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Medicaid Expansion and Utilization of Antihyperglycemic Therapies

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EPIDEMIOLOGY/HEALTH SERVICES RESEARCH

OBJECTIVE

Certain antihyperglycemic therapies modify cardiovascular and kidney outcomes among patients with type 2 diabetes, but early uptake in practice appears restricted to particular demographics. We examine the association of Medicaid expansion with use of and expenditures related to antihyperglycemic therapies among Medicaid beneficiaries.

RESEARCH DESIGN AND METHODS

We employed a difference-in-difference design to analyze the association of Medicaid expansion on prescription of noninsulin antihyperglycemic therapies. We used 2012–2017 national and state Medicaid data to compare prescription claims and costs between states that did ($n = 25$) and did not expand ($n = 26$) Medicaid by January 2014.

RESULTS

Following Medicaid expansion in 2014, average noninsulin antihyperglycemic therapies per state/1,000 enrollees increased by 4.2%/quarter in expansion states and 1.6%/quarter in nonexpansion states. For sodium–glucose cotransporter 2 inhibitors (SGLT2i) and glucagon-like peptide 1 receptor agonists (GLP-1RA), quarterly growth rates per 1,000 enrollees were 125.3% and 20.7% for expansion states and 87.6% and 16.0% for nonexpansion states, respectively. Expansion states had faster utilization of SGLT2i and GLP-1RA than nonexpansion states. Difference-in-difference estimates for change in volume of prescriptions after Medicaid expansion between expansion versus nonexpansion states was 1.68 (95% CI 1.09–2.26; $P < 0.001$) for all noninsulin therapies, 0.125 (−0.003 to 0.25; $P = 0.056$) for SGLT2i, and 0.12 (0.055–0.18; $P < 0.001$) for GLP-1RA.

CONCLUSIONS

Use of noninsulin antihyperglycemic therapies, including SGLT2i and GLP-1RA, increased among low-income adults in both Medicaid expansion and nonexpansion states, with a significantly greater increase in overall use and in GLP-1RA use in expansion states. Future evaluation of the population-level health impact of expanded access to these therapies is needed.

Over 34 million U.S. patients live with diabetes including an estimated 6 million enrolled in Medicaid (1). Metrics of income and health care access are key predictors of mortality among patients with diabetes (2). Unfortunately, there has been a resurgence of cardiovascular complications among young and middle-aged adults with diabetes in the U.S. (3).

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Over the last three decades, there has been important therapeutic progress in the management of diabetes with 12 classes of antihyperglycemic therapies now approved for use in the U.S. Two classes, the sodium–glucose cotransporter 2 inhibitors (SGLT2i) and glucagon-like peptide 1 receptor agonists (GLP-1RA), have been shown to reduce risk for cardiovascular and kidney outcomes in at-risk patients with type 2 diabetes mellitus (T2DM) (4–6). However, recent data have suggested that these therapies may not be reaching the highest-risk patients, and uptake appears restricted to certain demographics, including those who are commercially insured (7). Few data are available tracking the use patterns of antihyperglycemic therapies among patients who are socioeconomically disadvantaged, a population that bears a high burden of disease (8).

By 1 January 2014, 24 U.S. states and the District of Columbia had elected to expand Medicaid eligibility requirements under the Affordable Care Act (ACA). While Medicaid expansion increased coverage of millions of previously uninsured patients and has been associated with lower cardiovascular hospitalizations (9) and mortality (10), it has not been consistently linked with greater provision of evidence-based therapies and quality of care in expansion states (11–14). Understanding whether Medicaid expansion increased access to antihyperglycemic therapies for socioeconomically disadvantaged populations is critically important, given the high burden of T2DM in this population. Therefore, in this study, we characterize national trends in the use of antihyperglycemic therapies among adults insured by Medicaid and examine the association between the ACA's Medicaid expansion and use patterns and associated spending related to antihyperglycemic therapies.

RESEARCH DESIGN AND METHODS

These data were obtained from the 2012 to 2017 Medicaid Drug Spending and Utilization data set, which contains national-level drug utilization data for covered outpatient drugs paid for by Medicaid agencies, and the 2010–2017 Medicaid State Drug Utilization Database, which contains the state-level claims and costs data for covered outpatient drugs. State Medicaid participants must report data to the State Drug Utilization Database.

All classes of antihyperglycemic therapies used to treat T2DM, as defined by the American Diabetes Association, were identified (9). Total spending accounts for both Medicaid and non-Medicaid payments to pharmacies and includes both the federal and state reimbursements. Annual spending, number of claims filled, average spending per claim, prescription claims per state, Medicaid reimbursement, and total reimbursement were extracted. We categorized insulin by onset/duration-of-action and by type (human or analog), as determined by the American Diabetes Association (15). Noninsulin classes were categorized as SGLT2i, GLP-1RA, metformin, dipeptidyl peptidase 4 inhibitors (DPP-4i), and other (thiazolidinediones, meglitinides, sulfonylureas, α-glucosidase inhibitors, and amylin analogs). Bromocriptine and colesevelam were not included given overlapping indications and infrequent use. Combination products of two or more different classes were excluded.

We quantified trends in prescription claims and costs (reported as absolute values and per 1,000 Medicaid enrollees) for antihyperglycemic therapies over time nationally and at the state level. State-level estimates of number of individuals with Medicaid coverage were obtained from the Current Population Survey database (16).

We employed a quasi-experimental difference-in-difference design to evaluate the association of Medicaid expansion and prescription of antihyperglycemic therapies among states that did and did not expand the program. We compared prescription claims and costs between all states that expanded Medicaid coverage in 2014 (expander states; $n = 24$ states and the District of Columbia) and states that did not expand Medicaid coverage in 2014 (nonexpander states; $n = 26$ states) (17). Expander states that expanded Medicaid eligibility as of 1 January 2014 included the following: Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Hawaii, Illinois, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, Nevada, New Jersey, New Mexico, New York, North Dakota, Ohio, Oregon, Rhode Island, Vermont, Washington, and West Virginia. The pre-expansion period was defined as 2013 quarter 1 to 2013 quarter 4, while the postexpansion period was defined as 2014 quarter 1 to 2017 quarter 4. We visually tested the central assumption that the time trends in antihyperglycemic use were parallel in the pre-expansion period. Linear regression was used to model the quarterly use of noninsulin antihyperglycemic therapies (and for SGLT2i and GLP-1RA, separately) both pre- and post-expansion, using clustered SEs at the state level. In difference-in-difference analyses, we compared changes in regression slopes before versus after expansion among expander states versus nonexpander states at the start of 2014.

We conducted two sensitivity analyses to evaluate whether our difference-in-differences findings were sensitive to *1*) exclusion of the seven late expander states that expanded after 1 January 2014 (Arkansas, Indiana, Louisiana, Michigan, Montana, New Hampshire, and Pennsylvania); or *2*) exclusion of seven very early expansion states that had expanded Medicaid eligibility prior to 1 January 2014 (Massachusetts, California, Connecticut, Minnesota, New Jersey, Washington, and Washington, D.C.). All reported cost values are adjusted for inflation and are represented in 2017 U.S. dollars. Because of aggregated and deidentified nature of the data, institutional review board approval was not required. All statistical computations were performed using Stata 15.1 (StataCorp., College Station, TX).

RESULTS

National Use Patterns and Medicaid Spending on Antihyperglycemic Therapies

From 2012 to 2017, the number of claims of analog insulin has risen steadily by 72%, but this has been outpaced by GLP-1RA (182,256 claims in 2012 to 816,189 claims in 2017, a 348% increase), SGLT2i (76,319 claims in 2014 to 752,391 claims in 2017, a 886% increase), and DPP-4i (887,595 claims in 2012 to 1,876,575 claims in 2017, a 111% increase) (Supplementary Fig. 1). The overall distribution of total Medicaid spending across insulin and noninsulin therapeutic classes in 2012 and 2017 is shown in Supplementary Fig. 2. In 2017, Medicaid spent $5.8 billion on all antihyperglycemic therapies, up from $2.1 billion in 2012. Noninsulin therapies accounted for $1.8 billion in total Medicaid spending in 2017 and $6 billion from 2012 to 2017. Compared with 2012 spending, total spending in 2017 of GLP-1RA and DPP-4i increased by 659% and 202%, respectively. SGLT2i total spending in 2017 increased by

1,115% compared with 2014 spending. Detailed breakdown of trajectories of use and spending of individual antihyperglycemic classes are shown in Supplementary Fig. 1.

Use of Overall Noninsulin Antihyperglycemic Therapies After Medicaid Expansion

The average number of noninsulin prescription claims per state and the average Medicaid reimbursement for noninsulin prescriptions remained stable in the preexpansion period (between quarter 1 and 4 of 2013) for both expansion and nonexpansion states. The average number of antihyperglycemic medication prescription claims per state doubled (6,283 in the first quarter of 2014 and 11,213 in the last quarter of 2017) and average Medicaid reimbursement more than tripled ($284,860 in the first quarter of 2014 and $1,010,062 in the last quarter of 2017) between 2014 and 2017. Among nonexpansion states, Medicaid prescription claims and reimbursement for antihyperglycemic therapies increased, albeit to a lesser extent than expansion states. These trends remained consistent when evaluating prescription claims per 1,000 Medicaid beneficiaries (Fig. 1). States that expanded Medicaid had, on average, greater increases in per capita antihyperglycemic prescriptions than states that did not (Fig. 2). Following the Medicaid expansion in 2014, average noninsulin antihyperglycemic therapies per state/1,000 enrollees increased by 4.2%/quarter in expansion states and 1.6%/quarter in nonexpansion states. When restricted to the early postexpansion period through the end of 2014, we note that expansion states increased by 4.9%/quarter and nonexpansion states decreased by 0.28%/quarter in the use of noninsulin antihyperglycemic therapies per 1,000 beneficiaries. In difference-in-differences analyses, when comparing trajectories between expansion states versus nonexpansion states, the estimates for the difference between slopes of volume of prescriptions (per 1,000 beneficiaries) for noninsulin therapies was 1.68 (95% CI 1.09–2.26; $P < 0.001$) and of aggregate reimbursement (per 1,000 beneficiaries) for noninsulin therapies was 42.5 (3.19–81.82; $P = 0.035$). An explanatory difference-in-differences schematic for noninsulin therapy claims is shown in Supplementary Table 1. The results from two sensitivity analyses that excluded the seven late expander states or excluded the seven states that had expanded eligibility before 1 January 2014 were quantitatively similar to our primary analysis (Table 1).

SGLT2i and GLP-1RA After Medicaid Expansion

Use and spending related to SGLT2i and GLP-1RA displayed similar patterns to overall nonantihyperglycemic therapy trends. Following the Medicaid expansion, the quarterly growth rates for SGLT2i and GLP-1RA were 149.5%/quarter and 20.2%/quarter, respectively, for expansion states and 104.0%/quarter and 18.7%/quarter, respectively, for nonexpansion states. Accounting for the number of Medicaid enrollees did not modify rajectories of GLP-1RA prescription claims and Medicaid reimbursement, but smaller differences were observed for changes in SGLT2i use over time (Fig. 3). In the postexpansion period, for SGLT2i and GLP-1RA, the quarterly growth rates per 1,000 enrollees were 125.3% and 20.7%, respectively, for expansion states and 87.6% and 16.0%, respectively, for nonexpansion states. The difference-in-difference estimates for change in volume of SGLT2i prescriptions (per 1,000 beneficiaries) after Medicaid expansion between expansion versus nonexpansion states was 0.125 (95% CI −0.003 to 0.25; $P = 0.056$). In the difference-in-differences analysis, the volume of GLP-1RA prescriptions (per 1,000 beneficiaries) following Medicaid expansion increased significantly faster in expansion states than nonexpansion states (0.12; 0.055–0.18; $P < 0.001$).

CONCLUSIONS

Use of and spending related to antihyperglycemic therapies for T2DM have greatly increased among Medicaid beneficiaries, a population that bears a high burden of disease. Medicaid expansion was associated with significantly greater use of noninsulin antihyperglycemic therapies, including GLP-1RA, compared with nonexpansion states. This increased use pattern persisted after accounting for the number of Medicaid beneficiaries added based on expanded eligibility.

Identifying and increasing adoption of high-value therapies is of paramount importance. Medicaid spending on T2DM therapies more than doubled over the study timeframe. Although insulins remained the primary drivers of increasing T2DM therapeutic expenditures, costs associated with newer therapeutic classes of SGLT2i, GLP-1RA, and DPP-4i have risen and insulin expenditures appeared to have plateaued. While this bending of the insulin spending curve since 2015 is encouraging, these therapies continue to contribute to more than half of all expenditures for antihyperglycemic therapies. Although overall spending for the SGLT2i and GLP-1RA classes is increasing, lower health care expenditures from averted downstream cardiovascular and kidney complications may support their overall value (3). It is reassuring that Medicaid trends and patterns of antihyperglycemic prescriptions largely parallel those reported in Medicare (18). Despite their relatively recent introduction, low-income patients with Medicaid still obtained access to SGLT2i and GLP-1RA.

The ACA represented a national effort to expand Medicaid coverage, yet adoption of broader coverage policies has been state-specific and variable. We identified an early and significant association between Medicaid expansion and increased use of T2DM therapies. Public policies that modify insurance coverage may directly facilitate access to medical treatments by increasing the number of covered individuals, as has been observed with prescription of other cardioprotective therapies (19). However, we additionally observed increased per beneficiary rates of use of noninsulin antihyperglycemic therapies in Medicaid expansion states, suggesting that newly enrolled beneficiaries had higher prescription utilization after expansion than those previously enrolled. Differences in uptake trajectories between expansion and nonexpansion states were especially apparent early after Medicaid expansion.

There may be several reasons underlying these observations. First, newly enrolled beneficiaries with previously established T2DM may have had pent-up demand for antihyperglycemic therapies without adequate prescription coverage that was addressed with Medicaid expansion. Second, Medicaid expansion not only increases the number of insured beneficiaries but also may expand the relative proportion of patients with known T2DM. Medicaid expansion has previously been associated with greatly increased screening (20) and detection of

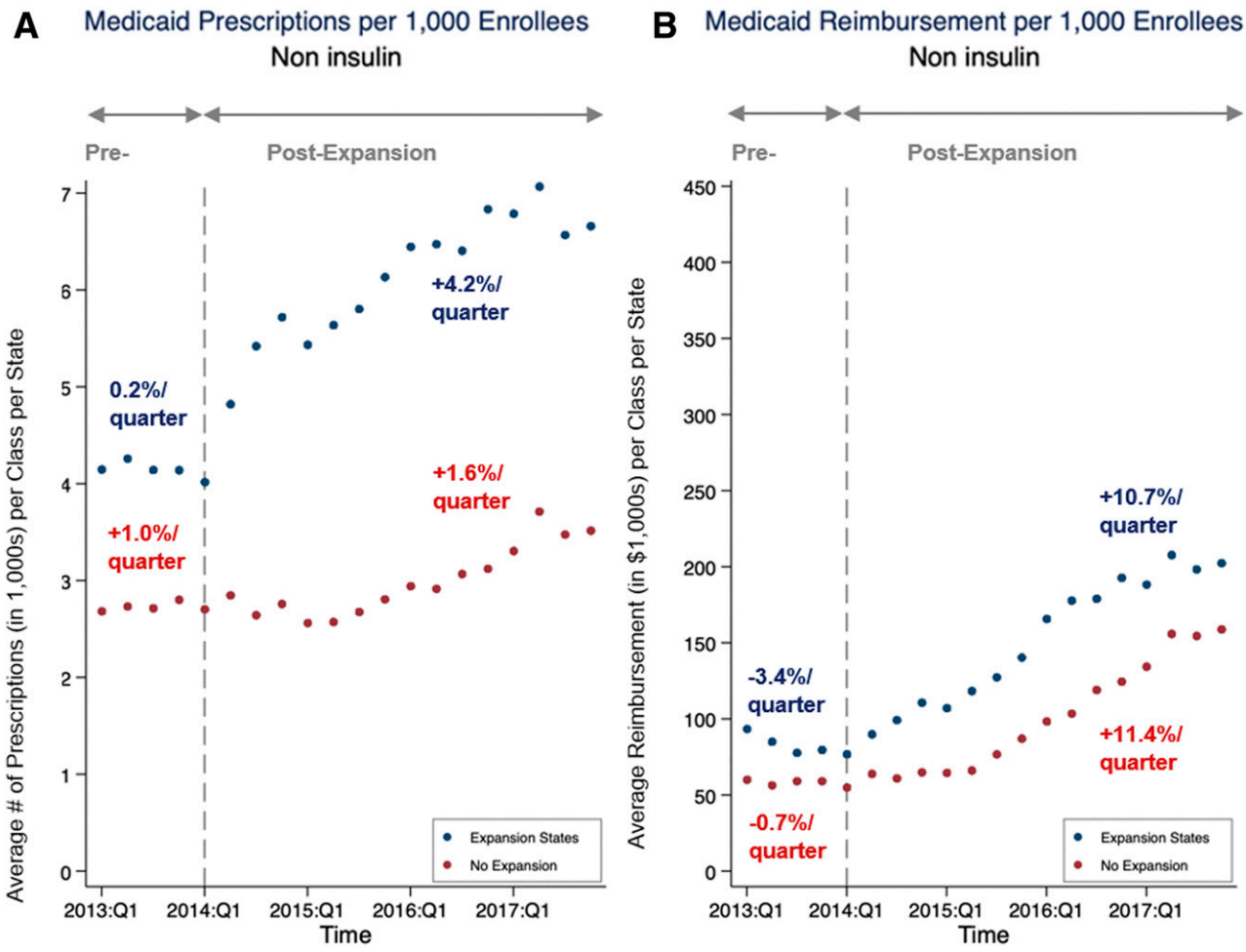

Figure 1—Trends in prescription claims (*A*) and spending (*B*) on noninsulin antihyperglycemic therapies by Medicaid expansion versus nonexpansion states, indexed per 1,000 Medicaid enrollees. Q1, quarter 1.

T2DM (8) supporting a greater pool of treatment-eligible patients in the post-expansion period. These data are in keeping with the only randomized controlled trial of Medicaid expansion, the Oregon Experiment, which found that Medicaid coverage increased rates of T2DM diagnoses and its management (21). This may suggest higher prevalence of T2DM

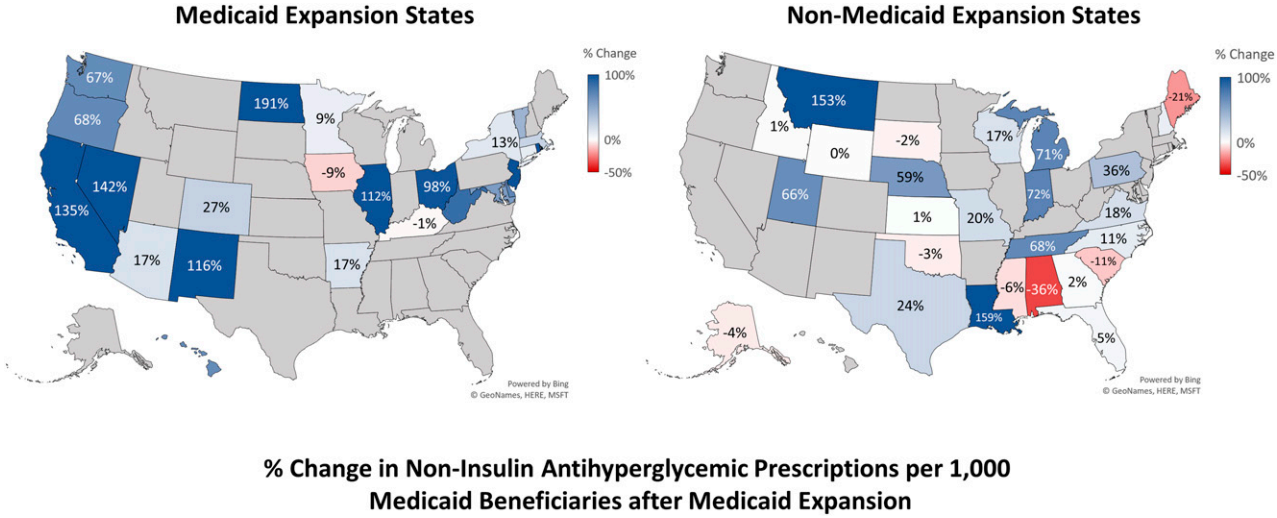

Figure 2—State-level changes in prescription claims of noninsulin antihyperglycemic therapies per 1,000 Medicaid beneficiaries. Percent change is measured in the postexpansion period.

Table 1—Difference-in-difference analyses of claims and expenditures between expansion and nonexpansion states

	Claims		Expenditures	
	DID slope (95% CI)	*P* value	DID slope (95% CI)	*P* value
All noninsulin antihyperglycemic	1.68 (1.09–2.26)	<0.001	42.50 (3.19–81.82)	0.035
SGLT2i	0.125 (−0.003 to 0.25)	0.056	51.12 (−2.58 to 104.81)	0.062
GLP-1RA	0.12 (0.055–0.18)	<0.001	69.66 (29.32–132.08)	0.003
Sensitivity analysis 1*	1.84 (1.20–2.48)	<0.001	49.43 (6.72–92.13)	0.024
Sensitivity analysis 2†	1.77 (1.12–2.43)	<0.001	42.99 (−8.66 to 94.65)	0.10

Sensitivity analyses evaluate difference-in-difference (DID) slopes of all noninsulin antihyperglycemic agents only. All estimates are indexed per 1,000 Medicaid enrollees in each state. *Sensitivity analysis 1 excludes late expansion states, defined as states that expanded after 1 January 2014 and before 31 December 2018 (Arkansas, Indiana, Louisiana, Michigan, Montana, New Hampshire, and Pennsylvania). †Sensitivity analysis 2 excludes very early expansion states that had expanded Medicaid eligibility prior to 1 January 2014 (Massachusetts, California, Connecticut, Minnesota, New Jersey, Washington, and Washington, D.C.).

among newly eligible beneficiaries compared with pre-expansion Medicaid beneficiaries. Finally, Medicaid expansion may have improved overall T2DM care such that beneficiaries may have greater health care contact and opportunities for therapeutic changes. Medicaid expansion is known to have spillover effects on other metrics of care quality (22–24), and promotes improved financial stability of community centers and safety-net hospitals that provide care for socially at-risk patients (25,26). Insurance coverage may promote more regular, longitudinal outpatient care; this greater access may increase individual patient adherence to antihyperglycemic therapies, such that prescription refills and claims may increase.

While we believe that Medicaid expansion had a contributory role, we recognize that insurance status represents one determinant of improved access to care and therapeutic uptake. We note that nonexpansion states also experienced longitudinal increases in quarterly per beneficiary prescriptions. While less pronounced than expansion states, these gains may be reflective of overall improvement in comprehensive care. Importantly, similar gains have been noted in antihyperglycemic therapy use in the Medicare population, despite no systematic changes in insurance coverage (18).

Expansion of Medicaid coverage and associated increased use of antihyperglycemic therapies have important implications. Medicaid expansion predominantly affects younger and middle-aged adults; certain antihyperglycemic therapies including SGLT2i have been shown to modify long-term disease course when introduced early in appropriately selected high-risk patients (27). Medicaid expansion has also been shown to reduce catastrophic health care spending, as observed in the Oregon Experiment (21). These benefits on overall utilization may offset increased therapeutic spending and improve overall care value.

We identified higher per beneficiary spending in both expansion and nonexpansion states, with nonexpansion states incurring slightly greater quarterly spending increases in antihyperglycemic therapies in the postexpansion period compared with expansion states. Among expansion states, new beneficiaries with previously undiagnosed diabetes may be more likely to be started on lower-cost options such as metformin prior to initiation of costlier drugs. In contrast, a less substantial influx of patients with T2DM would be expected in nonexpansion states. Thus, the relatively greater increases in expenditures in nonexpansion states potentially reflects preferential use of more expensive antihyperglycemic therapies.

Several limitations of these analyses should be highlighted. Despite the quasi-experimental framework, we are unable to make causal statements about the effects of Medicaid expansion given the nonrandomized design. Antihyperglycemic use patterns may be related to unbalanced patient characteristics or concurrent policies being implemented alongside changes in Medicaid eligibility in expansion states. We could not determine if therapeutic uptake represented a switch or addition to background antihyperglycemic therapies. SGLT2i were only first introduced in 2013, and many therapies within the class had yet to become available at the start of our observation period, which may explain more modest differences with Medicaid expansion (compared with GLP-1RA). We are unable to gauge appropriateness of care or achievement of glycemic targets in practice. While we could not distinguish use in type 1 or 2 diabetes, only amylin analogs among the noninsulin antihyperglycemic therapies are approved for use in type 1 diabetes. We were unable to differentiate new versus renewed prescriptions. Medicaid expansion occurred in phases and nonexpansion states may have crossed over to expansion states after January 2014. Sensitivity analyses excluding the seven states that expanded after the initial phase of expansion did not qualitatively alter our findings. We could not account for patients who may have purchased private insurance in the individual insurance marketplace and gained access to newer antihyperglycemic medications. Despite these limitations, to our knowledge, this represents one of the first comprehensive analyses assessing the association between Medicaid expansion and use of antihyperglycemic therapies for T2DM.

These data highlight that Medicaid expansion is associated with accelerated uptake of noninsulin antihyperglycemic therapies including GLP-1RA, among low-income adults. These observations may partially reflect an increased pool of previously uninsured eligible beneficiaries (including those who are newly detected with T2DM). While select antihyperglycemic classes have been shown to be effective in preventing or postponing important cardiovascular, kidney, and mortality outcomes among at-risk patients with T2DM (4–6), insurance coverage represents a barrier to their effective implementation in practice (7). To better ascertain effect sizes of public

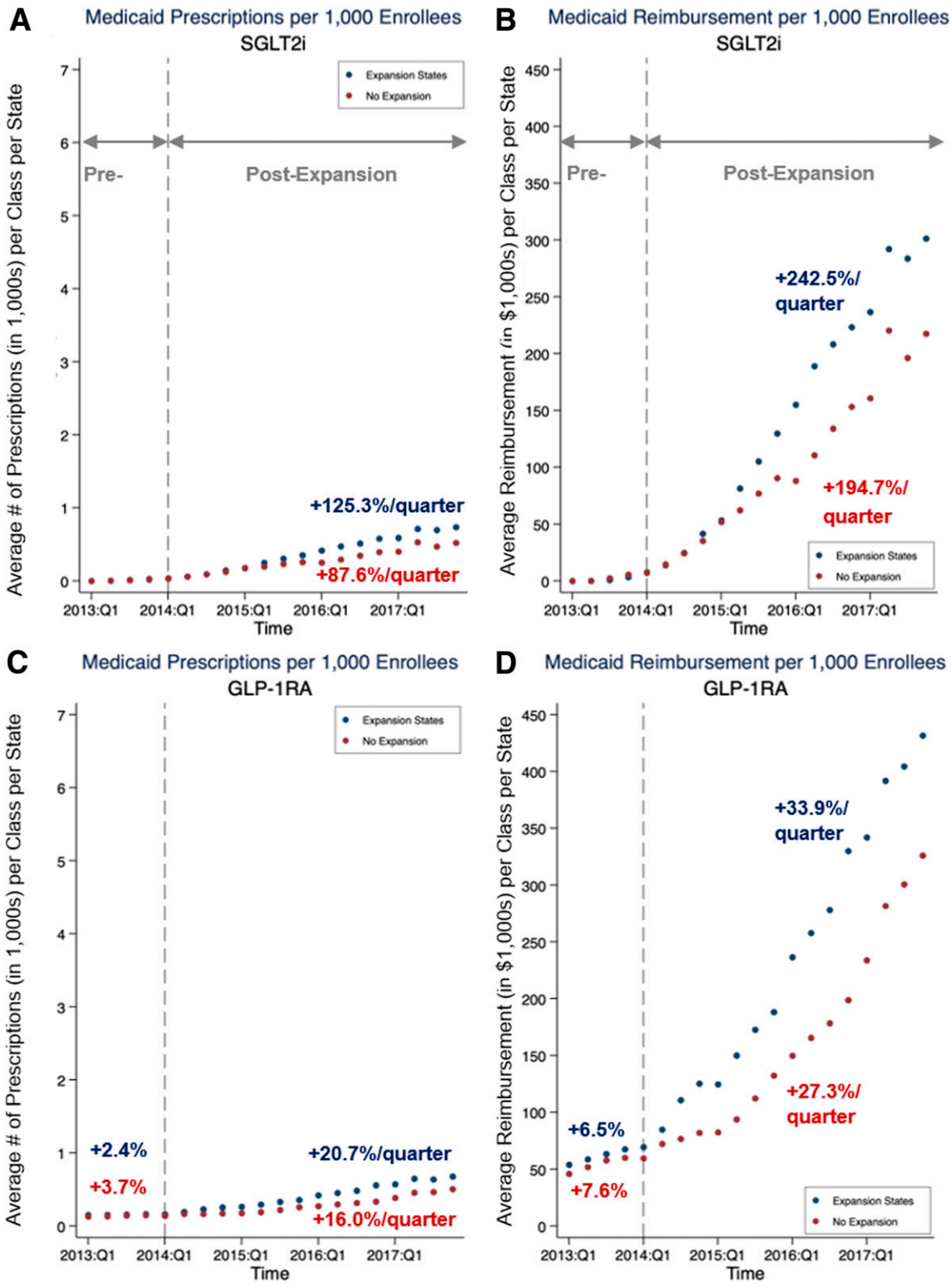

Figure 3—Trends in prescription claims and spending on SGLT2i and GLP-1RA by Medicaid expansion versus nonexpansion, per 1,000 Medicaid enrollees. Estimates of quarterly rates of SGLT2i pre-expansion are suppressed given infrequent use in both expansion and nonexpansion states. Q1, quarter 1.

policy interventions on use of antihyperglycemic medications, future randomized clinical trials of public policy may be feasible and should be considered (28). Innovative strategies to expand coverage and lower out-of-pocket medication spending should be designed and rigorously evaluated for adults with T2DM, as has been done in other disease settings (29,30). Future studies are needed to understand if expanded access to newer antihyperglycemic therapies, in turn, influence

T2DM-related kidney and cardiovascular complications and mortality.

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