Changes in dental visits and expenditures in veterans, older adults, and foreign-born after affordable care act repeal efforts: A quasi-experimental difference-in-differences study

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ABSTRACT

INTRODUCTION The Patient Protection and Affordable Care Act (ACA) faced political and legal challenges before and after enactment, and through implementation, including serious attempts at repealing and dismantling its main provisions in 2017. We assessed the relationship between ACA implementation (indicated as a state expanding Medicaid), dental visits, and costs among US military veterans, older adults aged ≥65 years, and foreign-born individuals following ACA repeal efforts.

METHODS Using data from the 2016–2018 Medical Expenditure Panel Surveys, logistic and two-part regressions were used to model dental visits and costs as a function of key explanatory variables. Differences-in-differences estimates compared changes in dental visits and costs in Medicaid expansion to non-expansion states in pre-repeal (2016) versus repeal (2017–2018) time periods.

RESULTS Post-ACA repeal efforts, multivariable analysis conducted among all US adults showed that individuals in Medicaid expansion states had higher odds of reporting a dental visit compared to those in a non-Medicaid expansion state (AOR=1.09; 95% CI: 1.02–1.16; p=0.009). In subgroup analysis, veterans in Medicaid expansion states had significantly higher odds of a past-year dental visit compared to those in non-Medicaid expansion states (AOR=1.28; 95% CI: 1.07–1.52; p=0.006). No significant changes in past-year dental visits were noted for older adults and the foreign-born in Medicaid expansion states. Regarding health expenditures, veterans, older adults, and foreign-born individuals in Medicaid expansion states all spent significantly more than the predicted average expenditure on dental visits following ACA repeal efforts, compared to those in non-Medicaid expansion states.

CONCLUSIONS The findings of this study suggest that the ACA, through expansion of Medicaid programs, improved access for veterans' post-ACA repeal efforts but without the cost savings typical to ACA implementation. Efforts to completely repeal or modify important ACA components result in higher expenditures whether health service utilization increases or not.

INTRODUCTION

The Affordable Care Act (ACA) faced many congressional, political, and legal debates and challenges after it was passed as law in 2010, the most significant coming with Executive Order (EO) 13765 signed in January 2017 which set out interim 'repeal and replace' procedures, setting the stage for at least 70 attempts to repeal, modify, or replace the ACA by mid-2017[1-3]. These included serious attempts at repealing and dismantling its two main provisions: the individual mandate (non-exempt individuals must purchase minimum essential coverage or face a tax penalty) and the employer mandate (employers must offer affordable health insurance that provides minimum value to 95% of their full-time employees and their children up to the age of 26 years, or face a tax penalty)[4,5]. These challenges were preceded by a landmark Supreme Court decision in June 2012 that upheld the constitutionality of ACA but ruled that states could opt to expand Medicaid rather than be mandated to do so[6].

Governors and state leaders were thus allowed to opt out of Medicaid expansion without fear of losing funding under Medicaid. As of January 2021, the following 12 states had chosen not to expand Medicaid: Alabama, Florida, Georgia, Kansas, Mississippi, North Carolina, South Carolina, South Dakota, Tennessee, Texas, Wisconsin, and Wyoming[7]. While three-fourths of the states had expanded Medicaid, only 13 states expanded Medicaid with adult dental benefits at the time of this analysis, failing to implement a combination that could provide coverage for vulnerable groups who otherwise would not have access to dental care[8].

Given that a central goal of the ACA is to significantly reduce the number of uninsured people by providing a continuum of affordable coverage options through Medicaid and the health insurance marketplaces, by expanding Medicaid for most low-income adults[9], it is pertinent to examine the impact of these repeal efforts on dental care – one aspect of healthcare that has been particularly noted for high out-of-pocket payments and poor access among the disadvantaged. Key demographic subgroups identified in previous reports as being particularly in need of barrier-free access to dental care include poor children, veterans, older adults, and many members of racial and ethnic minority groups, including immigrants[10,11].

While past research has examined the impact of Medicaid expansion on disparities in use of healthcare services[7], little is known about the impact of ACA repeal efforts among some of the most vulnerable populations with unique dental needs and access challenges. This article aims to fill this gap in knowledge, focusing on three special populations of great importance from a policy perspective: US military veterans, older adults aged ≥65 years, and foreign-born individuals. US military veterans are a special subgroup because of their varied health insurance coverage that makes their pattern of healthcare use different from other population groups[12,13]; older adults are a large and growing segment of the US population, projected to surpass children in population size by 2034[14], while the foreign-born are thought to disproportionately use more healthcare services and contribute more to healthcare costs in relation to their population share[15-17].

To inform public health policy and programs aimed at improving access to dental care among these subgroups, we compared changes in dental visits (past-year dental visits) and costs (nominal dollars) for veterans, older adults, and the foreign-born living in states that expanded Medicaid to those living in states that did not, following ACA repeal efforts in 2017. We hypothesized that Medicaid expansion may be associated with increased dental visits and reduced costs in veterans, older adults, and the foreign-born following ACA repeal efforts in 2017.

METHODS

Epidemiologic design, study population and data

This is a retrospective, quasi-experimental, secondary analysis of 2016–2018 Medical Expenditure Panel Surveys (MEPS) data representative of US non-institutionalized adults aged ≥18 years. Data on past-year dental visits from the full-year consolidated data files of the Household Component of MEPS, were linked back to the sample adult file of the NHIS to retrieve the two-letter states Federal Information Processing Standard codes collected in NHIS but not MEPS. The subpopulations of interest were veterans, older adults aged ≥65 years, and the foreign-born; demographic indicators captured in the NHIS adult file. Within each subpopulation, we were interested in comparing dental visits and costs between adults who lived in a state where specific ACA-related polices like Medicaid expansion were implemented versus those living in states where the policy was not implemented. Institutional Review Board approval was requested and approved by Morgan State University.

Dependent variables

The first dependent or outcome variable was dental visits, assessed as a binary or dichotomous variable (i.e. yes/no). Dental visits in MEPS was a continuous variable (i.e. the total number of dental care visits), and included those visits to any persons for dental care including general dentists, dental hygienists, dental technicians, dental surgeons, orthodontists, endodontists, and periodontists in the past 12 months (Supplementary file Section 1)[18].

Dental expenditure was the second dependent or outcome variable analyzed. Dental expenditure was assessed as a continuous variable (i.e. total expenditure in US$), the sum of out-of-pocket, private, Medicaid, and Medicare spending on dental services (Supplementary file Section 1)[18].

Independent variable

The key independent or predictor variable was Medicaid expansion, an indicator, binary variable (i.e. yes/no) for ACA implementation, representing the status of state action on the Medicaid expansion decision (Supplementary file Section 2)[18].

Covariates

These consisted of demographic factors such as sex, age, race/ethnicity, and marital status, and standard socioeconomic variables such as education level and income/poverty level. Also included were region of residence, veteran, nativity, dentate, and dental insurance status (Supplementary file Section 3)[18].

Statistical analysis

The relationships between Medicaid expansion, the main outcome variables (dental visits and dental expenditures), and covariates were assessed using regression models (models specified in Supplementary file Section 4)[18] estimated separately for veterans, older adults aged ≥65 years, and the foreign-born by state (reform states vs non-

reform states) and time period [pre-repeal (2016) vs repeal time periods (2017–2018)].

Frequencies and percentages were calculated to present a descriptive analysis. Bivariate analyses for comparison of demographic characteristics in the sample were performed using chi-squared tests for the key independent variable (Medicaid expansion), covariates, and the dependent variable (dental visits).

Unadjusted and adjusted logistic regressions (Equation 1 in models specified in Supplementary file Section 4)[18] were performed for the dichotomous outcome variable, dental visits. For the adjusted logistic regressions, a difference-in-differences (DiD) analysis[19,20] was conducted by including a dummy variable denoting the interaction between a Medicaid expansion state during the post-period (*post*i × *MedExp*i) estimated for the full sample, then separately for veterans versus non-veterans, older adults aged ≥65 years versus adults aged 18–64 years, and the foreign-born versus US-born. We report odds ratios (ORs) and 95% confidence intervals (CIs).

A two-part econometric regression model (2pm) was next fit for the continuous dependent variable, dental expenditures (see Equation 2 in models specified in Supplementary file Section 4[18])[21-25]. The 2pm analysis was by state (reform states vs non-reform states) and time period (pre-repeal vs repeal time periods) as unadjusted regressions, then adjusted. Next, simple subtractions were used to calculate changes in dental care expenditures as the difference in predicted expenditures in repeal and pre-repeal time periods for reform (Medicaid expansion) and non-reform (no Medicaid expansion) states separately, using the estimated average expenditure per capita for veterans, older adults, and the foreign-born. Finally, DiD summary estimates describing the difference in predicted outcomes of the interaction terms for each observation were calculated in US$ using average marginal effects. The DiD summary estimate compared those living in a reform (Medicaid expansion) state to those living in a non-reform (no Medicaid expansion) state, with the results averaged over the national sample.

All multivariable analyses were adjusted for demographics (age, race/ethnicity, and marital status), socio-economic level (education level and poverty level), region of residence, veteran, nativity, dentate and dental insurance status. Analyses were weighted using MEPS survey weights to adjust for the differential probabilities of selection and non-response, and conducted using Stata/MP version 17.0 (StataCorp LP, College Station, TX). A detailed discussion of the statistical analytic methods used is included in Supplementary file Section 4[18].

RESULTS

Descriptive results

There were 66639 adult participants in the 2016–2018 NHIS-MEPS analytic sample. In total, 69.8% of US adults were from a state where the ACA was implemented (i.e. Medicaid expansion states), while 73.1% and 26.9%, respectively, of those in expansion states and those in non-expansion states had a dental visit. In the study population, 51.8% were female, 79.2% were aged 18–64 years, 65.1% were White and non-Hispanic, 45.8% had an education level higher than high school, 73.8% had annual household income >200% of the Federal Poverty Level, 37.8% lived in the south, 52.3% were married, 92.4% were non-veterans, 82.5% were US-born, 93.6% were dentate, and 54.4% had no dental insurance (Supplementary file Section 6)[18].

Bivariate analysis results

Chi-squared tests were used to examine the relationship between each independent variable and dental visits in bivariate analysis. Results were statistically significant for all variables at $p<0.05$ (Table 1).

Dental visits and Medicaid expansion: multivariable results (all US adults)

Main results for all time periods are presented for unadjusted, adjusted, and DiD analyses. In unadjusted regressions all variables were statistically significantly associated with dental visits (Table 2, Model 1). Participants in Medicaid expansion states had 32% higher odds of having a dental visit compared to those in non-expansion states (unadjusted odds ratio, OR=1.32; 95% CI: 1.21–1.44; $p<0.001$). In adjusted analysis, all variables, except Medicaid expansion and veteran status were statistically significantly associated with dental visits (Table 2, Model 2). In the DiD analysis, participants in expansion states had 9% higher odds of having a dental visit compared to participants in non-expansion states (adjusted odds ratio, AOR=1.09; 95% CI: 1.02–1.16; $p<0.01$).

Dental visits and Medicaid expansion: subgroup analysis results

Table 3 provides the ORs and CIs for veterans, older adults aged ≥65 years, and the foreign-born. The DiD estimator was only significant for veterans. Veterans in Medicaid expansion states had 28% higher odds of having a dental visit compared to their counterparts in non-expansion states following ACA repeal efforts (AOR=1.28; 95% CI: 1.07–1.52; $p<0.01$)

Dental expenditures and Medicaid expansion: two-part regression model results

Predicted unadjusted and adjusted expenditures per capita for veterans, older adults aged ≥65 years, and the foreign-born, by reform (Medicaid expansion) and non-reform (no Medicaid expansion) states and by time periods [pre-repeal (2016) and repeal periods (2017–2018)] are shown in Tables 4 and 5. Differences in expenditure by time period (repeal period expenditure minus pre-repeal period expenditure) and DiD analysis results are also shown. All DiD estimates were significant in unadjusted and adjusted analysis.

Total expenditures for veterans, those aged ≥65 years, and

Table 1. Bivariate analysis between independent variables and dental visits, MEPS 2016–2018 (N=66639; weighted N=236408797)

Variables	Total (N=66639)	No dental visits (N=41433)	Dental visits (N=25206)	χ^2	p
	% (n)	% (n)	% (n)		
Was Medicaid expansion adopted?				37.89	<0.001
Not adopted	32 (21078)	61.5 (14414)	38.5 (6664)		
Adopted	68 (45561)	54.9 (27019)	45.1 (18542)		
Sex				27.08	<0.001
Male	46 (30875)	6.8 (20230)	39.2 (10645)		
Female	54 (35764)	53.3 (21203)	46.7 (14561)		
Age (years)				156.25	<0.001
18–64	79 (52619)	58.9 (33884)	41.1 (18735)		
≥65	21 (14020)	49.2 (7549)	5.8 (6471)		
Race/ethnicity				667.25	<0.001
Hispanic	26 (17367)	71.2 (13040)	28.8 (4327)		
White (non-Hispanic)	50 (33476)	5.3 (17347)	49.7 (16129)		
Black (non-Hispanic)	17 (11343)	71.4 (8376)	28.6 (2967)		
Asian (non-Hispanic)	7 (4453)	59 (2670)	41 (1783)		
Education level				1059.81	<0.001
Lower than H/S	18 (12133)	74.3 (9469)	25.7 (2664)		
High school/GED	47 (31025)	63.9 (21013)	36.1 (10012)		
Higher than H/S	35 (23481)	44.1 (10951)	55.9 (12530)		
Family income (% of poverty line)				1083.66	<0.001
Poor (<100)	16 (10657)	74.2 (8267)	25.8 (2390)		
Near poor (100–199)	20 (13269)	72.7 (9927)	27.3 (3342)		
Non-poor (≥200)	64 (42713)	51.1 (23239)	48.9 (19474)		
Residence				99.67	<0.001
Northeast	16 (10783)	53.4 (6206)	46.6 (4577)		
Midwest	20 (13375)	52.8 (7602)	47.2 (5773)		
South	38 (25573)	62.6 (17582)	37.4 (7991)		
West	25 (16908)	53.9 (10043)	46.1 (6865)		
Marital status				301.12	<0.001
Married	50 (32998)	52 (18772)	48 (14226)		
Separated/widowed/divorced	21 (14196)	59.5 (9169)	4.5 (5027)		
Never married	29 (19445)	64.1 (13492)	35.9 (5953)		
Veteran status				9.37	.0024
Non-veteran	93 (61874)	57.1 (38773)	42.9 (23101)		
Veteran	7 (4765)	54.1 (2660)	45.9 (2105)		
Nativity status				164.2	<0.001
US-born	76 (50700)	54.9 (30048)	45.1 (20652)		
Foreign-born	24 (15939)	66.3 (11385)	33.7 (4554)		
Dentate status				546.62	<0.001
Non-dentate	7 (4687)	81.2 (3866)	18.8 (821)		
Dentate	93 (61952)	55.2 (37567)	44.8 (24385)		
Dental insurance status				421.54	<0.001
Dental insurance	39 (25984)	48.8 (13396)	51.2 (12588)		
No dental insurance	61 (40655)	63.6 (28037)	36.4 (12618)		

Table 2. Unadjusted and adjusted analysis: odds ratio and difference-in-difference estimates for dental visits, MEPS 2016–2018 (N=66639)

Variables	Unadjusted - Model 1		Fully adjusted - Model 2	
	OR	95% CI	AOR	95% CI
DiD	-	-	1.09**	1.02–1.16
Medicaid expansion				
Not adopted ®	1		1	
Adopted	1.32***	1.21–1.44	0.95	0.86–1.04
Sex				
Male ®	1		1	
Female	1.36***	1.31–1.41	1.43***	1.37–1.50
Age (years)				
18–64 ®	1		1	
≥65	1.48***	1.40–1.57	1.93***	1.80–2.06
Race/ethnicity				
Hispanic ®	1		1	
White (non-Hispanic)	2.45***	2.27–2.63	1.71***	1.58–1.85
Black (non-Hispanic)	0.99	0.91–1.09	0.91*	0.82–1.00
Asian (non-Hispanic)	1.72***	1.53–1.93	1.17**	1.05–1.31
Education level				
Lower than H/S ®	1		1	
High school/GED	1.63***	1.51–1.77	1.09*	1.00–1.19
Higher than H/S	3.67***	3.37–3.99	1.96***	1.79–21.4
Family income (% of poverty line)				
Poor (<100) ®	1		1	
Near poor (100–199)	1.08	0.99–1.17	0.91**	0.84–0.99
Non-poor (≥200)	2.75***	2.56–2.96	1.59***	1.47–1.72
Residence				
Northeast ®	1		1	
Midwest	1.02	0.92–1.13	1.00	0.90–1.11
South	0.68***	0.62–0.75	0.75***	0.67–0.84
West	0.98	0.88–1.09	1.09	1.00–1.20
Marital status				
Married ®	1		1	
Separated/widowed/divorced	0.74***	0.69–0.79	0.90**	0.84–0.96
Never married	0.61***	0.57–0.64	0.89***	0.84–0.95
Veteran status				
Non-veteran ®	1		1	
Veteran	1.13**	1.04–1.22	1.04	0.96–1.14
Nativity status				
US-born ®	1		1	
Foreign-born	0.62***	0.57–0.66	0.83***	0.77–0.91
Dentate status				
Non-dentate ®	1		1	
Dentate	3.51***	3.14–3.92	3.54***	3.15–3.99
Dental insurance status				
Dental insurance ®	1		1	
No dental insurance	0.55***	0.52–0.58	0.66***	0.62–0.70

AOR: adjusted odds ratio. *p<0.05; **p<0.01; ***p<0.001. ® Reference categories.

Table 3. Difference-in-difference results for dental visits: stratification by veteran status, age group and foreign-born status, MEPS 2016–2018 (N=66639)

Variables	Veterans		Older adults aged ≥65 years		Foreign-born	
	OR	95% CI	OR	95% CI	OR	95% CI
DiD	1.28**	1.07–1.52	1.10	0.98–1.23	1.10	0.97–1.25
Medicaid expansion						
Not adopted ®	1		1		1	
Adopted	1.07	0.84–1.35	0.82*	0.69– 0.96	1.23	0.94–1.61
Sex						
Male ®	1		1		1	
Female	1.91***	1.50–2.44	1.30***	1.18– 1.44	1.42***	1.28–1.57
Age (years)						
18–64 ®	1		1		1	
≥65	2.55***	2.14–3.03	-	-	1.59***	1.35–1.86
Race/ethnicity						
Hispanic ®	1		1		1	
White (non-Hispanic)	0.97	0.70–1.35	1.54***	1.22–1.94	1.80***	1.51–2.15
Black (non-Hispanic)	0.78	0.53–1.14	0.65**	0.50–0.84	0.89	0.70–1.14
Asian (non-Hispanic)	1.06	0.62–1.83	0.95	0.70–1.29	1.12	0.96–1.29
Education level						
Lower than H/S ®	1		1		1	
High school/GED	2.68***	1.62–4.44	1.77***	1.50–2.10	1.21*	1.05–1.40
Higher than H/S	4.65***	2.79–7.77	3.42***	2.82–4.15	1.83***	1.56–2.13
Family income (% of poverty line)						
Poor (<100) ®	1		1		1	
Near poor (100–199)	0.83	0.56–1.22	0.93	0.77–1.12	1.02	0.86–1.21
Non-poor (≥200)	1.58**	1.12–2.23	1.69***	1.42–2.01	1.53***	1.29–1.82
Residence						
Northeast ®	1		1		1	
Midwest	0.82	0.63–1.06	0.84	0.70–1.00	1.01	0.83–1.24
South	0.77	0.58–1.01	0.67***	0.56–0.81	1.07	0.82–1.42
West	1.12	0.85–1.47	1.11	0.94–1.31	1.20*	1.00–1.43
Marital status						
Married ®	1		1		1	
Separated/widowed/divorced	0.78**	0.64–0.94	0.85*	0.75–0.97	1.16*	1.01–1.33
Never married	0.80	0.60–1.08	0.81	0.63–1.03	0.97	0.84–1.12
Veteran status						
Non-veteran ®	1		1		1	
Veteran	-	-	-	-	-	-
Nativity status						
US-born ®	1		1		1	
Foreign-born	0.91	0.57–1.46	0.69**	0.55–0.87	-	-
Dentate status						
Non-dentate ®	1		1		1	
Dentate	5.26***	3.80–7.28	5.67***	4.90–6.57	2.41***	1.76–3.30
Dental insurance status						
Dental insurance ®	1		1		1	
No dental insurance	0.72**	0.59–0.88	0.64***	0.55–0.74	0.49***	0.43–0.56

*p<0.05; **p<0.01; ***p<0.001. ® Reference categories.

Table 4. Unadjusted dental expenditures: difference-in-difference and two-part regression model results, MEPS 2016–2018 (N=66639)

Variables	Reform states[a] (Medicaid expansion)			Non-reform states[b] (non-Medicaid expansion)			Difference-in-difference
	Pre-repeal (2016) US$ (95% CI)	Repeal (2017–2018) US$ (95% CI)	Repeal - Pre-repeal US$	Pre-repeal (2016) US$ (95% CI)	Repeal (2017–2018) US$ (95% CI)	Repeal - Pre-repeal US$	DiD estimate US$ (95% CI)
Veteran status							
Non-veteran ®							
Veteran	86.63* (12.37–160.89)	150.92*** (86.63–215.21)	64.29	78.99 (-25.87–183.85)	135.99* (25.72–246.26)	57	76.28*** (43.11–109.44)
Age (years)							
18–64 ®							
≥65	190.78*** (125.69–255.87)	192.31*** (153.66–230.96)	1.53	98.72** (24.89–172.54)	156.92 (94.24–219.61)	58.2	67.98*** (38.20–97.76)
Nativity status							
US-born ®							
Foreign-born	-55.01* (-107.50 – -2.52)	-51.65 (-115.27–11.98)	3.36	-93.77 (-190.56–3.03)	-117.06*** (-178.43 – -55.70)	-23.29	85*** (49.30–120.96)

a Reform states: AK, AZ, CA, CO, CT, DE, DC, HI, ID, IL, IN, IA, KY, LA, ME, MD, MA, MI, MN, MO, MT, NE, NV, NH, NJ, NY, ND, OH, OK, OR, PA, RI, UT, VT, VA, WA, and WV.
b Non-reform states: AL, FL, GA, KS, MS, NC, SC, SD, TN, TX, WI, and WY. ® Reference categories. *p<0.05; **p<0.01; ***p<0.001.

Table 5. Adjusted dental expenditures: difference-in-difference and two-part regression model results, MEPS 2016–2018 (N=66639)

Variables	Reform states[a] (Medicaid expansion)			Non-reform states[b] (non-Medicaid expansion)			Difference-in-difference
	Pre-repeal (2016) US$ (95% CI)	Repeal (2017–2018) US$ (95% CI)	Repeal - Pre-repeal US$	Pre-repeal (2016) US$ (95% CI)	Repeal (2017–2018) US$ (95% CI)	Repeal - Pre-repeal US$	DiD estimate US$ (95% CI)
Veteran status							
Non-veteran ®							
Veteran	33.88 (-36.61–104.36)	110.18** (42.60–177.75)	76.3	137.80 (-26.64–302.23)	207.99 (-4.67–420.65)	70.19	68.93*** (37.82–100.03)
Age (years)							
18–64 ®							
≥65	192.40*** (132.14–252.66)	215.67*** (172.41–258.93)	23.27	210.70** (70.08–351.32)	215.27** (80.20–350.34)	4.57	64.51*** (35.39–93.63)
Nativity status							
US-born ®							
Foreign-born	-8.01 (-67.30–51.29)	42.85 (-27.54–113.24)	50.86	87.80 (-79.99–255.59)	-15.41 (-160.47–129.64)	-103.21	72.80*** (41.20–104.39)

a Reform states: AK, AZ, CA, CO, CT, DE, DC, HI, ID, IL, IN, IA, KY, LA, ME, MD, MA, MI, MN, MO, MT, NE, NV, NH, NJ, NY, ND, OH, OK, OR, PA, RI, UT, VT, VA, WA, and WV.
b Non-reform states: AL, FL, GA, KS, MS, NC, SC, SD, TN, TX, WI, and WY. ® Reference categories. *p<0.05; **p<0.01; ***p<0.001.

the foreign-born were $7.46 billion, $5.84 billion, and $7.13 billion, respectively from 2016 to 2018 (Supplementary file Section 5)[18]. Unadjusted average expenditures for veterans, those aged ≥65 years, and the foreign-born were $341.80, $311.88, and $365.18, respectively, from 2016 to 2018 (Supplementary file Section 5)[18]. Adjusted average expenditures for veterans, those ≥65 years old, and the foreign-born were $341.71, $311.92, and $365.21, respectively, from 2016 to 2018 (Supplementary file Section 5)[18]. Veterans, older adults aged ≥65 years, and the foreign-born in Medicaid expansion states spent $69, $65, and $73, respectively, more than the predicted average expenditure compared to their counterparts in non-Medicaid expansion states (DiD estimates in Table 5).

DISCUSSION

This study shows that almost three-quarters of US adults in Medicaid expansion states had a dental visit compared to about one-third of those in non-Medicaid expansion states. The study findings indicate lower utilization of dental services among veterans, older adults aged ≥65 years, and foreign-born relative to what is reported in the literature for healthcare in general. Of the three subgroups analyzed in our study, veterans had the highest total dental expenditure both pre- and post-ACA repeal efforts, whereas older adults aged ≥65 years had the lowest total dental expenditure and predicted average dental expenditure per capita.

Our full sample results showed that US adults in Medicaid expansion states were more likely to utilize dental services compared to participants in a non-Medicaid expansion state, supporting the hypothesis that dental visits increased after ACA repeal efforts in 2017, but this was only true for veterans following sub-group analysis. There was a statistically significant difference in dental expenditures for veterans, older adults aged ≥65 years, and the foreign-born following ACA repeal efforts, with each individual from these subgroups in a Medicaid expansion state spending more on their dental visits than their counterparts in a non-Medicaid expansion state.

Findings in context

Our results suggest that Medicaid expansion by states is likely to have considerable impact on access to dental services for vulnerable groups like veterans, despite attempts to repeal the ACA. Increased dental visits in veterans could likely be because when states expand Medicaid, low- and moderate-income veterans had expanded access to Medicaid as an important and additional coverage source for veterans who did not qualify for a TRICARE or VA health plan[26]. Of >22 million veterans, about 7% (more than 1.5 million) are uninsured and 55% of the uninsured veterans (>800000) are likely eligible for expanded adult dental benefits under Medicaid[26,27]. The significant difference in dental visits seen in veterans following ACA repeal attempts could also simply be the result of access to a more diverse slate of healthcare options – TRICARE, VA, plus Medicaid for low- and moderate-income veterans, and Medicare for older veterans.

Older adults aged ≥65 years and the foreign-born, despite the lack of a significant difference in dental visits for those living in Medicaid versus non-Medicaid expansion states, spent significantly more when they did have a dental visit. Risk pooling, a fundamental concept in health insurance, allowing the higher costs of the less healthy to be offset by the relatively lower costs of the healthy, is a possible reason for the increased expenditures we report following repeal attempts[28,29]. The ACA prevented this from happening through the individual mandate, but stripping away protections like this one during legal challenges and repeal efforts meant 'healthy' individuals no longer paid a penalty for not having health insurance and saw no upsides to being part of a risk pool. Less healthy individuals on the other hand want to ensure health insurance coverage and be part of a risk pool but this is more expensive, which in turn makes them less likely to seek preventive care, holding-off care until more dire illness, which then costs more to treat.

Implications for policy and service planning

The COVID-19 pandemic has brought into sharp focus the challenges vulnerable population groups like veterans, older adults aged ≥65 years, and the foreign-born face in terms of barriers to healthcare access and use. Access to and use of healthcare are key determinants of health, contributing to the complex interplay of factors that affect an individuals' health outcomes. While recent trends in oral health appear favorable, they mask large and important disparities. For example, our analysis highlights differential access to care in veterans living in Medicaid expansion and non-Medicaid expansion states. Health information technology tools that leverage telehealth/mHealth have been successfully deployed during the COVID-19 response and can address differential access to dentalcare[30].

For older adults aged ≥65 years and the foreign-born where dental visits appear to be suppressed following ACA repeal efforts, this is a call to action – for aging health practitioners and those concerned with migrant health to quickly identify and promote alternate health programs for these populations, to improve their dental and health outcomes if the constitutionality of the ACA continues to be challenged. While the US Department of Health and Human Services is unable to enforce Medicaid expansion despite assured federal funding, there is no deadline for states to implement it, making this a still viable option for states serious about meeting the Healthy People 2030 objective of increased use of the oral healthcare system[31].

As policy makers consider alternate health programs, it is important they acknowledge the striking heterogeneity in the subset of individuals designated as 'foreign-born'. These include naturalized US citizens, permanent residents, legal aliens, and undocumented individuals. The term should therefore not be taken to mean poor, illegal immigrants, even

though we did not have the data to make these distinctions.

Strengths and limitations

The strength of our study is the use of data from nationally representative and well-established survey datasets that not only relied on participants recall of health services, but includes confirmation through review of patients' medical records, thereby eliminating recall bias. Moreover, given the focus on specific vulnerable subpopulations, some of which normally comprise only a limited selection in normal study design and entail uniquely difficult sampling methods, the secondary analysis of pooled datasets from this survey provided the necessary sample sizes for these subpopulations to power the analyses presented.

All analyses reflect the limitations of secondary use of survey data and our findings can only be generalized to non-institutionalized US civilian adults. Even though we adjusted for confounders, comparison states could differ in ways not captured by our quasi-experimental approach; therefore, the risk for residual confounding cannot be completely eliminated. Cross-sectional survey data present challenges with respect to causal inference, and as such we do not provide conclusions regarding causal effects, only associations.

CONCLUSIONS

Using a nationally representative sample, we found that veterans in the US even after ACA repeal attempts, had higher dental visits compared to non-veterans supporting the notion that the ACA through its Medicaid expansion mechanism has achieved a key goal of improved access to healthcare for certain vulnerable population groups likely through access to a more diverse slate of health insurance options. However, the cost control piece was not achieved because dental costs increased instead, likely due to limited health insurance risk pooling following revocation of important ACA mandates.

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The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

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DATA AVAILABILITY
The data supporting this research cannot be made available for privacy or other reasons. Two publicly available datasets were merged for this study and these are available. The linkage key/file is, however, not publicly available and needs to be requested from AHRQ.

AUTHORS' CONTRIBUTIONS
All authors participated in the conceptualization and design of the study, analysis, interpretation of the data, and writing, reviewing and editing of the manuscript. All authors read and approved the final version of the manuscript.

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