**BRIEF REPORT**

# Insurance Instability Among Community-Based Health Center Patients with Diabetes Post-Affordable Care Act Medicaid Expansion

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***Background:*** **To evaluate insurance instability (churn) among adults with diabetes receiving care at community-based health centers (CHCs).**

***Methods:*** **Retrospective cohort study using patients' electronic health records data for 300,158 adults aged 19 to 64 with ≥3 ambulatory visits between 2014 and 2019 of which 39,542 churned out of insurance. Generalized estimating equation-based (GEE) logistic regression models were fitted to assess the odds of churning.**

***Results:*** **Among CHC patients, those with diabetes had 1.25 greater odds of churning than those without diabetes (aOR = 1.25; 95%CI = 1.18, 1.33). Among CHC patients with diabetes, the odds of churning were higher for those with uncontrolled diabetes, more complex medication regimens, and acute diabetes complication.**

***Conclusions:*** **CHC patients with diabetes are more likely to experience insurance instability than those without diabetes. Outreach efforts to reduce the impact of the postpandemic Medicaid disenrollment among patients with diabetes and lower income will be critical to reduce harmful health consequences. (J Am Board Fam Med 2025;38:154–164.)**

***Keywords:*** **Access to Care, Community Health Centers, Diabetes, Health Insurance, Insurance Coverage, Low-Income Population, Medicaid, Primary Health Care, Secondary Data Analysis, Social Determinants of Health**

## Introduction

In March 2020, states received funding for their Medicaid programs if they allowed beneficiaries to remain enrolled – referred to continuous enrollment - until the end of the public health emergency, which expired May 2023.[1] As Medicaid continuous enrollment unwinds, millions of Americans have lost, and will continue to lose, insurance coverage – over 21 million as of May 2024.[2,3] Evidence shows that up to 65% of people who disenroll from Medicaid experience a period of uninsurance during the following year.[4] This pattern of short-term disenrollment has been associated with difficulty accessing care or medication, unmet health care needs, discontinuity of care,[5–8] and poor health outcomes.[8–10] Health insurance instability may be particularly challenging for patients with diabetes needing regular chronic care management to reduce the risk of diabetes complications. Yet little is known about the frequency of insurance instability (churning) among patients with diabetes and what factors may be associated with churning. Understanding churning among patients

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with diabetes could provide critical information for clinics serving patients at risk for Medicaid disenrollment.

Patients receiving care in community-based health centers (CHCs) may be at particularly high risk for insurance instability following unwinding of Medicaid continuous enrollment. CHCs serve over 30 million patients yearly and provide services regardless of patients' ability to pay. A substantial proportion of CHC patients have low income, are more likely to belong to racial and ethnic minority groups, and have multimorbidity.[11,12] Further, a large proportion of CHC patients do not have health insurance or are Medicaid beneficiaries.[11] Therefore, this study estimates the prevalence of, and factors associated with, churning out of health insurance coverage (lost Medicaid or lost Private insurance) among patients with diabetes receiving care in CHCs.

## Methods

This retrospective cohort study uses electronic health records (EHR) data from the Accelerating Data Value Across a National Community Health Center Network (ADVANCE) of CHCs.[13] ADVANCE data are from OCHIN and Health Choice Network (HCN). OCHIN offers a fully hosted and tailored instance of OCHIN Epic practice management and EHR solutions. Similarly, HCN consists of a group of CHCs on a single EHR system. The data from OCHIN and HCN are centralized and standardized in the ADVANCE data warehouse using the PCORnet common data model.

We extracted data for 1,713,977 patients aged 19 to 64 seen in 354 clinics across 20 states, including Medicaid expansion and nonexpansion states, between January 2014 and December 2019 (the study period). We excluded patients who were pregnant between 2012 and 2019 or had Medicare coverage (n = 350,804) as they have different health care needs and access options. To determine longitudinal health insurance and churning status, we restricted the sample to patients with multiple ambulatory visits. Patients included had a baseline insured visit between 2014 and 2017, with ≥3 ambulatory visits occurring within the subsequent 3-year period, and ≥12 months separating the first and last of these visits (n = 300,158). Our sample included 44,864 patients with a diagnosis of diabetes (4.7% with type 1 and 95.3% with type 2 diabetes) at any time between 2012 and 2019 who were identified using ICD-9-CM and ICD-10-CM codes from problem list and encounter diagnoses, and 255,294 patients who did not have diabetes (no diagnosis, HbA1c ≥9 or insulin prescription during the study period).

Our primary outcome was a binary indicator distinguishing patients who churned out of insurance coverage vs those who did not. Those who churned (n = 39,542) were defined as having ≥2 consecutive uninsured visits. Those who did not churn included patients who had every visit insured (217,894) or a single uninsured visit (42,722). Among this last group, the uninsured visit could have been in between insured visits, possibly due to delay in enrollment (n = 30,910), or as their last visit (n = 11,812). Among the 30,910 group, 89% had their next insured visit within 12 months of the uninsured one. Insured visits were mostly paid for by Medicaid (55%), followed by Private insurance (29%), then a mix of payors (16%). Health insurance status from the EHR data are primarily based on information collected at each visit for billing purposes,[14] represent a reliable source of information on insurance status and services received at each visit, and demonstrated to have excellent agreement with Medicaid data in CHC settings.[15]

Characteristics of patients include sex, age, race and ethnicity, federal poverty level, and patient rural/urban residential classification. We assessed multimorbidity status (2+ conditions excluding diabetes diagnosis), baseline payor type (Medicaid or Private), and the average number of ambulatory visits during the study period. For patients with diabetes, we evaluated glycohemoglobin (HbA1c) following Centers for Medicare & Medicaid Services quality metric[16] to determine uncontrolled status (HbA1c >9.0 averaged over 3 years from the baseline visit); whether insulin was ever prescribed during the study period; and whether other diabetes medications were prescribed over the entire study period, categorized by the complexity of the medication regimen (eg, prior authorization, demonstrated nonresponse to prior medication). Acute diabetes-related complications (abnormal blood glucose, acute kidney failure, cardiac arrest, cardiac arrythmias, congestive heart failure, diabetic ulcer, glaucoma, hyperkalemia, hypertensive emergency, hypotension or shock, infections or closely related conditions, myocardial infarction, neuropathy, noncardiac, noncerebral artery complications, stroke, transient neurological deficit, or cerebral artery occlusion) were identified using ICD-9-CM and ICD-10-CM code classifications, had to occur on or after the

**Table 1. Percent and Adjusted Odds of Insurance Churning Among Patients Seen in Community-Based Health Centers from 2014 to 2019***

| | Total N = 300,158 | | Churned out of Insurance N = 39,542 | | Did Not Churn out of Insurance N = 260,616 | | aOR of Churning (95% CI) |
|---|---|---|---|---|---|---|---|
| | N | Col % | N | Row % | N | Row % | |
| Diabetes diagnosis | | | | | | | |
| Yes | 44,864 | 14.9 | 7,954 | 17.7 | 36,910 | 82.3 | **1.25 (1.18, 1.33)** |
| No | 255,294 | 85.1 | 31,588 | 12.4 | 223,706 | 87.6 | Reference |
| Sex | | | | | | | |
| Female | 184,675 | 61.5 | 26,990 | 14.6 | 157,685 | 85.4 | Reference |
| Male | 115,483 | 38.5 | 12,552 | 10.9 | 102,931 | 89.1 | **0.76 (0.71, 0.82)** |
| Age at baseline visit | | | | | | | |
| 19 to 44 | 166,869 | 55.6 | 21,819 | 13.1 | 145,050 | 86.9 | Reference |
| 45 to 64 | 133,289 | 44.4 | 17,723 | 13.3 | 115,566 | 86.7 | **0.86 (0.81, 0.90)** |
| Race/Ethnicity | | | | | | | |
| Non-Hispanic White | 129,756 | 43.2 | 11,940 | 9.2 | 117,816 | 90.8 | Reference |
| Hispanic | 94,817 | 31.6 | 16,986 | 17.9 | 77,831 | 82.1 | **1.87 (1.58, 2.22)** |
| Non-Hispanic Black | 46,497 | 15.5 | 7,742 | 16.7 | 38,755 | 83.3 | **1.73 (1.50, 1.99)** |
| Non-Hispanic Other | 13,880 | 4.6 | 1,183 | 8.5 | 12,697 | 91.5 | **0.85 (0.75, 0.98)** |
| Missing | 15,208 | 5.1 | 1,691 | 11.1 | 13,517 | 88.9 | **1.24 (1.09, 1.41)** |
| Federal poverty level | | | | | | | |
| ≤138% | 211,177 | 70.4 | 30,672 | 14.5 | 180,505 | 85.5 | **1.31 (1.17, 1.47)** |
| >138% | 54,467 | 18.1 | 6,662 | 12.2 | 47,805 | 87.8 | Reference |
| Missing | 34,514 | 11.5 | 2,208 | 6.4 | 32,306 | 93.6 | **0.59 (0.46, 0.76)** |
| Patients' residence | | | | | | | |
| Rural | 81,695 | 27.2 | 8,548 | 10.5 | 73,147 | 89.5 | Reference |
| Urban | 218,463 | 72.8 | 30,994 | 14.2 | 187,469 | 85.8 | 1.16 (0.93, 1.46) |
| Baseline payor type | | | | | | | |
| Medicaid | 194,208 | 64.7 | 22,863 | 11.8 | 171,345 | 88.2 | Reference |
| Private insurance | 105,950 | 35.3 | 16,679 | 15.7 | 89,271 | 84.3 | **1.68 (1.47, 1.92)** |
| Comorbidities excluding diabetes | | | | | | | |
| Mental health disorder only | 37,487 | 12.5 | 4,582 | 12.2 | 32,905 | 87.8 | 1.06 (0.99, 1.14) |
| Physical comorbidity only | 76,575 | 25.5 | 12,009 | 15.7 | 64,566 | 84.3 | **1.16 (1.10, 1.24)** |
| Mental health and physical comorbidity | 44,404 | 14.8 | 5,741 | 12.9 | 38,663 | 87.1 | 1.00 (0.91, 1.09) |
| None | 141,692 | 47.2 | 17,210 | 12.1 | 124,482 | 87.9 | Reference |
| Mean ambulatory visits, N (SD) | 12.6 | 11.4 | 15.4 | 13.7 | 12.2 | 11.0 | **1.02 (1.01, 1.03)** |

*Abbreviations:* aOR, Adjusted odds ratio; CI, Confidence interval; SD, Standard deviation.
*Sample included non-pregnant patients aged 19-64 without Medicare coverage who had a baseline insured visit between 2014 and 2017, with ≥3 ambulatory visits occurring within the subsequent 3-year period, and at least 12 months separating the first and last of these visits between 2014 and 2019. Those who churned were defined as having ≥2 consecutive uninsured visits. Those who did not churn included those who had every visit insured or those who had one single uninsured. $\chi^2$ tests for categorical variables and *t* test for continuous variables were used to test for differences between churning groups, except for age groups, all were significant at $P < .001$. Bolded estimates are significant at $P < .05$.

first diagnosis of diabetes, and were counted as distinct complications if the interval between diagnostic encounters was at least 10 days.[17]

### *Statistical Analysis*

We conducted descriptive statistics to examine characteristics and health-related factors of the study population, both overall and stratified by churning and diabetes status and compared those who churn out of insurance with those who did not using $\chi^2$ tests and *t* test. First, we evaluated the odds of churning by diabetes status using a generalized estimating equation-based (GEE) logistic regression model. This GEE model included an

**Table 2. Percent and Adjusted Odds of Insurance Churning Among Patients with Diabetes Seen in Community-Based Health Centers from 2014 to 2019***

| | Churned out of Insurance (n = 7954) | | Did Not Churn out of Insurance (n = 36,910) | | aOR of Churning (95% CI) |
|---|---|---|---|---|---|
| | N | Row % | N | Row % | |
| Sex | | | | | |
| Female | 4,970 | 19.7 | 20,235 | 80.3 | Reference |
| Male | 2,984 | 15.2 | 16,675 | 84.8 | **0.78 (0.72, 0.84)** |
| Age | | | | | |
| 19 to 44 | 2,421 | 18.3 | 10,832 | 81.7 | Reference |
| 45 to 64 | 5,533 | 17.5 | 26,078 | 82.5 | **0.87 (0.81, 0.93)** |
| Race/Ethnicity | | | | | |
| Non-Hispanic White | 1,694 | 12.1 | 12,296 | 87.9 | Reference |
| Hispanic | 3,897 | 22.1 | 13,725 | 77.9 | **1.81 (1.50, 2.19)** |
| Non-Hispanic Black | 1,803 | 19.8 | 7,305 | 80.2 | **1.58 (1.35, 1.85)** |
| Non-Hispanic Other | 266 | 12.4 | 1,872 | 87.6 | 0.96 (0.81, 1.14) |
| Missing | 294 | 14.7 | 1,712 | 85.3 | **1.21 (1.04, 1.42)** |
| Federal poverty level | | | | | |
| ≤138% | 6,354 | 18.7 | 27,595 | 81.3 | **1.33 (1.15, 1.54)** |
| >138% | 1,276 | 16.9 | 6,283 | 83.1 | Reference |
| Missing | 324 | 9.7 | 3,032 | 90.3 | 0.68 (0.45, 1.03) |
| Patients' residence | | | | | |
| Rural | 1,566 | 15.6 | 8,496 | 84.4 | Reference |
| Urban | 6,388 | 18.4 | 28,414 | 81.6 | 1.12 (0.87, 1.44) |
| Baseline payor type | | | | | |
| Medicaid | 4,464 | 15.0 | 25,306 | 85.0 | Reference |
| Private insurance | 3,490 | 23.1 | 11,604 | 76.9 | **1.94 (1.68, 2.25)** |
| Comorbidities excluding diabetes | | | | | |
| Mental health disorder only | 310 | 16.1 | 1,616 | 83.9 | 0.99 (0.83, 1.18) |
| Physical comorbidity only | 4,423 | 19.1 | 18,708 | 80.9 | 1.08 (0.99, 1.17) |
| Mental health and physical comorbidity | 1,864 | 15.7 | 10,002 | 84.3 | 0.93 (0.84, 1.04) |
| None | 1,357 | 17.1 | 6,584 | 82.9 | Reference |
| Mean ambulatory visits, N (SD) | 19.5 | 15.7 | 16.9 | 12.8 | **1.01 (1.00, 1.01)** |
| HbA1c control | | | | | |
| ≤9 | 5,343 | 16.4 | 2,7182 | 83.6 | Reference |
| >9 | 2,465 | 21.9 | 8,782 | 78.1 | **1.33 (1.24, 1.43)** |
| Missing | 146 | 13.4 | 946 | 86.6 | 1.10 (0.87, 1.39) |
| Diabetes medication regimen complexity | | | | | |
| No medication | 946 | 12.7 | 6,498 | 87.3 | Reference |
| Lower complexity | 4,874 | 18.0 | 22,155 | 82.0 | **1.35 (1.24, 1.47)** |
| High complexity | 2,134 | 20.5 | 8,257 | 79.5 | **1.33 (1.19, 1.49)** |
| Ever with insulin | | | | | |
| Yes | 3,496 | 19.6 | 14,360 | 80.4 | 1.06 (0.98, 1.13) |
| No | 4,458 | 16.5 | 22,550 | 83.5 | Reference |

*Continued*

indicator denoting if a patient had diabetes (yes vs no) while controlling for demographic and health-related covariates. Second, we restricted our sample to patients with a diabetes diagnosis and further evaluated the associations between demographic/health-related factors and churning. All GEE models accounted for clustering of patients within clinics using an exchangeable working correlation and robust standard errors. All analyses were 2-sided with statistical significance set at type I error of 5%. Analyses were conducted using R Core Team (2021) and Stata version 17.0 (StataCorp

**Table 2. Continued**

| | Churned out of Insurance (n = 7954) | | Did Not Churn out of Insurance (n = 36,910) | | aOR of Churning (95% CI) |
|---|---|---|---|---|---|
| | N | Row % | N | Row % | |
| Acute complications during study period | | | | | |
| 0 | 6,614 | 17.2 | 31,764 | 82.8 | Reference |
| 1 | 807 | 21.6 | 2,922 | 78.4 | **1.20 (1.08, 1.33)** |
| ≥ 2 | 533 | 19.3 | 2,224 | 80.7 | 1.00 (0.87, 1.15) |

*Abbreviations:* aOR, Adjusted odds ratio, CI, Confidence interval.
*Sample included non-pregnant patients aged 19-64 without Medicare coverage who had a baseline insured visit between 2014 and 2017, with ≥3 ambulatory visits occurring within the subsequent 3-year period, and at least 12 months separating the first and last of these visits between 2014 and 2019. Those who churned were defined as having ≥2 consecutive uninsured visits. Those who did not churn included those who had every visit insured or those who had one single uninsured. $\chi^2$ tests for categorical variables and *t* test for continuous variables were used to test for differences between churning groups, except for age groups, all were significant at $P < .001$. Bolded estimates are significant at $P < .05$.

2021). The University's Institutional Review Board approved the study.

## Results

Among the 300,158 patients in the cohort, 17.0% (n = 7,954) of patients with diabetes experienced churning, while 12.0% (n = 31,588) of patients without diabetes experienced churning. Overall, among those who experience churning, 58% lost Medicaid coverage and 42% lost private insurance. The median number of visits following churning over the study period was 4 visits (range 0 to 201). The rate of patients with diabetes experiencing churning varied by state of residence from 5.0% in Massachusetts to 48.2% in Texas (Appendix Tables 1). Among patients with diabetes who lost Medicaid coverage, 46% remained uninsured, 11% switched to private insurance, and 42% regained Medicaid. Among patients with diabetes who lost private coverage, 61% remained uninsured, 8% gained Medicaid insurance, and 31% reenrolled into private insurance. The multivariate analysis shows that patients with diabetes had 1.25 greater odds of insurance churning than patients without diabetes [adjusted odd ratio (aOR) = 1.25; 95%CI = 1.18, 1.33], after adjusting for demographic and health-related factors (Table 1).

Among patients with diabetes, those who were female, aged 19 to 44, non-Hispanic Black, or Hispanic had higher odds of churning than their counterparts (Table 2). Patients with diabetes who had private insurance before churning, had more ambulatory visits, or had both physical and mental health comorbidities also had higher odds of churning than their counterparts. Patients with uncontrolled diabetes had greater likelihood of churning (aOR = 1.33; 95% CI = 1.24, 1.43). Those with more complex diabetes medication regimens (aOR = 1.33; 95%CI = 1.19, 1.49) or with an acute diabetes complication (aOR = 1.20; 95%CI = 1.08, 1.33) had higher odds of churning. Having a prescription of insulin was not associated with churning likelihood.

We conducted a sensitivity analysis removing 42,722 patients with a single uninsured visit from the nonchurning group and found the same pattern of results (Appendix Tables 2 and 3).

## Discussion

Overall, our findings suggest that, among patients who receive care at CHCs, those with diabetes are more likely to experience insurance instability than those without diabetes. This finding could be an artifact of visit data because patients with diabetes typically have more frequent visits and may be more likely to continue to visit their clinic during a period of uninsurance. In contrast, patients without diabetes may forgo care during a period of uninsurance leading to an underestimated rate of churning in this group. Future research is needed to evaluate the prevalence of churning among patients with other chronic health conditions to determine whether this result is specific to diabetes or not.

Notably, this analysis shows association and not causation; the methods used here do not demonstrate that churning leads to higher HbA1c, or the inverse. Future research is needed to assess the nature of the association between churning and diabetes outcomes. Further, our sample was restricted to

patients with at least 3 ambulatory visits and does not capture those who exited the health system within the network. This restriction likely underestimates the rate of churning; however, a previous study showed that patient attrition within CHCs over a 3-year period is less than 20%.[18] Lastly, among those who did not churn, 5% had their last encounter as uninsured and may have been misclassified; although the sensitivity analysis (Appendix Tables 2 and 3) removing these patients from the sample did not alter the results.

It is worrisome that patients with poorer diabetes outcomes, such as uncontrolled diabetes and acute complications, seem more likely to experience insurance instability than those with better diabetes management. As millions of Americans are disenrolled from Medicaid following the end of the public health emergency, CHCs must prepare for an influx of patients with diabetes experiencing insurance instability.[19] In addition, private insurance premiums are expected to increase which could lead to more patients becoming uninsured.[20] Fortunately, CHCs provide care regardless of patients' insurance coverage, but Medicaid is an important source of revenue for CHCs. In addition, while it may be expected that people churning out of Medicaid would enroll in marketplace plans, our study suggests that a large proportion will become and remain uninsured (51%) and few enroll in private insurance (11%). The Centers for Medicare and Medicaid Services have suggested strategies states can implement to reduce the impact of disenrollment on beneficiaries.[21] These strategies focus on reducing administrative burden and assisting beneficiaries with renewal efforts, but does not include patients who lose eligibility and are at risk of being uninsured. CHCs can provide limited assistance to help patients enroll in marketplace insurance but the increased demand may be prohibitive. State efforts should emphasize outreach and assistance to facilitate marketplace insurance enrollment and not focus exclusively on Medicaid re-enrollment and/or create state-sponsored insurance programs for people who are unable to afford or are ineligible for marketplace coverage.

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*To see this article online, please go to: http://jabfm.org/content/38/1/154.full.*

## References

1. Families First Coronavirus Response Act Pub. L. No. 116-127, Congress.gov (2020). Accessed March 22 2024. Available at: https://www.congress.gov/bill/116th-congress/house-bill/6201/text.
2. Kaiser Family Foundation. Medicaid enrollment and unwinding tracker. Accessed March 22, 2024. Available at: https://www.kff.org/medicaid/issue-brief/medicaid-enrollment-and-unwinding-tracker/.
3. Dague L, Badaracco N, DeLeire T, Sydnor J, Tilhou AS, Friedsam D. Trends in Medicaid enrollment and disenrollment during the early phase of the COVID-19 pandemic in Wisconsin. JAMA Health Forum 2022;3:e214752.
4. Corallo B, Burns A, Tolbert JGC. What happens after people lose Medicaid coverage? Kaiser Family Foundation. Accessed March 22, 2024. Available at: https://www.kff.org/medicaid/issue-brief/what-happens-after-people-lose-medicaid-coverage/.
5. Banerjee R, Ziegenfuss JY, Shah ND. Impact of discontinuity in health insurance on resource utilization. BMC Health Serv Res 2010;10:195.
6. Fields BE, Bell JF, Moyce S, Bigbee JL. The impact of insurance instability on health service utilization: does non-metropolitan residence make a difference? J Rural Health 2015;31:27–34.
7. Gai Y, Jones K. Insurance patterns and instability from 2006 to 2016. BMC Health Serv Res 2020;20:334.
8. Sommers BD, Gourevitch R, Maylone B, Blendon RJ, Epstein AM. Insurance churning rates for low-income adults under health reform: lower than expected but still harmful for many. Health Aff (Millwood) 2016;35:1816–24.
9. Brown AGM, Kressin N, Terrin N, et al. The influence of health insurance stability on racial/ethnic differences in diabetes control and management. Ethn Dis 2021;31:149–58.
10. Kressin NR, Terrin N, Hanchate AD, et al. Is insurance instability associated with hypertension outcomes and does this vary by race/ethnicity? BMC Health Serv Res 2020;20:216.
11. National Association of Community Health Centers. Community Health Center Chartbook 2023. Accessed March 22, 2024. Available at: https://www.nachc.org/resource/community-health-center-chartbook/.
12. Quiñones AR, Hwang J, Heintzman J, et al. Trajectories of chronic disease and multimorbidity

among middle-aged and older patients at community health centers. JAMA Netw Open 2023;6:e237497.

13. DeVoe JE, Gold R, Cottrell E, et al. The ADVANCE network: accelerating data value across a national community health center network. J Am Med Inform Assoc 2014;21:591–5.
14. Heintzman J, Marino M, Hoopes M, et al. Supporting health insurance expansion: do electronic health records have valid insurance verification and enrollment data? J Am Med Inform Assoc 2015;22:909–13.
15. Marino M, Angier H, Valenzuela S, et al. Medicaid coverage accuracy in electronic health records. Prev Med Rep 2018;11:297–304.
16. Centers for Medicare & Medicaid Services. Quality ID #1 (NQF 0059): Diabetes: Hemoglobin A1c (HbA1c) Poor Control (>9%). Accessed August 7, 2024. Available at: https://qpp.cms.gov/docs/QPP_quality_measure_specifications/CQM-Measures/2022_Measure_001_MIPSCQM.pdf.
17. Wharam JF, Zhang F, Eggleston EM, Lu CY, Soumerai S, Ross-Degnan D. Diabetes outpatient care and acute complications before and after high-deductible insurance enrollment: a natural experiment for translation in diabetes (NEXT-D) study. JAMA Intern Med 2017;177:358–68.
18. Huguet N, Kaufmann J, O'Malley J, et al. Using electronic health records in longitudinal studies: estimating patient attrition. Med Care 2020;58 Suppl 6 Suppl 1:S46–S52.
19. Bensken WP, Koroukian SM, McGrath BM, Alberti PM, Cottrell EK, Sills MR. Unwinding of continuous Medicaid coverage among patients at community health centers. JAMA Health Forum 2024;5:e234622.
20. Ortaliza J, McGough M, Cord ACC. How much and why ACA Marketplace premiums are going up in 2025. August 1 2024. Health Spending. Available at: https://www.healthsystemtracker.org/brief/how-much-and-why-aca-marketplace-premiums-are-going-up-in-2025/?utm_campaign=KFF-Health-Costs&utm_medium=email&_hsenc=p2ANqtz-_IfYpcyIIXyYWzzJeQe8epCsoTqqcA2EdyAXcwv8Lz-jksCTPPHBSSCEPV5ccAX-lq9CqTVhXUVMzYIWqbyY08gsO8SA&_hsmi=318730370&utm_content=318730370&utm_source=hs_email#Distribution%20of%20proposed%202025%20rate%20changes%20among%20324%20reviewed%20ACA%20Marketplace%20insurers.
21. Centers for Medicare & Medicaid Services. Available State strategies to minimize terminations for procedural reasons during the COVID-19 unwinding period: operational considerations for implementation. Accessed March 22, 2024. Available at: https://www.medicaid.gov/sites/default/files/2023-12/considerations-for-procedural-termination-strategies.pdf.

**Appendix Table 1. Number and Percent of Insurance Churning Among Patients with Diabetes Seen in Community-Based Health Centers by State from 2014 to 2019***

| State | Patients with Diabetes N | Patients with Diabetes who Churn out of Insurance N (%) |
|---|---|---|
| AK** | <150 | <30 (17.9) |
| CA | 6,588 | 892 (13.5) |
| FL | 10,779 | 2,529 (23.5) |
| HI | 441 | 43 (9.8) |
| IN | 767 | 125 (16.3) |
| KS | 248 | 69 (27.8) |
| MA | 1,001 | 50 (5.0) |
| MD | 899 | 120 (13.3) |
| MN | 356 | 60 (16.9) |
| MO | 706 | 184 (26.1) |
| MT | 333 | 55 (16.5) |
| NC | 1,756 | 437 (24.9) |
| NM | 3,454 | 382 (11.1) |
| NV** | <50 | <10 (17.0) |
| OH | 2,334 | 383 (16.4) |
| OR | 10,374 | 2,041 (19.7) |
| RI | 2,238 | 195 (8.7) |
| TX | 137 | 66 (48.2) |
| WA | 1,372 | 158 (11.5) |
| WI | 894 | 132 (14.8) |

*Sample included non-pregnant patients aged 19-64 without Medicare coverage who had a baseline insured visit between 2014 and 2017, with ≥3 ambulatory visits occurring within the subsequent 3-year period, and at least 12 months separating the first and last of these visits between 2014 and 2019. Those who churned were defined as having ≥2 consecutive uninsured visits.
**Numbers <10 are masked to protect patients' identities.

**Appendix Table 2. Percent and Adjusted Odds of Insurance Churning Among Patients Seen in Community-Based Health Centers from 2014 to 2019* - Excluding 42,722 Patients with a Single Uninsured from Those Who Did Not Churn**

| | Total N = 257,436 | | Churned out of Insurance N = 39,542 | | Did not Churn out of Insurance N = 217,894 | | aOR of Churning (95% Cl) |
|---|---|---|---|---|---|---|---|
| | N | Col % | N | Row % | N | Row % | |
| Diabetes diagnosis | | | | | | | |
| Yes | 37,775 | 14.7 | 7,954 | 21.1 | 29,821 | 78.9 | **1.27 (1.19, 1.35)** |
| No | 219,661 | 85.3 | 31,588 | 14.4 | 188,073 | 85.6 | Reference |
| Sex | | | | | | | |
| Female | 158,031 | 61.4 | 26,990 | 17.1 | 131,041 | 82.9 | Reference |
| Male | 99,405 | 38.6 | 12,552 | 12.6 | 86,853 | 87.4 | **0.76 (0.71, 0.82)** |
| Age at baseline visit | | | | | | | |
| 19-44 | 143,124 | 55.6 | 21,819 | 15.2 | 121,305 | 84.8 | Reference |
| 45-64 | 114,312 | 44.4 | 17,723 | 15.5 | 96,589 | 84.5 | **0.85 (0.80, 0.90)** |
| Race/Ethnicity | | | | | | | |
| Non-Hispanic White | 112,487 | 43.7 | 11,940 | 10.6 | 10,0547 | 89.4 | Reference |
| Hispanic | 81,149 | 31.5 | 16,986 | 20.9 | 64,163 | 79.1 | **1.93 (1.61, 2.31)** |
| Non-Hispanic Black | 38,512 | 15 | 7,742 | 20.1 | 30,770 | 79.9 | **1.85 (1.59, 2.16)** |
| Non-Hispanic Other | 12,019 | 4.7 | 1,183 | 9.8 | 10,836 | 90.2 | **0.85 (0.73, 0.98)** |
| Missing | 13,269 | 5.2 | 1,691 | 12.7 | 11,578 | 87.3 | **1.25 (1.09, 1.43)** |
| Baseline payor type | | | | | | | |
| Medicaid | 165,417 | 64.3 | 22,863 | 13.8 | 142,554 | 86.2 | Reference |
| Private | 92,019 | 35.7 | 16,679 | 18.1 | 75,340 | 81.9 | **1.71 (1.49, 1.96)** |
| Federal poverty level | | | | | | | |
| ≤138% | 179,246 | 69.6 | 30,672 | 17.1 | 148,574 | 82.9 | **1.34 (1.19, 1.51)** |
| >138% | 47,195 | 18.3 | 6,662 | 14.1 | 40,533 | 85.9 | Reference |
| Missing | 30,995 | 12 | 2,208 | 7.1 | 28,787 | 92.9 | **0.56 (0.44, 0.73)** |
| Patients' residence | | | | | | | |
| Rural | 70,817 | 27.5 | 8,548 | 12.1 | 62,269 | 87.9 | Reference |
| Urban | 186,619 | 72.5 | 30,994 | 16.6 | 155,625 | 83.4 | 1.18 (0.92, 1.51) |
| Comorbidities excluding diabetes | | | | | | | |
| Mental health disorder only | 32,046 | 12.4 | 4,582 | 14.3 | 27,464 | 85.7 | 1.06 (0.98, 1.14) |
| Physical comorbidity only | 65,421 | 25.4 | 12,009 | 18.4 | 53,412 | 81.6 | **1.16 (1.09, 1.23)** |
| Mental health and physical comorbidity | 37,704 | 14.6 | 5,741 | 15.2 | 31,963 | 84.8 | 0.98 (0.89, 1.08) |
| None | 122,265 | 47.5 | 17,210 | 14.1 | 105,055 | 85.9 | Reference |
| Mean ambulatory visits, (SD) | 12.4 | 10.9 | 15.4 | 13.7 | 11.8 | 10.3 | **1.03 (1.02, 1.03)** |

*Abbreviations:* aOR, Adjusted odds ratio, CI, Confidence interval; SD, standard deviation.

*Sample included non-pregnant patients aged 19-64 without Medicare coverage who had a baseline insured visit between 2014 and 2017, with ≥3 ambulatory visits occurring within the subsequent 3-year period, and at least 12 months separating the first and last of these visits between 2014 and 2019. Those who churned were defined as having ≥2 consecutive uninsured visits. Those who did not churn included those who had every visit insured. Those with one uninsured visit among those who did not churn were excluded Chi-square tests for categorical variables and t-tests for continuous variables were used to test for differences between churning groups, except for age groups, all were significant at $p < .001$.

Bolded estimates are significant at $p < .05$.

**Appendix Table 3. Percent and Adjusted Odds of Insurance Churning Among Patients With Diabetes Seen in Community-Based Health Centers from 2014 to 2019* - Excluding 42,722 Patients with a Single Uninsured from Those Who Did Not Churn**

| | Churned out of Insurance (N = 7,954) | | Did not Churn out of Insurance (N = 29,821) | | aOR of Churning (95% Cl) |
|---|---|---|---|---|---|
| | N | Row % | N | Row % | |
| Sex | | | | | |
| Female | 4,970 | 23.4 | 16,277 | 76.6 | Reference |
| Male | 2,984 | 18.1 | 13,544 | 81.9 | **0.78 (0.72, 0.85)** |
| Age | | | | | |
| 19-44 | 2,421 | 21.6 | 8,782 | 78.4 | Reference |
| 45-64 | 5,533 | 20.8 | 21,039 | 79.2 | **0.88 (0.82, 0.94)** |
| Race/Ethnicity | | | | | |
| Non-Hispanic White | 1,694 | 14.3 | 10,155 | 85.7 | Reference |
| Hispanic | 3,897 | 26.1 | 11,037 | 73.9 | **1.84 (1.51, 2.25)** |
| Non-Hispanic Black | 1,803 | 24.1 | 5,675 | 75.9 | **1.67 (1.41, 1.99)** |
| Non-Hispanic Other | 266 | 14.8 | 1,536 | 85.2 | 0.97 (0.81, 1.16) |
| Missing | 294 | 17.2 | 1,418 | 82.8 | **1.21 (1.03, 1.43)** |
| Baseline payor type | | | | | |
| Medicaid | 4,464 | 17.9 | 20,502 | 82.1 | Reference |
| Private | 3,490 | 27.2 | 9,319 | 72.8 | **2.00 (1.71, 2.33)** |
| Federal poverty level | | | | | |
| ≤138% | 6,354 | 22.3 | 22,091 | 77.7 | **1.37 (1.17, 1.59)** |
| >138% | 1,276 | 20 | 5,109 | 80 | Reference |
| Missing | 324 | 11 | 2,621 | 89 | **0.65 (0.42, 0.99)** |
| Patients' residence | | | | | |
| Rural | 1,566 | 18.3 | 6,970 | 81.7 | Reference |
| Urban | 6,388 | 21.8 | 22,851 | 78.2 | 1.14 (0.86, 1.51) |
| Comorbidities excluding diabetes | | | | | |
| Mental health disorder only | 310 | 19.3 | 1,298 | 80.7 | 0.99 (0.82, 1.20) |
| Physical comorbidity only | 4,423 | 22.7 | 15,093 | 77.3 | 1.06 (0.97, 1.15) |
| Mental health and physical comorbidity | 1,864 | 18.7 | 8,128 | 81.3 | 0.91 (0.81, 1.02) |
| None | 1,357 | 20.4 | 5,302 | 79.6 | Reference |
| Mean ambulatory visits, (SD) | 19.5 | 15.7 | 16.4 | 12.2 | **1.02 (1.01, 1.02)** |
| HbA1c control | | | | | |
| ≤9 | 5,343 | 19.4 | 22,168 | 80.6 | Reference |
| >9 | 2,465 | 26.5 | 6,850 | 73.5 | **1.40 (1.30, 1.50)** |
| Missing | 146 | 15.4 | 803 | 84.6 | 1.12 (0.88, 1.43) |
| Diabetes medication regimen complexity | | | | | |
| No medication | 146 | 15.4 | 803 | 84.6 | Reference |
| Lower complexity | 4,874 | 21.3 | 1,7979 | 78.7 | **1.38 (1.26, 1.51)** |
| High complexity | 2,134 | 24.9 | 6,431 | 75.1 | **1.39 (1.23, 1.58)** |
| Ever with insulin | | | | | |
| Yes | 3,496 | 23.5 | 11,411 | 76.5 | 1.05 (0.97, 1.13) |
| No | 4,458 | 19.5 | 18,410 | 80.5 | Reference |

*Continued*

**Appendix Table 3. Continued**

| | Churned out of Insurance (N = 7,954) | | Did not Churn out of Insurance (N = 29,821) | | aOR of Churning (95% CI) |
|---|---|---|---|---|---|
| | N | Row % | N | Row % | |
| Acute complications during study period | | | | | |
| 0 | 6,614 | 20.5 | 25,713 | 79.5 | Reference |
| 1 | 807 | 25.7 | 2,327 | 74.3 | **1.19 (1.06 1.33)** |
| ≥2 | 533 | 23 | 1,781 | 77 | 0.97 (0.84, 1.13) |

*Abbreviations:* aOR, Adjusted odds ratio, CI, Confidence interval.

*Sample included non-pregnant patients aged 19-64 without Medicare coverage who had a baseline insured visit between 2014 and 2017, with ≥3 ambulatory visits occurring within the subsequent 3-year period, and at least 12 months separating the first and last of these visits between 2014 and 2019. Those who churned were defined as having ≥2 consecutive uninsured visits. Those who did not churn included those who had every visit insured. Those with one uninsured visit among those who did not churn were excluded. Chi-square tests for categorical variables and t-tests for continuous variables were used to assess differences between churning groups, except for age groups, all were significant at $p < .001$.

Bolded estimates are significant at $p < .05$.