New hypertension and diabetes diagnoses following the Affordable Care Act Medicaid expansion

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ABSTRACT

Objective To assess the Affordable Care Act (ACA) Medicaid expansion’s impact on new hypertension and diabetes diagnoses in community health centres (CHCs).

Design Rates of new hypertension and diabetes diagnoses were computed using generalised estimating equation Poisson models and we tested the difference-in-difference (DID) pre-ACA versus post-ACA in states that expanded Medicaid compared with those that did not.

Setting We used electronic health record data (pre-ACA: 1 January 2012–31 December 2013—post-ACA: 1 January 2014–31 December 2016) from the Accelerating Data Value Across a National Community Health Center Network clinical data network. We included clinics with ≥50 patients contributing to person-time at risk in each study year.

Participants Patients aged 19–64 with ≥1 ambulatory visit in the study period were included. We then excluded patients who were pregnant during the study period (N=127 530). For the hypertension outcome, we excluded individuals with a diagnosis of hypertension prior to the start of the study period, those who had a hypertension diagnosis on their first visit to a clinic or their first visit after 3 years without a visit, and those who had a diagnosis more than 3 years after their last visit (pre-ACA non-expansion N=130 973; expansion N=145 435; post-ACA non-expansion N=186 341; expansion N=251 015). For the diabetes analysis, we excluded patients with a diabetes diagnosis prior to study start, on their first visit or first visit after inactive patient status, and diagnosis while not an active patient (pre-ACA non-expansion N=145 435; expansion N=198 558; post-ACA non-expansion N=215 039; expansion N=264 644).

Results In non-expansion states, adjusted hypertension diagnosis rates saw a relative decrease of 6%, while in expansion states, the adjusted rates saw a relative increase of 7% (DID 1.14, 95% CI 1.11 to 1.18). For diabetes diagnosis, adjusted rates in non-expansion states experienced a significant relative increase of 28% and in expansion states the relative increase was 25%; yet these differences were not significant pre-ACA to post-ACA comparing expansion and non-expansion states (DID 0.98, 95% CI 0.91 to 1.05).

Conclusion There was a differential impact of Medicaid expansion for hypertension and diabetes diagnoses. Moderate increases were found in diabetes diagnosis rates among all patients served by CHCs post-ACA (both in expansion and non-expansion states). These increases suggest that ACA-related opportunities to gain health insurance (such as marketplaces and the Medicaid expansion) may have facilitated access to diagnostic tests for this population. The study found a small change in hypertension diagnosis rates from pre-ACA to post-ACA (a decrease in non-expansion and an increase in expansion states). Despite the significant difference between expansion and non-expansion states, the small change from pre-ACA to post-ACA suggests that the diagnosis of hypertension is likely documented for patients, regardless of health insurance availability. Future studies are needed to understand the impact of the ACA on hypertension and diabetes treatment and control.

INTRODUCTION

In the USA, the Patient Protection and Affordable Care Act (ACA) included several provisions to increase health insurance coverage. For example, the ACA provided states the opportunity to expand Medicaid eligibility to citizens and legal residents earning ≤138% of the federal poverty level (FPL) and opened health insurance marketplaces; many states chose to expand Medicaid while others did
not. The ACA Medicaid expansion improved access to healthcare and reduced disparities for some patients, which may have increased opportunities to identify health conditions. Indeed, the ACA decreased the number of uninsured by nearly 20 million and increased preventative screenings. Despite these advances, to date, little is known about the effects of the ACA Medicaid expansion on the diagnosis of serious chronic health conditions such as hypertension and diabetes. Yet, both conditions are major causes of morbidity and mortality and disproportionately affect low-income populations in the USA. Hypertension, the most prevalent cardiovascular risk factor, affects approximately 103 million people representing 46% of US adults, using thresholds from the 2017 American College of Cardiology/American Heart Association blood pressure guideline. Diabetes was diagnosed in over 30 million people in 2016 and is approaching a 10% prevalence rate in the US adult population. Accurate and timely diagnosis is the first step in hypertension and diabetes care to ensure adequate treatment and symptom management, which can lead to reduction in morbidity and mortality associated with these conditions. Yet, nearly 16% of adults with hypertension were unaware they had it. While there have been improvements in diagnosing hypertension and diabetes in the US general population, recent data indicate declines in hypertension awareness and treatment. For example, nearly 85% of US adults with hypertension were aware of the diagnosis in 2013–2014, whereas awareness declined to 77% in 2017–2018. Nearly 30% of adults without health insurance were unaware of their hypertension in comparison to more than 14% of those with health insurance. In addition, the HealthyPeople 2020 target for those with diabetes to receive a correct diagnosis (79.8%) has been met or is closely approaching the target in those with high educational attainment, while trailing for those with less than a high school degree (70.9%).

Community health centres (CHCs) serve a large proportion of medically underserved adults in the USA and are an essential source of care for racial/ethnic minorities and those with low socioeconomic status. They provide services to over 27 million Americans, regardless of health insurance, and care for more than one in six Medicaid beneficiaries. Yet, lack of insurance remains a barrier for CHC patients to receive some services even though clinic visits are available. For example, a patient without insurance might be able to access a visit but cannot pay for medications or laboratory testing. After the ACA Medicaid expansion, CHCs saw a decrease in uninsured visits in both expansion and non-expansion states, and a significant increase in Medicaid-insured visits in expansion states. Previous studies also showed an increase in preventive and primary care services at CHCs post-ACA. These studied and established effects the ACA had on CHCs make them the ideal setting for studying the impact health insurance policy changes had on recognising and documenting the diagnosis of chronic conditions among underserved populations. Thus, the purpose of this study was to assess whether: (1) new hypertension and diabetes diagnoses increased from pre-ACA to post-ACA among a large cohort of CHC patients and (2) this change, if any, varied in states that chose to expand Medicaid eligibility vs the states that did not. We hypothesised that new diagnoses would increase pre-ACA to post-ACA and that the states which elected to expand Medicaid would see a greater increase in diagnosis rates compared with states that did not expand Medicaid due to increased access to healthcare services (especially diagnostic tests), and consequently, greater opportunities to identify previously undocumented health conditions.

METHODS

Data source

We used electronic health record (EHR) data from the Accelerating Data Value Across a National Community Health Center Network clinical data network (CDN) of CHCs. This CDN brings together outpatient clinical EHR data from more than one million patients from three health systems. The study included 110 primary care CHCs ‘live’ on an EHR ≥12 months before the start of the study period and maintained on the EHR throughout the study period (1 January 2012–31 December 2016) in nine states (California, Hawaii, Maryland, New Mexico, Ohio, Oregon, Rhode Island, Washington, Wisconsin) that expanded Medicaid eligibility on 1 January 2014 and four states (Florida, Kansas, Missouri, North Carolina) that did not expand during the study time period. We included as an expansion state because they increased Medicaid eligibility to 100% FPL.

We included clinics with ≥50 patients contributing to person-time-at risk in each study year and patients aged 19–64 with ≥1 ambulatory visit in the study period (n=581 936) meaning patients had to have visited a CHC at least once (but could have visited several times) during the entire study period and that visit could have been either pre-ACA or post-ACA. We excluded patients who were pregnant during the study period (N=127 530).

For the hypertension outcome, we excluded individuals with a diagnosis of hypertension prior to the start of the study period (N=107 930), those who had a hypertension diagnosis on their first visit to a clinic or their first visit after 3 years without a visit (N=76 079), and those who had a diagnosis ≥3 years after their last ambulatory visit and thus not an active patient in the health system (N=80 442). The resulting dataset used in the analyses for hypertension incidence included pre-ACA cohorts from non-expansion (N=130 973) and expansion states (N=193 198), and post-ACA cohorts from non-expansion (N=186 341) and expansion states (N=251 015).

For the diabetes outcome, we excluded patients with a diabetes diagnosis prior to study start (N=3284), on their first visit or their first visit after inactive patient status (N=15 557), and those who had a diagnosis while not an active patient (N=27 572). The resulting dataset...
used in the analyses for diabetes incidence included pre-ACA cohorts from non-expansion (N=145 435) and expansion states (N=198 558) and post-ACA cohorts from non-expansion (N=215 039) and expansion states (N=264 644).

**Measures**

Hypertension diagnoses were assessed using International Classification of Diseases (ICD)-9: 401.00–401.99, 402.00–405.99 or ICD-10: I10–I15. Diabetes diagnoses were assessed using ICD-9: 250.00 or ICD-10-CM E11.9.

**Analysis**

Hypertension and diabetes diagnoses were defined as incidence rates by estimating the number of diagnoses at a clinic over person-time at risk (visit date plus a 1 year buffer). In other words, each patient seen in the clinic was included in the person-time at risk (denominator) at each visit they had plus 1 year of time after that visit within the study time period. If they had another visit within the year, the year buffer started again. Since this is a clinic-level analysis, the incidence rate is the sum of diagnoses over the person-time at risk for a given clinic. Using person-time at risk allows for accurate rates regardless of the time frame included. We used generalised estimating equation (GEE) Poisson models with an interaction term that tested a difference in difference (DID) of diagnosis incidence rates pre-ACA versus post-ACA Medicaid expansion between expansion and non-expansion states. These GEE models produced incidence rate ratios (IRRs) comparing post-ACA versus pre-ACA periods within and between expansion groups. All models were adjusted for study year and primary CHC patient population demographics in the preperiod (ie, clinic-level distributions of race/ethnicity, sex, age, most frequent insurance coverage and % FPL). Data processing was managed in R V.3.6.0; analyses were conducted using STATA V.15.

**RESULTS**

Overall, sex and age distributions were similar (table 1 and online supplemental appendix table 1). However, non-expansion and expansion states differed in race/ethnicity distributions and FPL. Specifically, large differences were noted in percentage of non-Hispanic

| Table 1 Demographics of patients pre-Affordable Care Act (ACA) and post-ACA by Medicaid expansions status |
|----------------------------------------------------------|---------|---------|---------|---------|
| **Pre-ACA** | **Expansion states** | **Post-ACA** | **Expansion states** |
| **Total patients** | N=130973 | N=193198 | N=186341 | N=251015 |
| **Race/ethnicity** | N (%) | N (%) | N (%) | N (%) |
| Hispanic | 41684 (31.8) | 54071 (28.0) | 63328 (34.0) | 67632 (26.9) |
| Missing | 11739 (9.0) | 14608 (7.6) | 18006 (9.7) | 23197 (9.2) |
| NH black | 36820 (28.1) | 12165 (6.3) | 47645 (25.6) | 14958 (6.0) |
| NH other | 2792 (2.1) | 10239 (5.3) | 4733 (2.5) | 13982 (5.6) |
| NH white | 37938 (29.0) | 102115 (52.9) | 52629 (28.2) | 131246 (52.3) |
| **Sex** | | | | |
| Female | 84036 (64.2) | 115501 (58.9) | 116853 (62.7) | 142921 (56.9) |
| Male | 46934 (35.8) | 77693 (40.2) | 69485 (37.3) | 108089 (43.1) |
| Not indicated | 3 (0.0) | 4 (0.0) | 3 (0.0) | 5 (0.0) |
| **Age at first visit, N (%)** | | | | |
| 19–25 | 24765 (18.9) | 35163 (18.2) | 33749 (18.1) | 44785 (17.8) |
| 26–39 | 44482 (34.0) | 72082 (37.3) | 65793 (35.3) | 95206 (37.9) |
| 40–64 | 59228 (45.2) | 80807 (41.8) | 86298 (46.3) | 109320 (43.6) |
| N/A | 2498 (1.9) | 5146 (2.7) | 501 (0.3) | 1704 (0.7) |
| **Federal poverty level (most frequently recorded)** | | | | |
| ≤138 | 105007 (80.2) | 129990 (67.3) | 145586 (78.1) | 167152 (66.6) |
| >138 | 13754 (10.5) | 24404 (12.6) | 24497 (13.1) | 39233 (15.6) |
| N/A | 12212 (9.3) | 38804 (20.1) | 16258 (8.7) | 44630 (17.8) |
| **Insurance (most frequently recorded)** | | | | |
| Private | 7548 (5.8) | 32165 (16.6) | 38562 (20.7) | 43794 (17.4) |
| Public | 52429 (40.0) | 91485 (47.4) | 64108 (34.4) | 160685 (64.0) |
| Uninsured | 68498 (52.3) | 64402 (33.3) | 83170 (44.6) | 44831 (17.9) |
| N/A | 2498 (1.9) | 5146 (2.7) | 501 (0.3) | 1705 (0.7) |

Patients with visits in both periods contribute distinct demographics in the pre-ACA and post-ACA columns.

*All demographics were significantly different (<0.001) between expansion and non-expansion states in both the pre-ACA and post-ACA periods.

NA, not available; NH, non-Hispanic.
The ACA expanded access to health insurance coverage, which led to increased preventive service receipt for hypertension and diabetes diagnosis. We found a differential impact of Medicaid expansion on hypertension and diabetes diagnosis rates. Medicaid expansion may have facilitated access to diagnostic tests for this population. The study found small changes in diagnostic test rates among patients served by CHCs in states that did not. We hypothesized that following ACA Medicaid expansion, there would be an increase in the rate of diagnoses. We assessed the change in new hypertension and diab(s) in 3. We found that following ACA Medicaid expansion, there was a decrease in patients without insurance, with smaller decreases in non-expansion states than in expansion states. Due to these differences in group characteristics, we adjusted models as specified above.

**Table 2** Hypertension and diabetes diagnosis rates, IRRs and difference-in-difference post-ACA versus pre-ACA by Medicaid expansion status

<table>
<thead>
<tr>
<th></th>
<th>Hypertension diagnosis</th>
<th>Diabetes diagnosis</th>
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<tbody>
<tr>
<td></td>
<td>Pre-ACA</td>
<td>Post-ACA</td>
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<tr>
<td><strong>Non-expansion states</strong></td>
<td></td>
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<tr>
<td>Unadjusted rate per 100 patients per year</td>
<td>7.0</td>
<td>5.5</td>
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<tr>
<td>Adjusted rate* per 100 patients per year</td>
<td>5.5</td>
<td>5.2</td>
</tr>
<tr>
<td>Post-ACA versus pre-ACA IRR 95% CI</td>
<td>0.94 (0.91 to 0.97)†</td>
<td>1.28 (1.18 to 1.38) †</td>
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<tr>
<td><strong>Expansion states</strong></td>
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<tr>
<td>Unadjusted rate per 100 patients per year</td>
<td>4.7</td>
<td>4.4</td>
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<tr>
<td>Adjusted rate* per 100 patients per year</td>
<td>4.6</td>
<td>4.9</td>
</tr>
<tr>
<td>Post-ACA versus pre-ACA IRR 95% CI</td>
<td>1.07 (1.03 to 1.10)†</td>
<td>1.25 (1.16 to 1.34) †</td>
</tr>
<tr>
<td><strong>Difference in difference (DID)</strong></td>
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</tr>
<tr>
<td>Expansion versus non-expansion, DID 95% (CI)</td>
<td>1.14 (1.11 to 1.18)†</td>
<td>0.98 (0.91 to 1.05)</td>
</tr>
</tbody>
</table>

*Generalised estimating equation Poisson models adjusted for year and primary community health centre patient population demographics (ie, clinic-level distributions of race/ethnicity, sex, age, most frequent insurance coverage and % federal poverty level).
‡Statistically significant p<0.05. §Incidence rate was defined as number of new diagnoses at a clinic over person-time at risk.
ences in expansion compared with non-

Findings are aligned with a previous study comparing

The relatively small changes to hypertension diagnosis

The relatively small changes to hypertension diagnosis

CONCLUSION

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REFERENCES


28 Han X, Luo Q, Ku L. Medicaid expansion and grant funding increases helped improve community health center capacity. Health Aff 2017;36:49–56.


### Appendix Table 1: Demographics of Patients for Diabetes Diagnosis Outcomes Pre- and Post-Affordable Care Act by Medicaid Expansion Status

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Pre-Affordable Care Act*</th>
<th>Post-Affordable Care Act*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Expansion States</td>
<td>Expansion States</td>
</tr>
<tr>
<td></td>
<td>N= 145,435</td>
<td>N= 198,558</td>
</tr>
<tr>
<td>Hispanic</td>
<td>44,932 (30.9)</td>
<td>70,979 (33.0)</td>
</tr>
<tr>
<td>Missing</td>
<td>13,102 (9.0)</td>
<td>20,764 (9.7)</td>
</tr>
<tr>
<td>NH Black</td>
<td>42,257 (29.1)</td>
<td>57,138 (26.6)</td>
</tr>
<tr>
<td>NH Other</td>
<td>2,990 (2.1)</td>
<td>5,301 (2.5)</td>
</tr>
<tr>
<td>NH White</td>
<td>42,154 (29.0)</td>
<td>60,857 (28.3)</td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>91,877 (63.2)</td>
<td>132,449 (61.6)</td>
</tr>
<tr>
<td></td>
<td>53,555 (36.8)</td>
<td>82,586 (38.4)</td>
</tr>
<tr>
<td>Age at first visit, N (%)</td>
<td></td>
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<tr>
<td>19 to 25</td>
<td>24,975 (17.2)</td>
<td>34,128 (15.9)</td>
</tr>
<tr>
<td>26 to 39</td>
<td>46,513 (32.0)</td>
<td>69,479 (32.3)</td>
</tr>
<tr>
<td>40 to 64</td>
<td>71,447 (49.1)</td>
<td>110,803 (51.5)</td>
</tr>
<tr>
<td>N/A</td>
<td>2,500 (1.7)</td>
<td>629 (0.3)</td>
</tr>
<tr>
<td>Federal Poverty Level (Most frequently recorded)</td>
<td></td>
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<tr>
<td>≤138</td>
<td>117,049 (80.5)</td>
<td>168,277 (78.3)</td>
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<tr>
<td>&gt;138</td>
<td>15,168 (10.4)</td>
<td>28,085 (13.1)</td>
</tr>
<tr>
<td>N/A</td>
<td>13,218 (9.1)</td>
<td>18,677 (8.7)</td>
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<tr>
<td>Insurance (Most frequently recorded)</td>
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<tr>
<td>Private</td>
<td>8,077 (5.6)</td>
<td>45,272 (21.1)</td>
</tr>
<tr>
<td>Public</td>
<td>57,559 (39.6)</td>
<td>73,130 (34.0)</td>
</tr>
<tr>
<td>Uninsured</td>
<td>77,299 (53.2)</td>
<td>96,008 (44.6)</td>
</tr>
<tr>
<td>N/A</td>
<td>2,500 (1.7)</td>
<td>629 (0.3)</td>
</tr>
</tbody>
</table>

Notes

NH: non-Hispanic

*All demographics were significantly different (p<0.001) between expansion and non-expansion states in both the pre- and post-ACA periods.

Patients with visits in both periods contribute distinct demographics in the pre- and post-Affordable Care Act columns.