 (0.81, 0.93)**	0.92 (0.80, 1.07)
45-54	**1.33 (1.27, 1.39)**	**0.75 (0.70, 0.80)**	**0.82 (0.71, 0.95)**
55-64	1.02 (0.98, 1.07)	**0.57 (0.53, 0.60)**	**0.66 (0.57, 0.76)**
65 or older	**0.36 (0.34, 0.37)**	**0.23 (0.21, 0.25)**	**0.28 (0.24, 0.33)**
Female	**0.93 (0.92, 0.95)**	1.02 (1.00, 1.05)	**1.11 (1.05, 1.16)**
Race/Ethnicities (ref: Non-Hispanic White)			
Hispanic	**0.70 (0.68, 0.73)**	**0.95 (0.91, 0.99)**	0.96 (0.88, 1.05)
Non-Hispanic Black	**0.74 (0.72, 0.77)**	**1.07 (1.03, 1.12)**	**1.11 (1.04, 1.19)**
Non-Hispanic Asian	**1.09 (1.03, 1.16)**	1.06 (1.00, 1.13)	**1.14 (1.00, 1.31)**
Non-Hispanic all other	**0.63 (0.55, 0.72)**	1.10 (0.93, 1.29)	1.14 (0.93, 1.39)
Education (ref: Less than high school)			
GED/High school graduate	**1.94 (1.86, 2.03)**	**1.31 (1.25, 1.37)**	**1.27 (1.18, 1.36)**
Some college	**2.83 (2.71, 2.96)**	**1.63 (1.55, 1.71)**	**1.49 (1.39, 1.61)**
College or higher	**4.70 (4.50, 4.91)**	**1.80 (1.71, 1.89)**	**1.62 (1.50, 1.74)**

Covariates	Odds Ratio (95% Confidence Interval)		
	Predisposing Only (Model 1)	Predisposing + Enabling (Model 2)	Predisposing + Enabling + Need (Model 3)
Enabling Factors			
Work Status (ref: Currently working)			
Never worked		**0.45 (0.42, 0.48)**	**0.36 (0.32, 0.41)**
No work		**0.49 (0.47, 0.51)**	**0.44 (0.42, 0.46)**
Family Income (ref: Poor FPL <100%			
Low: 100% ≤ FPL < 200%		**1.89 (1.77, 2.01)**	**2.22 (2.03, 2.42)**
Middle: 200% ≤ FPL <		**4.46 (4.19, 4.75)**	**5.59 (5.15, 6.07)**
300%		**7.41 (6.93, 7.92)**	**9.34 (8.53, 10.23)**
High: FPL ≥ 400%			
Have Health Insurance		**36.87 (34.12, 39.85)**	**30.95 (26.54, 36.08)**
Need Factors			
Good to Excellent Reported Health Status (ref: Poor to Fair)			**0.77 (0.73, 0.80)**
Smoking Status (ref: Never smoker)			
Current smoker			**0.77 (0.73, 0.82)**
Former smoker			**0.90 (0.86, 0.94)**
Alcohol Drinking Status (ref: Lifetime abstainer)			
Current drinker			**1.16 (1.09, 1.23)**
Former drinker			1.04 (0.97, 1.11)
Hypertension			0.97 (0.93, 1.01)
Depression			**0.82 (0.75, 0.89**

Note. Values written in bold indicate statistical significance.

Predictors of Delayed Dental Care Due to Cost

In unadjusted analyses, non-citizens were significantly more likely to delay dental care due to cost (OR=1.24, CI [1.16, 1.33]). However, after adjusting for enabling factors such as income and insurance, the direction of association reversed. In the final model, non-citizens had significantly lower odds of delay (OR=0.72, CI [0.67, 0.77]) compared to U.S.-born citizens, suggesting that structural barriers—rather than citizenship per se—drive cost-related delay. Naturalized citizens also showed reduced odds of delay (OR=0.88, CI [0.81, 0.95]).

Lack of dental insurance was the strongest predictor of delayed care (OR=3.52, CI [3.30, 3.74]), followed by lack of health insurance (OR=2.27, CI [2.13, 2.41]) and income <100% FPL (OR=2.61, CI [2.41, 2.83]). Poor or fair self-rated health (OR=1.41), current smoking (OR=1.18), and depression diagnosis (OR=1.26) also contributed significantly. Surprisingly, individuals who reported never working were less likely to delay care, possibly reflecting coverage through public programs such as Medicaid (see Table 3).

Taken together, these findings support the notion that citizenship disparities in dental access are largely mediated by socioeconomic position and insurance status rather than citizenship status alone.

Table 3

Predictors of Delayed Dental Care due to Cost

Covariates	Odds Ratio (95% Confidence Interval)		
	Predisposing Only (Model 1)	**Predisposing + Enabling (Model 2)**	**Predisposing + Enabling + Need (Model 3)**
Citizenship Status (ref: US born citizen)			
Naturalized citizen	**0.92 (0.87,0.97)**	**0.90 (0.84,0.95)**	1.09 (0.98,1.22)
Non-citizen	**1.11 (1.04,1.19)**	**0.72 (0.67,0.77)**	0.99 (0.87,1.13)
Predisposing Factors			
Age (ref: 18-24)			
25-34	**1.70 (1.60,1.80)**	**1.74 (1.64,1.85)**	**1.39 (1.22,1.57)**
35-44	**1.50 (1.42,1.60)**	**1.78 (1.67,1.90)**	**1.29 (1.14,1.45)**
45-54	**1.56 (1.47,1.65)**	**2.07 (1.94,2.20)**	**1.25 (1.11,1.41)**
55-64	**1.35 (1.27,1.43)**	**1.74 (1.63,1.85)**	1.02 (0.90,1.15)
65 or older	**0.59 (0.55,0.62)**	**0.68 (0.63,0.73)**	**0.42 (0.37,0.48)**
Female	**1.42 (1.38,1.46)**	**1.44 (1.39,1.48)**	**1.40 (1.33,1.46)**
Race/Ethnicities (ref: Non-Hispanic White)			
Hispanic	**1.18 (1.11,1.24)**	**0.93 (0.87,0.99)**	1.04 (0.95,1.14)
Non-Hispanic Black	**1.18 (1.12,1.23)**	**0.88 (0.84,0.92)**	1.00 (0.93,1.07)
Non-Hispanic Asian	**0.65 (0.59,0.70)**	**0.68 (0.62,0.75)**	0.94 (0.80,1.10)
Non-Hispanic all other	1.18 (1.00,1.40)	**0.82 (0.68,1.00)**	0.83 (0.66,1.05)
Education (ref: Less than high school)			
GED/High school graduate	**0.77 (0.74,0.80)**	0.99 (0.95,1.04)	1.05 (0.98,1.12)
Some college	**0.78 (0.74,0.82)**	**1.24 (1.18,1.31)**	**1.38 (1.28,1.48)**
College or higher	**0.43 (0.41,0.45)**	1.03 (0.97,1.08)	**1.29 (1.20,1.40)**
Enabling Factors			
Work Status (ref: Currently working)			
Never worked		**0.71 (0.66,0.76)**	**0.58 (0.52,0.65)**
No work		**1.21 (1.16,1.25)**	**0.87 (0.83,0.93)**
Family Income (ref: Poor: FPL < 100%)			
Low: 100% ≤ FPL < 200%		**0.96 (0.92,1.00)**	1.04 (0.98,1.10)
Middle: 200% ≤ FPL < 400%		**0.62 (0.60,0.65)**	**0.69 (0.65,0.74)**
High: FPL ≥ 400%		**0.27 (0.26,0.29)**	**0.32 (0.30,0.35)**
Have Health Insurance		**0.40 (0.38,0.42)**	**0.37 (0.35,0.40)**
Have Dental Coverage		**0.45 (0.43,0.47)**	**0.50 (0.47,0.54)**
Need Factors			
Reported Health Status (Good to Excellent) ref: Poor to Fair)			**1.49 (1.42,1.56)**
Smoking Status (ref: Never smoker)			
Current smoker			**1.41 (1.34,1.50)**
Former smoker			**1.17 (1.10,1.24)**
Alcohol Drinking Status (ref: Lifetime abstainer)			
Current drinker			**1.33 (1.24,1.42)**
Former drinker			**1.28 (1.18,1.38)**
Hypertension			**1.18 (1.12,1.23)**
Depression			**1.72 (1.60,1.84)**

Note. Values written in bold indicate statistical significance.

DISCUSSION

The findings are consistent with prior studies that have documented significant disparities in dental insurance coverage and access to dental care among immigrant populations (Cheng et al., 2019; Wilson et al., 2016). Similar to earlier reports, non-citizens in our analysis had the lowest rates of dental insurance coverage and highest rates of delayed dental care due to cost. These disparities may be attributed to immigration-related barriers for non-citizens such as lack of access to public benefits, fear, or being unfamiliar with the U.S. healthcare system (Asad & Clair, 2015; Castañeda et al., 2015).

The findings also align with previous research showing that cost is the most common reason individuals delay dental care, even among those with some form of insurance (American Dental Association, Health Policy Institute, 2024; Vujicic et al., 2016). This study reinforces those observations by showing that dental insurance along may not eliminate affordability concerns, especially when coverage is limited or out-of-pocket expenses remain high. Fellows et al. (2022) highlighted that even insured individuals face considerable cost burdens, and our findings reflect this trend.

The multivariable analysis models support the assertion that enabling factors such as income and insurance status play a greater role in explaining disparities than citizenship alone. When these structural variables are accounted for, the association between citizenship and cost-related delay becomes non-significant. This reinforces findings by Nasseh and Vujicic (2014), who noted that rising income disparities play a growing role in dental care utilization. It also supports the framework presented by Andersen (1995), where enabling resources are pivotal for access.

Interestingly, the results indicate that naturalized citizens had lower odds of delayed dental care compared to U.S.-born citizens in adjusted models. This finding may reflect differences in healthcare-seeking behaviors or perceived value of dental care among immigrant populations. It may also be influenced by underreporting due to structural, cultural, or language-related barriers. While this outcome deserves further exploration, it highlights the importance of disaggregating immigrant subgroups and using multiple access indicators when evaluating disparities.

The study also sheds light on the influence of predisposing and need factors on dental access outcomes, in alignment with Andersen's Behavioral Model of Health Services Use. According to the model, predisposing characteristics—age, sex, race, and education—shape an individual's propensity to seek care (Andersen, 1995). Our findings revealed that middle-aged adults (45–64) and females were more likely to delay dental care due to cost, which may reflect caregiving burdens, employment instability, or differential prioritization of oral health within this group. Higher educational attainment was associated with greater odds of having dental insurance, likely reflecting not only greater access to employer-based benefits but also increased health literacy and the ability to navigate insurance systems. These patterns suggest that educational and demographic background influence not just structural access to care but also attitudes and behaviors regarding when and how dental care is sought. Race and ethnicity were associated with differences in dental outcomes, but these effects were attenuated after adjusting for enabling factors, supporting the interpretation that socioeconomic inequality is the primary driver of racial disparities in oral health.

Need factors, another core component of Andersen's model, refer to both perceived and evaluated health needs. The analysis showed that individuals with fair/poor self-rated health, as well as those with behavioral or chronic health risks—such as smoking, depression, and hypertension—were more

likely to delay care due to cost. These findings suggest that people are already managing significant health burdens and may be forced to deprioritize dental care when resources are limited, especially if oral health is viewed as less urgent. Moreover, these conditions may exacerbate or be exacerbated by poor oral health, reflecting a bidirectional relationship between chronic illness and access to care (Öçbe et al., 2025). The intersection of clinical need and affordability constraints highlight the vulnerability of medically complex patients and underscores the importance of integrating oral health into broader chronic disease management strategies. By incorporating these predisposing, enabling, and need factors into the analysis, we show that disparities in dental access arise from a combination of individual vulnerabilities, structural barriers, and broader systemic inequities, as theorized in Andersen's theoretical framework.

Finally, this study builds on the work of Song et al. (2021), who found that the ACA had a modest impact on dental coverage on adults. Our trend analysis shows modest increases in dental coverage across all groups post-ACA, but persistent disparities suggest that targeted reforms, such as expanding Medicaid adult dental benefits, are needed. Taken together, these findings to the growing body of literature that calls for structural reforms to reduce oral health disparities, particularly among immigrant and low-income populations.

Limitations

The study has limitations that merit consideration. The study relies on self-reported data, which may be subject to recall bias and misclassification, particularly in variables such as dental coverage, care-seeking behavior, and health status. While analysis distinguishes between naturalized and non-citizens, the survey data do not capture detailed documentation or the full nuances of the respondents' immigration status. This limitation may introduce inaccuracies in classifying citizenship groups, thereby limiting our ability to conduct a more detailed analysis of variations within non-citizen subpopulations. In addition, the NHIS does not provide clinical indicators of oral health, and the analysis did not incorporate state-level policy variations in Medicaid dental coverage. These factors could influence the observed variation in health outcomes and affect the assessment of insurance access and utilization.

Nonetheless, by drawing on a large nationally representative sample and employing Andersen's model, this study offers important insights into how citizenship intersects with predisposing, enabling, and need-based factors to shape access to oral health care. Our findings contribute to the evidence base needed to guide future public health strategies and policy reforms aimed at reducing dental care disparities.

CONCLUSION

This study highlights that disparities in dental coverage and delayed dental care among U.S. adults are primarily driven by structural factors, particularly income and insurance access, rather than citizenship status alone. Non-citizens face the steepest barriers, but our findings show that these barriers are mitigated when enabling resources are improved, emphasizing the powerful role of structural determinants over individual characteristics. Guided by Andersen's behavioral model of health services use, this study demonstrates that strengthening enabling factors like dental and health insurance coverage can meaningfully reduce oral health disparities. Achieving equitable access to dental care requires policy reforms that expand adult dental benefits and clinical practices that

recognize and address cost barriers, particularly for immigrant and low-income populations. The path toward oral health equity lies in dismantling structural obstacles and ensuring that access to care is a reality for all, regardless of citizenship.

List of Abbreviations
ACA- Affordable Care Act
FPL- Federal Poverty Level

Declarations

Ethical Issues
The study is a secondary analysis of a publicly available national health survey. No human subjects were involved during the conduct of research; thus, no ethics review was required.

Availability of Data and Materials

All data relevant to this study are presented within the article. Since no additional datasets were created or analyzed during this study, data sharing is not applicable.

Competing Interests

The authors declare that they have no known financial interests or personal relationships that could potentially influence the work presented in this paper.

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Author's contributions

This work is the sole authorship of the authors, who independently designed the protocol, conducted the data cleaning, re-coding, analysis and interpretation of the results. They also wrote, edited, reviewed, and approved the final manuscript.

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