# Surge in Newly Identified Diabetes Among Medicaid Patients in 2014 Within Medicaid Expansion States Under the Affordable Care Act

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## OBJECTIVE

**Twenty-six states and the District of Columbia expanded Medicaid in January 2014 pursuant to the Affordable Care Act (ACA); 24 states did not. This created an opportunity to examine the impact of Medicaid expansion on the number of Medicaid patients with newly identified diabetes among enrollees (19–64 years of age) who had laboratory testing through Quest Diagnostics.**

## RESEARCH DESIGN AND METHODS

**Newly identified diabetes was defined as an ICD-9 diagnosis code of 250.x (diabetes) or hemoglobin $A_{1c}$ of >6.4% (46 mmol/mol) within the first 6 months of a calendar year and the absence of both in the preceding calendar year within our data repository.**

## RESULTS

**We identified 215,398 and 218,890 patients who met our definition of newly diagnosed diabetes within the first 6 months of 2013 (control period) and 2014 (study period), respectively (a 1.6% increase). We identified 26,237 Medicaid-enrolled patients with new diabetes in the control period vs. 29,673 in the study period: an increase of 13%. The number of Medicaid-enrolled patients with newly identified diabetes increased by 23% (14,625 vs. 18,020 patients) in the 26 states (and District of Columbia) that expanded Medicaid compared with an increase of 0.4% (11,612 vs. 11,653 patients) in the 24 states that did not expand Medicaid during this period. Similar differences were observed in younger and older adults and for both men and women.**

## CONCLUSIONS

**This study suggests that in the states that expanded Medicaid under the ACA, an increased number of Medicaid patients with diabetes are being diagnosed and treated earlier. This could be anticipated to lead to better long-term outcomes.**


The Affordable Care Act (ACA) refers to both the Patient Protection and Affordable Care Act (public law 111–148) and the Health Care and Education Reconciliation Act (public 111–152) of 2010. Together, the ACA expanded Medicaid eligibility to reach nearly all nonelderly adults with incomes ≤138% of the federal poverty level (FPL)—about 16,105 USD for an individual in 2014. Effective 1 January 2014, this expansion established a new coverage pathway for millions of uninsured adults who were previously excluded from the program. After a U.S. Supreme Court decision,

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states could decide whether they would accept the conditions to expand Medicaid (1). Twenty-six states and the District of Columbia ("expansion states") agreed to expand Medicaid; 24 states did not (2).

This division of states created an opportunity to examine the impact of Medicaid expansion on specific health metrics, such as detection of disease, using the Quest Diagnostics database. In this Quest Diagnostics Health Trends study, we used deidentified patient data to assess changes in identification of newly identified laboratory-defined diabetes after implementation of Medicaid expansion.

We selected diabetes as an indicator because it is a common medical condition affecting ~28–29 million Americans and has a much larger population at risk (3). In addition, aggressive prevention and treatment programs have been shown to improve outcomes (4). Clear definitions have been established that are amenable to analysis using laboratory measurements in a large database-centered epidemiological study (5). Finally, any observations derived from such an analysis are likely to be applicable to other common chronic medical conditions.

## RESEARCH DESIGN AND METHODS

Quest Diagnostics maintains the largest private clinical laboratory database in the U.S. Consisting of deidentified data on nearly 2 billion patient encounters since 2000, the database provides laboratory information on the vast majority of conditions and diseases affecting the U.S. population. Quest Diagnostics has approximately 150 million patient encounters annually with individuals from all states and the District of Columbia. The overall testing volume declined slightly in the study period (first half of 2014) compared with the control period (first half of 2013). This Quest Diagnostics Health Trends study was determined to be exempt by the Western Institutional Review Board.

The Quest Diagnostics database was queried for patients 19–64 years of age meeting our laboratory criteria for newly identified diabetes in the pre-Medicaid expansion control period (January–June 2013) or the postexpansion study period (January–June 2014). Newly identified diabetes was defined as having an ICD-9 diagnosis code of 250.x (diabetes) or a hemoglobin $A_{1c}$ of >6.4% (46 mmol/mol) within the control or study period and the absence of both in the preceding calendar year (January–December 2012 for control period and January–December 2013 for the study period). Importantly, all patients included in this analysis had to have had at least one test through Quest Diagnostics in the preceding calendar year. This was to assure that we identified patients with only newly identified diabetes on the premise that patients with diabetes should receive hemoglobin $A_{1c}$ testing and are likely to have been assigned an ICD-9 code of diabetes in the preceding year.

Patients were categorized as being Medicaid enrollees if they were enrolled in Medicaid at the time diabetes was diagnosed having a hemoglobin $A_{1c}$ >6.4% (46 mmol/mol) or an ICD-9 code of 250.x (diabetes) in the control period or study period. Medicaid, including managed Medicaid, was listed on the test requisition as one of the payers.

The residence (state or District of Columbia) of each patient was based on the address provided for the patient at the time of testing that was used for categorization of the patient as having newly identified diabetes.

Hemoglobin $A_{1c}$ testing was performed using the Roche Cobas Integra (Indianapolis, IN), which is National Glycohemoglobin Standardization Program certified. Statistical significance of comparisons was tested using Pearson $\chi^2$ test to assess the difference between proportions. Analyses were performed in SAS 9.4 (SAS Institute, Inc., Cary, NC).

## RESULTS

A total of 434,288 patients from all 50 states and the District of Columbia met our criteria for newly identified diabetes. Demographic features (age and sex distributions) of patients remained stable between the control and study periods (Table 1). The mean (SD) age of Medicaid patients was similar between expansion and nonexpansion states: 48.2 (11.2) vs. 48.0 (11.4), respectively. Non-Medicaid (hereafter referred to as "other") patients were older than Medicaid patients in expansion (51.3 [10.0] vs. 48.2 [11.2] years) and nonexpansion (52.1 [9.5] vs. 48.0 [11.4] years) states.

Overall, we observed a 1.6% increase in newly identified diabetes from the control period to the study period (Table 2). In our analysis, we focused on patients who were enrolled in Medicaid at least once during the control or study periods and for whom data were available establishing the absence of diabetes (by ICD-9 code or hemoglobin $A_{1c}$ test result) in the preceding calendar year. A total of 26,237 Medicaid-enrolled patients were newly identified with diabetes in the control period vs. 29,673 Medicaid-enrolled patients in the study period: an increase of 13% (Table 2). We examined the data for other (non-Medicaid) patients in both periods as well to have a comparison group with which to contrast the observations in Medicaid patients. The number of patients with newly identified diabetes among other patients increased by only 0.03% from the control ($n$ = 189,161) to the study ($n$ = 189,217) periods (Table 2).

The Medicaid patients were then analyzed after assignment into the two categories (expansion states versus nonexpansion states) (Table 2). Within the expansion states, 14,625 patients were classified as having newly identified diabetes in the control period vs. 18,020 patients in the study period: an increase of 23%. In the nonexpansion states, by contrast, 11,612 patients were classified as having newly identified diabetes in the

**Table 1—Demographic characteristics of control and study populations with newly identified diabetes ($N$ = 434,288)***

| Characteristics | Control period | Study period |
|---|---|---|
| Total, *n* | 215,398 | 218,890 |
| Sex, *n* (%) | | |
| Male | 89,977 (41.8) | 92,547 (42.3) |
| Female | 125,421 (58.2) | 126,343 (57.7) |
| Age-group, *n* (%) | | |
| Younger (19–49 years) | 78,086 (36.3) | 77,518 (35.4) |
| Older (50–64 years) | 137,312 (63.8) | 141,372 (64.6) |

*Newly identified diabetes was defined as having an ICD-9 diagnosis code of 250.x (diabetes) or a hemoglobin $A_{1c}$ of >6.4% within the control (January–June 2013) or study (January–June 2014) period and the absence of both in the preceding calendar year.

**Table 2—Patients with newly identified diabetes in all states, Medicaid expansion states, and nonexpansion states**

| | Total | Medicaid | Other* |
|---|---|---|---|
| Overall | | | |
| Control period (*n*) | 215,398 | 26,237 | 189,161 |
| Study period (*n*) | 218,890 | 29,673 | 189,217 |
| Change (%) | 1.6 | 13.1 | 0.03 |
| Expansion states | | | |
| Control period (*n*) | 121,149 | 14,625 | 106,524 |
| Study period (*n*) | 122,153 | 18,020 | 104,133 |
| Change (%) | 0.8 | 23.2 | −2.2 |
| Nonexpansion states | | | |
| Control period (*n*) | 94,249 | 11,612 | 82,637 |
| Study period (*n*) | 96,737 | 11,653 | 85,084 |
| Change (%) | 2.6 | 0.4 | 3.0 |

Change (%) is from control period (January–June 2013) to study period (January–June 2014).
*Other represents non-Medicaid patients.

control period vs. 11,653 patients in the study period: an increase of 0.4% (Fig. 1).

The number of other patients with newly identified diabetes decreased by 2.2% within the expansion states between the control (106,524) and study (104,133) periods but increased by 3.0% (82,637 in the control period to 85,084 in the study period) in the nonexpansion states (Fig. 1). The overall increase in newly identified patients with diabetes was about the same magnitude in the expansion states (0.8%) and nonexpansion states (2.6%) (Table 2).

Patients were also categorized by sex (Table 3) and by age range (younger, ages 19–49 years, and older, ages 50–64 years) (Table 4). The surge in newly identified Medicaid patients with diabetes in the expansion states was observed for each category of sex or age-group ($P < 0.0001$).

A potential explanation for the increase in the number of newly identified patients with diabetes is that diabetes is being diagnosed at an earlier stage of disease. Among Medicaid patients with newly identified diabetes, the mean (SD) hemoglobin $A_{1c}$ was 8.03% (1.92) (64 mmol/mol). Mean hemoglobin $A_{1c}$ levels among Medicaid patients were significantly lower in the expansion states (7.96% [1.88]) (63 mmol/mol) than in the nonexpansion states (8.14% [1.97]) (65 mmol/mol) ($P < 0.0001$). Consistent with this, the percentage of Medicaid patients with hemoglobin $A_{1c}$ results of 6.5–6.9% (48–52 mmol/mol) was higher in the expansion states (44.1%) than in the nonexpansion states (39.3%) ($P < 0.0001$).

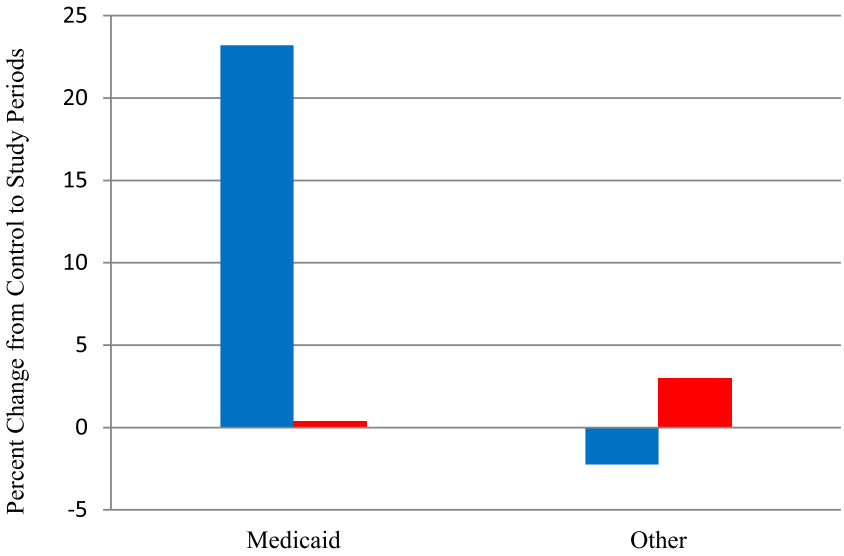


**Figure 1**—Patients with newly identified diabetes in expansion (blue) and nonexpansion (red) states.

For other patients with newly identified diabetes, we observed no difference in the mean hemoglobin $A_{1c}$ or percentage of patients with hemoglobin $A_{1c}$ results between 6.5 and 6.9% (48–52 mmol/mol). The mean (SD) hemoglobin $A_{1c}$ was similar in the expansion states (7.78% [1.72] [62 mmol/mol]) and the nonexpansion states (7.79% [1.73] [62 mmol/mol]), as was the percent of patients with hemoglobin $A_{1c}$ results in the 6.5–6.9% (48–52 mmol/mol) range: 47.5% in the expansion states and 47.1% in the nonexpansion states.

The mean (SD) hemoglobin $A_{1c}$ was 8.03% (1.92) (64 mmol/mol) in the Medicaid patients and 7.78% (1.73) (62 mmol/mol) in other patients. The percent of hemoglobin $A_{1c}$ results of 6.5–6.9% (48–52 mmol/mol) was 42.4% in the Medicaid patients and 47.3% in other patients.

## CONCLUSIONS

We identified 215,398 patients overall and 26,237 Medicaid patients who met our definition of newly identified diabetes within the first 6 months of calendar year 2013 (control period). The expansion of Medicaid resulted in a 23% surge in Medicaid patients newly identified with diabetes in the expansion states versus a minimal 0.4% increase in the nonexpansion states. By definition, all of the patients who were new to Medicaid in 2014 had used medical services and Quest Diagnostics laboratory services in 2013. Thus, it is intriguing that the expansion of Medicaid coincided with the surge in newly identified Medicaid patients. It is likely that changes in access to health care for patients with Medicaid contributed to testing for diabetes at an earlier stage of disease. There were no other significant changes to Quest Diagnostics services during the period of this analysis.

The lower mean hemoglobin $A_{1c}$ results with a smaller SD in the expansion states support the observation that the newly identified patients with diabetes in the expansion states are more likely at an earlier state of their disease than within the nonexpansion states. We postulate that these Medicaid patients with newly identified diabetes will experience better management of their disease than if diagnoses had been made later. This could be anticipated to lead to fewer long-term complications.

**Table 3—Patients with newly identified diabetes in all states, Medicaid expansion states, and nonexpansion states by sex**

| | All states | | | Expansion states | | | Nonexpansion states | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Medicaid | Other* | Total | Medicaid | Other* | Total | Medicaid | Other* |
| Control period (*n*) | | | | | | | | | |
| Men | 89,977 | 8,366 | 81,611 | 50,642 | 4,934 | 45,708 | 39,335 | 3,432 | 35,903 |
| Women | 125,421 | 17,871 | 107,550 | 70,507 | 9,691 | 60,816 | 54,914 | 8,180 | 46,734 |
| Study period (*n*) | | | | | | | | | |
| Men | 92,547 | 9,781 | 82,766 | 51,553 | 6,190 | 45,363 | 40,994 | 3,591 | 37,403 |
| Women | 126,343 | 19,892 | 106,451 | 70,600 | 11,830 | 58,770 | 55,743 | 8,062 | 47,681 |
| Change from study to control period (%) | | | | | | | | | |
| Men | 2.9 | 16.9 | 1.4 | 1.8 | 25.5 | −0.8 | 4.2 | 4.6 | 4.2 |
| Women | 0.7 | 11.3 | −1.0 | 0.1 | 22.1 | −3.4 | 1.5 | −1.4 | 2.0 |

*Other represents non-Medicaid patients.

For the other patient population, there was a minimal increase of 0.03% (from the control period in 2013 to the study period in 2014) in the number of patients with newly identified diabetes. There are many less dramatic differences between groups and changes observed in this study. For example, when both Medicaid enrollees and nonenrollees are considered, nonexpansion states had a greater overall increase in newly identified patients with diabetes (2.6%) than did the expansion states (0.8%). Two main factors drove this finding. First, the number of newly identified other patients with diabetes actually decreased by 2.2% in the expansion states while increasing 3.0% in the nonexpansion states. This difference is small in clinical impact, and the overall change may be compatible with data from the Centers for Disease Control and Prevention suggesting that the diabetes epidemic may be reaching a plateau (6). Second, this difference was magnified because other patients vastly outnumbered the Medicaid patients. These observations warrant further analysis to see whether these changes are due to shifts among payers, small shifts in Quest Diagnostics business in these states, or underlying differences in the growth of diabetes in the expansion versus nonexpansion states. Of note, 9 of the 11 states (AL, GA, IN, LA, MS, NC, SC, TN, and VA) with high rates of stroke, cardiovascular disease, and obesity are represented in the nonexpansion states and may account for faster growth in new diabetes in the nonexpansion states. The other two states, AR and KY, expanded Medicaid.

The general observations were similar when analyzed by sex. For men, the change in the number of Medicaid patients with newly identified diabetes was 25.5% in the expansion states and only 4.6% in the nonexpansion states ($P < 0.0001$). For women, the change in the number of Medicaid patients with newly identified diabetes was 22% in the expansion states and declined 1.4% in the nonexpansion states ($P < 0.0001$). Women comprised 58% of patients newly identified with diabetes across both periods. Yet, the percent change in newly identified diabetes was more striking among men than women. In the other patient population, the changes were modest for both men and women in both the states with and the states without Medicaid expansion, with men always having a slightly higher rate of newly identified patients with diabetes in the study versus control periods. Two hypotheses are that women have had a more consistent pattern of medical service utility and that men are at greater risk of developing diabetes within the 19–64 age range.

In like fashion, the observations were similar when analyzed according to age-groups: younger (ages 19–49 years) and older (ages 50–64 years) patients. For younger patients, the change in the number of Medicaid patients with newly identified diabetes was nearly 15% in the expansion states; there was essentially no change in the nonexpansion states. For older patients, the change in the number of Medicaid patients with newly identified diabetes was 31% in the expansion states and increased 0.5% in the nonexpansion states ($P < 0.0001$). The percent change in newly identified diabetes was more striking among older patients than

**Table 4—Patients with newly identified diabetes in all states, Medicaid expansion states, and nonexpansion states by age-group†**

| | All states | | | Expansion states | | | Nonexpansion states | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Medicaid | Other* | Total | Medicaid | Other* | Total | Medicaid | Other* |
| Control period (*n*) | | | | | | | | | |
| Younger | 78,086 | 12,728 | 65,358 | 45,390 | 7,197 | 38,193 | 32,696 | 5,531 | 27,165 |
| Older | 137,312 | 13,509 | 123,803 | 75,759 | 7,428 | 68,331 | 61,553 | 6,081 | 55,472 |
| Study period (*n*) | | | | | | | | | |
| Younger | 77,518 | 13,820 | 63,698 | 44,601 | 8,277 | 36,324 | 32,917 | 5,543 | 27,374 |
| Older | 141,372 | 15,853 | 125,519 | 77,552 | 9,743 | 67,809 | 63,820 | 6,110 | 57,710 |
| Change from study to control period (%) | | | | | | | | | |
| Younger | −0.7 | 8.6 | −2.5 | −1.7 | 15.0 | −4.9 | 0.7 | 0.2 | 0.8 |
| Older | 3.0 | 17.4 | 1.4 | 2.4 | 31.2 | −0.8 | 3.7 | 0.5 | 4.0 |

†Younger (19–49 years) vs. older (50–64 years). *Other represents non-Medicaid patients.

younger patients. This difference based on age may reflect the higher risk of diabetes in older patients.

The lower mean and higher percentage of hemoglobin $A_{1c}$ results of 6.5–6.9% (48–52 mmol/mol) for other patients compared with Medicaid patients suggest that other patients may be identified at an earlier stage of disease than Medicaid patients. This may reflect different demographics or access to medical services.

Our definition of newly identified diabetes reflects the limitations of our approach. We lacked clinical information and relied on the provision of ICD-9 codes from ordering physicians and hemoglobin $A_{1c}$ testing performed only at Quest Diagnostics. Some of these patients may have been diagnosed previously but lacked the specified testing in the preceding calendar year or received testing from other clinical laboratories. Some patients might have had alternative explanations for an elevated hemoglobin $A_{1c}$, and in some cases, the test requisition might have been incorrectly coded by the ordering physician. Further, there are regional differences in clinical practice and access to medical care throughout the U.S. We postulate that such differences were insignificant when comparing the 26 states and District of Columbia to the 24 nonexpansion states. Overall, we believe that our findings closely approximate the actual number of newly diagnosed patients with diabetes. Another consideration is that Medicaid enrollment increased 18.5% in the expansion states that opted to accept the conditions of the ACA (5). Medicaid enrollment enlarged 4.0% in the nonexpansion states that chose not to accept Federal funds for the expansion (5). The comparison between the expansion and nonexpansion states was slightly confounded by this voluntary expansion of Medicaid enrollment. Also, some of the patients categorized as Medicaid patients in the control and study periods may have been Medicaid enrollees in the preceding calendar years.

In summary, this Quest Diagnostics Health Trends report provides insight into the impact of the national Medicaid expansion under the ACA. Medicaid expansion states had a 23% increase in newly identified Medicaid patients with diabetes compared with a year earlier; the change was 0.4% in the nonexpansion states. This large difference between expansion states versus nonexpansion states was observed in men and in women and in younger and older patients within the 19–64 age range. These observations were based on comparing only the first 6 months of Medicaid expansion under the ACA. The data suggest that new enrollees in Medicaid are being screened for diabetes and that screening was productive. Since we do not have clinical data, we cannot comment as to whether such screening was targeted using criteria such as those suggested by the American Diabetes Association (7). The subject of screening is controversial. One trial (8) showed no mortality benefit over 5 years with the early diagnosis obtained from such screening. However, the timeline of that study was likely too short to see a mortality benefit. The U.S. Preventive Services Task Force has recently endorsed screening for type 2 diabetes for patients $\geq$45 years old and for patients with other risk factors (9). Additional follow-up will be required to establish whether these trends continue (10).

Our data suggest that Medicaid expansion has led to an increased number of Medicaid patients being newly diagnosed with diabetes. Beyond diabetes, the trends we observed in the current study are likely to affect diagnosis of other chronic medical conditions such as hypertension, hypercholesterolemia, and chronic kidney disease. Such a pattern has already been reported for the diagnosis of HIV (11), where diagnosis occurred at an earlier stage among Medicaid patients in expansion states. Improved access and use of medical services may in turn lead to earlier diagnosis of associated diseases and permit earlier intervention to reduce long-term complications (12).

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**Author Contributions.** H.W.K. and Z.C. researched data. H.W.K., Z.C., V.A.F., and M.J.M. wrote, reviewed, and edited the manuscript, including the conclusions. H.W.K. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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