ORIGINAL RESEARCH

Changes in Coverage, Access, and Health Following Implementation of Healthy Behavior Incentive Medicaid Expansions vs. Traditional Medicaid Expansions

Daniel B. Nelson, MD MPP¹, Benjamin D. Sommers, MD PhD^{1,2},
Phillip M. Singer, PhD MHSA^{3,4}, Emily K. Arntson, MS^{5,6}, and Renuka Tipirneni, MD MSc^{7,8}

¹Department of Medicine, Brigham and Women's Hospital, 75 Francis St., Boston, MA, USA; ²Department of Health Policy and Management, Harvard T.H. Chan School of Public Health, Boston, MA, USA; ³Department of Political Science, University of Utah, Salt Lake City, UT, USA; ⁴Department of Population Health Sciences, University of Utah School of Medicine, Salt Lake City, UT, USA; ⁵University of Michigan Medical School, Ann Arbor, MI, USA; ⁶Department of Health Management and Policy, University of Michigan School of Public Health, Ann Arbor, MI, USA; ⁷Department of Internal Medicine, University of Michigan Medical School, Ann Arbor, MI, USA; ⁸Institute for Healthcare Policy and Innovation, University of Michigan, Ann Arbor, MI, USA.

BACKGROUND: Several states expanded Medicaid under the Affordable Care Act using Section 1115 waivers to implement healthy behavior incentive (HBI) programs, but the impact of this type of expansion relative to traditional expansion is not well understood.

OBJECTIVE: To examine whether Medicaid expansion with healthy behavior incentive programs and traditional Medicaid expansion were associated with differential changes in coverage, access, and self-rated health outcomes among low-income adults.

DESIGN: Difference-in-differences analysis of American Community Survey and Behavioral Risk Factor Surveillance System data from 2011 to 2017.

PARTICIPANTS: Low-income adults ages 19–64 in the Midwest Census region (American Community Survey, $n = 665,653$; Behavioral Risk Factor Surveillance System, $n = 71,959$).

INTERVENTIONS: Exposure to either HBI waiver or traditional Medicaid expansion in the state of residence.

MAIN MEASURES: Coverage: Medicaid, private, or any health insurance coverage; access: routine checkup, personal doctor, delaying care due to cost; health: cancer screening, preventive care, healthy behaviors, self-reported health.

KEY RESULTS: Healthy behavior incentive (HBI) and traditional expansion (TE) states experienced reductions in uninsurance (-5.6 [$-7.5, -3.7$] and -6.2 [$-8.1, -4.4$] percentage points, respectively) and gains in Medicaid (HBI, $+7.6$ [$2.4, 12.8$]; TE, $+9.7$ [$5.9, 13.4$] percentage points) relative to non-expansion states. Both expansion types were associated with increases in rates of having a personal doctor (HBI, $+3.8$ [$2.0, 5.6$]; TE, $+5.9$ [$2.2, 9.6$] percentage points) and mammography (HBI, $+5.6$ [$0.6, 10.6$]; TE, $+7.3$ [$0.7, 13.9$] percentage points). Meanwhile,

checkups increased more in HBI than in TE states ($p < 0.01$), but no other changes in health care services differed between expansion types.

CONCLUSIONS: Medicaid expansion was associated with improvements in coverage and access to care with few differences between expansion types.

KEY WORDS: Medicaid; Medicaid expansion; health policy; healthy behavior incentives.

J Gen Intern Med 35(9):2521–8

DOI: 10.1007/s11606-020-05801-6

© Society of General Internal Medicine 2020

INTRODUCTION

Section 1115 waivers have been an important policy tool used by states to expand Medicaid under the Affordable Care Act (ACA)¹ and allow states to seek federal approval to modify their existing Medicaid programs. The Centers for Medicare and Medicaid Services (CMS) communicated the Trump Administration's openness for Medicaid expansion waiver applications² and has encouraged broad use of waivers to implement new approaches in the program, including work requirements.

While the new emphasis on flexibility may cause states that have already expanded to alter their Medicaid programs, it could also induce new states to expand eligibility using novel design features. As more states decide whether and how to expand Medicaid, the existing evidence on different types of Medicaid expansion will be important to consider. Thus far, eight states have either implemented Medicaid expansion or modified an existing expansion plan through Section 1115 waivers (Arkansas, Arizona, Iowa, Indiana, Kentucky, Michigan, Montana, and New Hampshire), and other states are seeking to do the same. Modifications in these states have included features like cost-sharing and premiums, private insurance expansion, health savings accounts, healthy behavior programs, and work requirements. One argument offered by many proponents of these waivers is that they promote

Prior Presentations Portions of this work were presented at the 2018 SGIM Annual Meeting in Denver, CO.

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s11606-020-05801-6>) contains supplementary material, which is available to authorized users.

Received June 6, 2019

Accepted March 12, 2020

Published online April 1, 2020

cost-sensitive care seeking behavior,³ though reforms like these may have unintended consequences.⁴ Work evaluating Arkansas' "private option"—which expanded private coverage for the Medicaid population—showed few differences on important health and access outcomes relative to Medicaid.⁵

Three states—Indiana, Iowa, and Michigan—implemented healthy behavior incentive programs in their Medicaid expansion programs under the ACA. While each program varied in the financial rewards for the newly eligible, all programs included incentives for checkups with a primary care provider and promotion of healthy behavior changes, like tobacco cessation, immunizations, or recommended preventive screenings (Appendix I in the Supplementary Material). These financial incentives can take the form of a monetary reward or a reduction of cost-sharing for enrollees.

The underlying rationale for these programs is that financial incentives can induce Medicaid enrollees to make better health and health care choices. This argument is supported in part by evidence that even small changes in financial incentives can result in changes in health-related behaviors.^{6–8} However, one limitation of this prior research is that it has primarily focused on the privately insured. Evidence is limited about the effects of financial incentives on low-income populations with Medicaid coverage,^{9, 10} though one recent study evaluated healthy behavior incentive programs in Medicaid waivers broadly.¹¹

Our work aims to understand the effects of Section 1115 waiver–associated healthy behavior incentive programs as one potential path to Medicaid expansion, relative to traditional Medicaid expansions. Specifically, we examined whether healthy behavior incentive programs in Section 1115 waiver programs in Indiana, Iowa, and Michigan were associated with differential changes in coverage, access, health care utilization, health behaviors, and self-reported health compared with states implementing traditional Medicaid expansions.

METHODS

Data Sources

We used 2011–2017 data from two national surveys with large state-based samples—the American Community Survey (ACS) and the Behavioral Risk Factor Surveillance System (BRFSS), nationally representative surveys of the non-institutionalized population. Both surveys enable estimates that are representative of state populations.¹²

Our sample was restricted to adults aged 19–64 with incomes that would make them eligible for Medicaid coverage under the ACA in expansion states, the population primarily affected by expansion. In the ACS, income is measured continuously, and we have measured family income based on the Health Insurance Unit (a person, his/her spouse, and any dependent children). In contrast, eligibility is more coarsely measured in the BRFSS, which measures income as a range, rather than a continuous measure. To estimate whether an individual would be eligible for Medicaid expansion, we

compared the upper limit of the reported range with the eligibility threshold for their family size (138% of the federal poverty level [FPL]). When the number of adults was missing from the BRFSS, we approximated family size based upon marital status and number of children in the household.

In order to assess the healthy behavior incentive programs in Indiana, Iowa, and Michigan relative to traditional Medicaid expansion, we selected a comparison group of traditional Medicaid expansion and non-Medicaid expansion states from the Midwest Census Region. Traditional Medicaid expansion comparison states were Illinois, North Dakota, and Ohio; non-expansion comparison states were Kansas, Missouri, Nebraska, and South Dakota. States with partial Medicaid expansions before the ACA expansion (Minnesota and Wisconsin) were excluded from our main model, but included in sensitivity analyses. See the Appendices in the Supplementary Material for discussion of healthy behavior incentive programs (Appendix I), comparator state selection (Appendix II), and full regression equations (Appendix III).

Survey Measures

Our outcomes of interest included coverage, access, utilization of preventive care services, health behaviors, and self-reported health status. Coverage was measured in three categories using the ACS—Medicaid, private insurance, and uninsured. Individuals were allowed to report multiple types of coverage.

Access to care, utilization of preventive care services, health behaviors, and self-reported health were measured in the BRFSS. Access measures included the likelihood of having a routine checkup in the past year, a personal doctor, or delaying care due to cost. Preventive care services included receiving a flu shot in the past year, ever receiving HIV or cholesterol screening, and obtaining recommended screening for colorectal, cervical, or breast cancer. We also assessed the likelihood of whether an individual completed any of the three age-appropriate cancer screenings.^{13–15}

Health behavior outcomes included current smoking, lack of physical exercise in the past month, and heavy alcohol use (defined as more than 7 drinks in a week or 3 drinks in one episode for women, and more than 14 drinks in a week or 4 drinks in one episode for men).¹⁶ We also created a composite “any unhealthy behavior” variable to evaluate if an individual reported any of these behaviors.

Health outcomes included self-reported health, dichotomized as the likelihood of excellent/very good health vs. good/fair/poor health. We also assessed functional limitations across three dimensions: mental, physical, or either mental or physical limitation during ≥ 14 of the past 30 days.

Statistical Analysis

We employed a difference-in-differences (DID) approach¹⁷ using linear probability models to study differential changes across Medicaid expansion types. Changes in outcomes for treatment states (either healthy behavior incentive or

traditional Medicaid) were compared with changes in the same outcome in non-expansion states. The pre-period was defined as quarters prior to expansion and the post-period included quarters after expansion. Study states expanded Medicaid eligibility in January 2014, except Indiana (January 2015) and Michigan (April 2014). Two interaction terms were included in each regression: one that interacted an indicator for healthy behavior incentive expansion with implementation status in a given quarter (pre/post expansion) and another that interacted an indicator for traditional expansion with implementation status. We then conducted post-estimation testing using an F-statistic to assess whether the difference-in-differences estimates for healthy behavior incentive expansion and traditional expansion states differed from one another.

Regression models included fixed effects for state and time, as well as adjustment for age, gender, race, marital status, education, income, employment status, and whether the respondent was part of the BRFSS cell phone sample. All analyses were adjusted for survey weighting. Standard errors were clustered by state to account for serial correlation of the error terms.

To assess the assumptions of the DID model—namely, whether the three groups of states experienced parallel trends in outcomes in the pre-expansion period—we used two approaches. In the first, we visually examined regression-adjusted graphs of our outcomes of interest in the pre-expansion period. In the second, we performed regression analyses interacting a linear time trend with each type of Medicaid expansion and assessed for statistical significance. Both tests were consistent with parallel trends in the pre-period (Appendix IV in the Supplementary Material). To test the robustness of our findings to alternative specifications (Appendix VI in the Supplementary Material), we analyzed alternative control groups, time controls, definitions of income and self-reported health, and standard error specifications. A placebo test of the effects of expansion on those with income too high for Medicaid eligibility was performed. We also stratified our analysis by educational attainment and race and performed a subgroup analysis on individuals with chronic disease. All analyses were performed using Stata version 13.

RESULTS

Baseline characteristics were similar across each state group (healthy behavior incentive, traditional expansion, non-expansion), except that traditional expansion states had a greater proportion of residents with Hispanic ethnicity than other states (Appendix V in the Supplementary Material).

Graphs showing unadjusted coverage rates over time indicate declining uninsurance and increases in Medicaid coverage in healthy behavior incentive and traditional Medicaid expansion states, compared with non-expansion states (Fig. 1). Rates of checkups increased for both groups of expansion states as well, though with larger apparent gains for healthy

behavior incentive states. Appendix V in the Supplementary Material shows comparable figures for our other outcomes.

In difference-in-differences analyses adjusting for sociodemographic characteristics, uninsurance rates (Panel A) decreased by 5.6 percentage points in healthy behavior incentive states ($p < 0.01$) and 6.2 percentage points in traditional expansion states ($p < 0.01$), relative to non-expansion states (Table 1). Concurrently, Medicaid coverage (Panel B) increased by 7.6 percentage points in healthy behavior incentive states ($p = 0.01$) and 9.7 percentage points in traditional expansion states ($p < 0.01$). Neither type of expansion was associated with decreased rates of private insurance coverage, and none of the coverage outcomes differed significantly between traditional expansion and healthy behavior incentive states. Panel C shows changes in rates of routine checkups over time.

Healthy behavior incentive expansion was associated with an increased likelihood of having a routine checkup in the past year (+6.5 percentage points, $p < 0.01$), and the increase in checkups was larger for healthy behavior incentive states than for traditional expansion states (+2.5 percentage points, $p = 0.17$), relative to non-expansion states (Table 1). The difference between expansion types was statistically significant ($p < 0.01$). Both types of expansion were associated with increased rates of having a personal doctor (+3.8 and +5.9 percentage points, $p < 0.01$ and $p = 0.01$, respectively).

Both healthy behavior incentive (+5.6 percentage points, $p = 0.03$) and traditional expansion states (+7.3 percentage points, $p = 0.03$) saw significant increases in mammogram screening rates relative to non-expansion states, with no significant difference between healthy behavior incentive and traditional expansion (Table 2). HIV screening increased (+3.1 percentage points, $p = 0.04$) and cholesterol screening decreased (−1.7 percentage points, $p = 0.02$) in healthy behavior incentive states relative to non-expansion states. There were no significant differences in either expansion group with regard to cancer screening composite or other preventive services (Table 2).

Traditional expansion and healthy behavior incentive were associated with decreased rates of smoking. There were no significant differences in either state group for the unhealthy behavior composite measure (Table 2). There were also no significant changes in self-reported health status in either healthy behavior incentive or traditional expansion states compared with non-expansion states, though the between-group comparison indicated higher rates of excellent or very good health in the traditional expansion compared with the healthy behavior incentive states ($p = 0.01$). This finding was not robust to specifying self-reported health as fair or poor health vs. excellent, very good, or good (Appendix VI in the Supplementary Material).

Figure 2 presents these results graphically, comparing estimated changes in healthy behavior incentive expansion relative to traditional expansions. The general pattern shows that healthy behavior incentive and traditional expansions were associated with similar changes for most of the outcomes we assessed.

Our findings of increased coverage, checkups, and personal doctors in expansion states were robust to our sensitivity

Fig. 1 Unadjusted trends in selected coverage and access outcomes by Medicaid expansion type, before and after healthy behavior incentive Medicaid expansion waivers, 2011–2017. Panel A, rates of uninsurance; Panel B, rates of Medicaid insurance; Panel C, rates of routine checkups in the last year. HBI: healthy behavior incentive program. Population restricted to non-elderly adults with income $\leq 138\%$ Federal Poverty Limit, as estimated by household income and household size. Analyses are adjusted for ACS and BRFSS survey weighting. All states expanded Medicaid eligibility in January 2014, except Indiana (January 2015) and Michigan (April 2014).

analyses, though changes in utilization of specific preventive care services and in smoking were not consistently observed (Appendix VI in the Supplementary Material).

DISCUSSION

In this analysis of survey data from the Midwest Census region examining the different paths to state Medicaid expansions under the ACA, we found that healthy behavior incentive programs implemented as part of the Section 1115 waivers and traditional Medicaid expansions were associated with similar gains in insurance coverage, but somewhat nuanced changes in health care use and healthy behaviors. Our finding that coverage gains were similar in size for the two groups of expansion states was consistent with several prior studies.^{18–20} While other analyses have suggested that healthy behavior incentive programs may lead to lower rates of coverage uptake than traditional expansions due to their higher cost-sharing requirements,²¹ we did not find evidence of this association in the present study.

Meanwhile, we found that, for most health care utilization and health behavior outcomes we assessed, the results were

similar in healthy behavior incentive and traditional expansion states. One notable exception was that healthy behavior incentive states exhibited increased rates of routine health checkups compared with traditional Medicaid expansion states. For the other measures we studied, including cancer screening and other preventive health screenings, unhealthy behaviors, and vaccinations, there was no significant difference between healthy behavior incentive and traditional expansion states.

While the nature of the expansion type was not associated with differences for most of these outcomes, we did find improvements in some preventive care measures for both types of expansion states compared with non-expansion states—including increases in the rates of having a personal physician and mammography, though this latter association was inconsistently present in sensitivity analyses. Taken together, these findings suggest that the healthy behavior incentive expansions were by-and-large similar to traditional expansions in their overall association with increasing coverage and access to care, without dramatic differences between the two approaches. This is consistent with previous evidence on another waiver expansion program, the so-called “private option” in Arkansas, which performed similarly to a traditional Medicaid expansion in a nearby comparison state.²²

Table 1 Adjusted Probabilities of Coverage and Access Outcomes Among Medicaid Eligible, Before and After Healthy Behavior Incentive Medicaid Expansion Waivers

	Non-expansion states		HBI states		Traditional expansion states		DID estimate—HBI vs. non-expansion, [95% CI]	DID estimate—traditional vs. non-expansion, [95% CI]	p value, HBI vs. traditional expansion states
	Pre-period mean	Post-period mean	Pre-period mean	Post-period mean	Pre-period mean	Post-period mean			
Coverage outcomes									
Uninsurance	36.7	28.5	33.4	17.5	34.0	18.7	−5.6* (−7.5, −3.7)	−6.2* (−8.1, −4.4)	0.38
Medicaid	21.1	23.1	28.3	40.7	27.8	40.6	7.6* (2.4, 12.8)	9.7* (5.9, 13.4)	0.20
Private health insurance	41.2	47.3	38.1	42.7	37.1	40.2	−1.4 (−4.7, 2.0)	−3.1 (−6.3, 0.1)	0.31
Access outcomes									
Routine checkup in past year	54.3	55.7	54.5	65.0	58.1	62.9	6.5* (4.1, 8.9)	2.5 (−1.3, 6.3)	0.002*
Have a personal doctor	64.0	64.0	68.8	73.2	65.3	70.3	3.8* (2.0, 5.6)	5.9* (2.2, 9.6)	0.11
Delayed care due to cost	37.7	31.6	36.1	26.0	34.0	24.1	−2.3 (−5.0, 0.5)	−2.9 (−6.5, 0.8)	0.64

HBI, healthy behavior incentive program; DID, differences-in-differences. Population restricted to non-elderly adults with income $\leq 138\%$ of the Federal Poverty Level, as estimated by household income and household size. Pre- and post-period means are survey-weighted values. Both DID analyses are regression-adjusted for state fixed effects, gender, age, race, marital status, education, income, and employment status. The BRFSS DID analysis was also regression-adjusted for cell phone sample and quarter-year fixed effects; the ACS DID analysis was regression-adjusted for year fixed effects. Standard errors are clustered by state. All changes are in percentage-point terms. * $p < 0.01$

There are several possible reasons we observed similar outcomes between expansion using healthy behavior incentive programs and traditional Medicaid expansion. First, the design and implementation of the healthy behavior incentive programs differed between states. The only behaviors incentivized across all study states were attending an annual physician visit and obtaining recommended screenings, vaccinations, and other preventive care.²³ In Michigan and Iowa, the beneficiary had to complete a health risk assessment with a primary care provider to receive a financial incentive; obtaining further preventive care was also encouraged. While Indiana's plan left the specific incentive structure to the discretion of Medicaid-managed care organizations, obtaining recommended preventive care was among the potentially incentivized behaviors. Second, it is likely that healthy behavior incentive programs were not well understood by patients or their health care providers. Early work evaluating Iowa's Medicaid expansion showed that the incentive program was limited by a low completion rate among the newly eligible, likely because few people knew about the program or its requirements.^{24, 25} This is consistent with prior attempts to include behavior incentives in Medicaid.^{26, 27}

In addition to offering a greater understanding of healthy behavior incentive programs in Medicaid, this study confirms other works demonstrating increased access to and utilization of some preventive care services in states that have expanded Medicaid relative to those that have not.²⁸ For example, prior work suggests Medicaid expansion was associated with earlier cancer diagnoses. Our findings suggest increased mammography as one potential mechanism for this finding.^{29–31}

Another recent study examined healthy behavior incentive programs in Medicaid Section 1115 waivers broadly, finding small increases in preventive health visits and no effects on rates of smoking or obesity.¹¹ Our study differs in its focus on comparing healthy behavior incentive expansion to traditional Medicaid expansion as two different paths to Medicaid expansion and thus has corresponding differences in study design. To minimize differences across states in pre-period trends and sociodemographic characteristics, we selected nearby states in the same geographic region for our comparison group. We also assessed a broader range of health and health behavior outcomes and included the most recent 2017 ACS and BRFSS data. One earlier study also examined the effects of Medicaid expansion on health behaviors, but this did not differentiate between expansion types and found overall similar results.³²

Our findings should be interpreted in the context of some limitations. First, our outcomes are self-reported and may be limited by measurement or nonresponse biases. However, potential reporting biases are unlikely to be time-varying or correlated with healthy behavior incentive or Medicaid expansions. Second, available data included a relatively short follow-up period after Medicaid expansion was implemented, which may not be

Table 2 Adjusted Probabilities of Preventive Health, Health Behavior, and Health Outcomes Among Medicaid Eligible, Before and After Healthy Behavior Incentive Medicaid Expansion Waivers

	Non-expansion states		HBI states		Traditional expansion states		DID estimate—HBI vs. non-expansion, [95% CI]	DID estimate—traditional vs. non-expansion, [95% CI]	p value, HBI vs. traditional expansion states	
	Pre-period mean	Post-period mean	Pre-period mean	Post-period mean	Pre-period mean	Post-period mean				
Preventive health outcomes										
Colorectal cancer screening [†]	43.9	42.1	46.8	51.4	44.4	45.8	3.3 (−3.7, 10.4)	1.4 (−8.7, 11.6)	0.65	
Mammogram [‡]	53.2	50.0	55.3	63.5	57.6	63.1	5.6 [†] (0.6, 10.6)	7.3 [†] (0.7, 13.9)	0.45	
Pap smear [‡]	75.0	66.6	74.5	74.0	80.0	77.8	1.7 (−3.2, 6.7)	3.4 (−0.6, 7.4)	0.17	
Cancer screening composite [‡]	96.6	94.5	95.2	96.1	95.9	96.8	0.9 (−1.2, 3.1)	1.7 (−0.9, 4.2)	0.51	
Flu shot in past year	28.5	31.3	25.2	28.2	23.5	28.7	0.7 (−1.5, 3.0)	3.3 (−1.4, 8.0)	0.22	
HIV screening [§]	50.0	47.9	49.5	51.5	49.6	47.6	3.1 [†] (0.1, 6.1)	0.2 (−2.4, 2.9)	0.05	
Cholesterol screening [§]	60.4	71.9	65.3	74.4	62.7	79.3	−1.7 [†] (−3.1, −0.3)	6.2 (−2.4, 14.7)	0.06	
Health behavior outcomes										
Any exercise in past month	66.8	66.0	64.7	64.3	66.9	65.6	0.2 (−1.9, 2.4)	−1.2 (−3.2, 0.8)	0.12	
Current smoking	41.3	39.5	41.7	38.0	37.6	33.8	−3.0 [†] (−5.5, −0.5)	−2.6 [†] (−4.9, −0.2)	0.56	
Heavy alcohol use	19.1	19.0	19.7	18.4	22.8	20.9	−0.4 (−2.7, 2.0)	−1.0 (−3.7, 1.7)	0.69	
Unhealthy behavior composite	67.0	66.5	68.7	67.2	66.6	64.3	−0.7 (−2.9, 1.4)	−1.1 (−2.9, 0.8)	0.62	
Health outcomes										
Excellent/very good health	34.7	35.5	33.5	31.6	30.7	34.1	−1.7 (−4.5, 1.0)	2.7 (−1.2, 6.7)	0.01*	
Mental or physical limitation ≥ 14/30 past days	28.7	29.6	28.9	28.9	24.6	23.5	−1.2 (−5.7, 3.2)	−1.4 (−4.4, 1.6)	0.88	

HBI, healthy behavior incentive program; DID, differences-in-differences. Population restricted to non-elderly adults with income ≤ 138% of the Federal Poverty Level, as estimated by household income and household size. Pre- and post-period means are survey-weighted values. DID analyses are adjusted for state fixed effects, gender, age, race, marital status, education, income, employment status, cell phone sample, and quarter-year fixed effects. Standard errors are clustered by state. All changes are in percentage-point terms. * $p < 0.01$, [†] $p < 0.05$

‡Mammogram, colorectal cancer, and Pap smear screening were considered positive if respondents met clinical screening guidelines; the cancer screening composite was marked “yes” if the respondent had received any of these

§HIV and cholesterol screening were positive if the respondent had ever been screened

||Heavy alcohol use was defined as more than 7 drinks in a week or 3 drinks in one episode for women, and more than 14 drinks in a week or 4 drinks in one episode for men. Unhealthy behavior composite consisted of a “yes” response to smoking or heavy alcohol use or a “no” response to any exercise in the past month

Fig. 2 Comparison of outcomes among Medicaid eligible, before and after healthy behavior incentive Medicaid expansion waivers*. HBI: healthy behavior incentive program; DID: differences-in-differences. Population restricted to non-elderly adults with income $\leq 138\%$ of the Federal Poverty Level, as estimated by household income and household size. Both DID analyses are regression-adjusted for state fixed effects, gender, age, race, marital status, education, income, and employment status. The BRFSS DID analysis was also regression-adjusted for cell phone sample and quarter-year fixed effects; the ACS DID analysis was regression-adjusted for year fixed effects. Standard errors are clustered by state. Boxes indicate point estimates and lines represent 95% confidence interval. All changes are in percentage-point terms. Asterisks indicate whether the DID estimates for HBI and traditional expansion states are significantly different. $^{\dagger}p < 0.01$. ‡ Mammogram, colorectal cancer, and Pap smear screening were considered positive if respondents met clinical screening guidelines; the cancer screening composite was marked “yes” if the respondent had received any of these. § HIV and cholesterol screening were positive if the respondent had ever been screened. $^{\parallel}$ Heavy alcohol use was defined as more than 7 drinks in a week or 3 drinks in one episode for women, and more than 14 drinks in a week or 4 drinks in one episode for men. Unhealthy behavior composite consisted of a “yes” response to smoking or heavy alcohol use or a “no” response to any exercise in the past month.

long enough to detect health differences that might emerge over time. Third, the healthy behavior incentive “treatment” group is comprised of three Midwestern states; as each of these states implemented distinctive program features, aggregating them may obscure important differences. Likewise, we are unable to disentangle the effects of the healthy behavior incentive from other features of the waiver programs, like differences in cost-sharing. Nonetheless, as these are the only states to have implemented a healthy behavior incentive in a Medicaid expansion Section 1115 waiver program, analyzing these states provides the best available data about the impacts of these programs. Fourth, we did not adjust for multiple comparisons, as we were interested in the range of potential outcomes of expansion, not simply whether any single outcome varied. Given our general finding of few significant differences between healthy behavior incentive and traditional expansion states, any adjustment for multiple comparisons would lead to an even stronger conclusion there is little to distinguish the two expansion types in terms of our study outcomes.

CONCLUSIONS

Section 1115 waivers with healthy behavior incentive programs are likely to grow in number, especially as states with more conservative leadership consider expanding Medicaid eligibility in the near future.³ Healthy behavior incentive programs may have the potential to change Medicaid enrollees’ health behaviors, and, in our current examination, we found significant changes in checkup rates. However, we found little evidence of additional health benefits compared with traditional Medicaid expansion. As a whole, our findings suggest that, in these states, deciding to expand Medicaid was a more important decision than whether to include healthy behavior incentive programs. The ultimate health effects of these expansion programs will depend on how well they are implemented and incentivized, though their impact should be weighed against the requisite administrative costs and burden on enrollees. As healthy behavior incentives continue to be implemented in Medicaid programs, careful attention should be paid to the association with longer term health outcomes and state costs to determine whether there is sufficient value to warrant implementing these programs.

Corresponding Author: Daniel B. Nelson, MD MPP; Department of Medicine Brigham and Women's Hospital, 75 Francis St., Boston, MA 02115, USA (e-mail: nel.daniel.son@gmail.com).

Contributors None.

Funders Dr. Tipirneni was supported by a K08 Clinical Scientist Development Award from the National Institute on Aging (1K08AG056591).

Compliance with Ethical Standards:

Conflict of Interests: The authors declare that they do not have a conflict of interest.

REFERENCES

- Jones DK, Singer PM, Ayanian JZ. The changing landscape of Medicaid: practical and political considerations for expansion. *JAMA*. 2014;311(19):1965–6.
- Price TE, Verma S. Letter to US governors [Internet]. 2017 Mar [cited 2018 Oct 20]. Available from: <https://www.hhs.gov/sites/default/files/sec-price-admin-verma-ltr.pdf>.
- Singer PM, Nelson DB, Tipirneni R. Consumer-directed health care for Medicaid patients: past and future reforms. *Am J Public Health*. 2017;107(10):1592–4.
- Baker AM, Hunt LM. Counterproductive consequences of a conservative ideology: Medicaid expansion and personal responsibility requirements. *Am J Public Health*. 2016;106:1181–1187.
- Sommers BD, Maylone B, Blendon RJ, Orav EJ, Epstein AM. Three-year impacts of the Affordable Care Act: improved medical care and health among low-income adults in two states. *Health Aff*. 2017;36(6):1119–1128.
- Sutherland K, Christianson JB, Leatherman S. Impact of targeted financial incentives on personal health behavior. *Med Care Res Rev*. 2008;65(6_suppl):36S–78S.
- Mantzari E, Vogt F, Shemilt I, Wei Y, Higgins JP, Marteau TM. Personal financial incentives for changing habitual health-related behaviors: a systematic review and meta-analysis. *Prev Med*. 2015;75:75–85.
- Barte JC, Wendel-Vos GW. A systematic review of financial incentives for physical activity: the effects on physical activity and related outcomes. *Behav Med*. 2017;43(2):79–90.
- Greene J. Medicaid Efforts to Incentivize Healthy Behaviors. New Jersey: Center for Health Care Systems. 2007.
- Redmond P, Solomon J. Can incentives for healthy behavior improve health and hold down Medicaid costs? Center on Budget and Policy Priorities. 2007.
- Huf SW, Volpp KG, Asch DA, Bair E, Venkataramani A. Association of Medicaid healthy behavior incentive programs with smoking cessation, weight loss, and annual preventive health visits. *JAMA Netw Open*. 2018 Dec 7;1(8):e186185–.
- Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System: annual survey data [Internet]. Atlanta (GA): CDC; [page last reviewed 8 October 2018; cited 2018 Oct 20]. Available from: https://www.cdc.gov/brfss/annual_data/annual_data.htm
- Siu AL. Screening for breast cancer: US Preventive Services Task Force recommendation statement. *Ann Int Med*. 2016;164:279–96.
- US Preventive Services Task Force. Screening for cervical cancer US Preventive Services Task Force recommendation statement. *JAMA*. 2018 Aug 21;320(7):674–86.
- US Preventive Services Task Force. Screening for colorectal cancer: US Preventive Services Task Force recommendation statement. *JAMA*. 2016 Jun 21;315(23):2564–75.
- National Institute on Alcohol Abuse and Alcoholism. Helping patients who drink too much: a clinician's guide. NIH Publication no. 05–3769, Bethesda, MD 2005.
- Dimick JB, Ryan AM. Methods for evaluating changes in health care policy: The difference-in-differences approach. *JAMA*. 2014;312(22):2401–2.
- Wherry L, Miller S. Early coverage, access, utilization, and health effects of the Affordable Care Act Medicaid expansions. *Ann Int Med*. 2016;164:795–803.
- Courtemanche C, Marton J, Ukert B, Yelowitz B, Zapata D. Early impacts of the Affordable Care Act on health insurance coverage in Medicaid expansion and non-expansion states. *J Policy Anal Manage*. 2017;36(1):178–210.
- Frean M, Gruber J, Sommer BD. Premium subsidies, the mandate, and Medicaid expansion: coverage effects of the Affordable Care Act. *J Health Econ*. 2017;53:72–86.
- Freedman S, Richardson L, Simon K. Learning from waiver states: coverage effects under Indiana's HIP Medicaid expansion. *Health Aff*. 2018;37(6):936–43.
- Sommers BD, Blendon RJ, Orav EJ, Epstein AM. Changes in utilization and health among low-income adults after Medicaid expansion or expanded private insurance. *JAMA Intern Med*. 2016;176(10):1501–9.
- Medicare and CHIP Payment and Access Commission. The use of healthy behavior incentives in Medicaid. Issue Brief. August 2016.
- Askelson NM, Wright B, Bentler S, Momany ET, Damiano P. Iowa's Medicaid expansion promoted healthy behaviors but was challenging to implement and attracted few participants. *Health Aff*. 2017;36(5):799–807.
- Wright B, Askelson NM, Ahrens M, Momany ET, Bentler S, Damiano P. Completion of requirements in Iowa's Medicaid expansion premium disincentive program, 2014–2015. *Am J Pub Health*. 2018;108(2):219–23.
- Blumenthal KJ, Saulsgriver KA, Norton L, Troxel AB, Anarella JP, Gesten FC, et al. Medicaid incentive programs to encourage healthy behavior show mixed results to date and should be studied and improved. *Health Aff*. 2013;32(3):497–507.
- RTI International and the National Academy for State Health Policy. Final Report, Medicaid Incentives for Prevention of Chronic Diseases. April 2017.
- Mazurenko O, Balio CP, Agarwal R, Carroll AE, Menachemi N. The effects of Medicaid expansion under the ACA: a systematic review. *Health Aff*;37(6):944–50.
- Soni A, Simon K, Cawley J, Sabik L. Effect of Medicaid expansions of 2014 on overall and early-stage cancer diagnoses. *Am J Public Health*. 2017;108(2):216–8.
- Hendryx M, Luo J. Increased cancer screening for low-income adults under the Affordable Care Act Medicaid expansion. *Med Care*. 2018;56(11):944–949.
- Fedewa SA, Yabroff KR, Smith RA, Goding Sauer A, Han X, Jemal A. Changes in breast and colorectal cancer screening after Medicaid expansion under the Affordable Care Act. *Am J Prev Med*. 2019;57(1):3–12.
- Simon K, Soni A, Cawley J. The impact of health insurance on preventive care and health behaviors: evidence from the first two years of the ACA Medicaid expansions. *J Policy Anal Manage*;38(2):390–417.

Publisher's Note: Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.